

**Manchester - Boston Regional Airport  
City of Manchester - Department of Aviation**

**RUNWAY INCURSION MITIGATION PROJECTS**

**TAXIWAYS A1 & A2 HOLD LINE RECONFIGURATION**

**AND**

**TAXIWAY H RECONFIGURATION TO TAXIWAY K**

**FAA AIP No. 3-33-0011-xxx-2021**

**Bid # FY21-805-25 (Taxiway A1-A2 Hold Line Reconfiguration)**

**Bid # FY21-805-26 (Taxiway H Reconfiguration to Taxiway K)**



**ISSUED FOR BIDDING  
MARCH 2021**

**PREPARED BY:**



**McFarland Johnson**

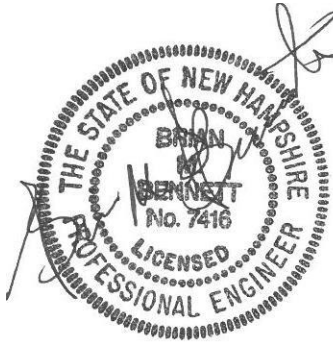
**53 REGIONAL DRIVE  
CONCORD, NH 03301**

THIS PAGE INTENTIONALLY LEFT BLANK

# TAXIWAYS A1 & A2 HOLD LINE RECONFIGURATION

**FAA AIP No. 3-33-0011-xxx-2021  
Bid # FY21-805-25**

## SEALS



Civil

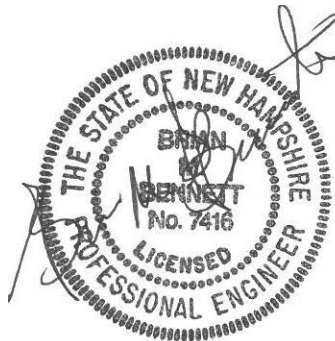
THIS PAGE INTENTIONALLY LEFT BLANK



# TAXIWAY H RECONFIGURATION TO TAXIWAY K

FAA AIP No. 3-33-0011-xxx-2021  
Bid # FY21-805-26

## SEALS



Civil



Electrical

THIS PAGE INTENTIONALLY LEFT BLANK

## **TABLE OF CONTENTS**

### **ADVERTISEMENT FOR BIDS**

#### **INFORMATION FOR BIDDERS**

1.01	Receipt, Preparation and Opening of Bids	IB-1
1.02	Description of Work	IB-1
1.03	Preparation of Bid	IB-2
1.04	Subcontracts	IB-2
1.05	Bidder's Qualifications	IB-2
1.06	Bid Modification	IB-2
1.07	Proposal Guaranty Bid Security	IB-2
1.08	Time of Completion and Liquidated Damages	IB-2
1.09	Security for faithful performance	IB-3
1.10	Addenda and Interpretations	IB-3
1.11.	Power of Attorney	IB-3
1.12	Laws and Regulations	IB-3
1.13	Execution of Contract	IB-4
1.14	Approval Contract	IB-4
1.15	Failure to Execute Contract	IB-4
1.16	Notice of Special Conditions	IB-4
1.17	Employment of Women	IB-4
1.18	Equal Employment Opportunity	IB-4
1.19	Electronically Provided Bid Documents	IB-5

#### **BID PROPOSAL**

Bid Bond	BP-1
Certificate as to Corporate Principal – Bid Bond	BP-3
Proposal	BP-5
Acknowledgment of Addenda	BP-6
Bid Form – Schedule A – Taxiway A1 & A2 Hold Line Reconfiguration	BP-7
Bid Form – Schedule B – Taxiway H Reconfiguration to Taxiway K	BP-11
Bid Form – Schedule C – Runway 6-24 Pavement Maintenance	BP-20
Bid Summary – All Schedules	BP-21
Certificate as to Corporate Principal – Proposal	BP-22

#### **BID PROPOSAL CERTIFICATES OF COMPLIANCE**

Affirmative Action Certification	BPC-2
Certificate of Buy American Compliance for Manufactured Products	BPC-3
Goals and Assurances for Disadvantaged Business Enterprises	BPC-5
Disadvantage Business Enterprise (DBE) Utilization	BPC-6
DBE Letter of Intent	BPC-7
Non-Collusion Affidavit	BPC-8
Certification of Nonsegregated Facilities	BPC-9
Certification of Prohibition of Segregated Facilities (Contractors/Subcontractors)	BPC-10
Certification for Debarment and Suspension	BPC-11
Trade Restriction Certification	BPC-12
Disclosure of Lobbying Activities	BPC-13
Certification of Bidder's/Offeror's Regarding Tax Delinquency and Felony Conviction	BPC-15

## CONTRACT DOCUMENTS

<b>Contract – Schedule A - Taxiway A1-A2 Hold Line Reconfiguration</b>	CA-1
Contract Signatures	CA-3
Certificate of Insurance	CA-4
Safety Responsibility Covenant	CA-5
Contract Bonds	CA-7
Form of Performance Bond	CA-9
Certificate as to Corporate Principal – Performance Bond	CA-11
Form of Payment Bond	CA-13
Certificate as to Corporate Principal – Payment Bond	CA-16
Warranty Bond	CA-17
Certificate as to Corporate Principal – Warranty Bond	CA-19
 <b>Contract – Schedules B &amp; C - Taxiway H Reconfiguration to Taxiway K</b>	 CB-1
Contract Signatures	CB-3
Certificate of Insurance	CB-4
Safety Responsibility Covenant	CB-5
Contract Bonds	CB-7
Form of Performance Bond	CB-9
Certificate as to Corporate Principal – Performance Bond	CB-11
Form of Payment Bond	CB-13
Certificate as to Corporate Principal – Payment Bond	CB-16
Warranty Bond	CB-17
Certificate as to Corporate Principal – Warranty Bond	CB-19

## GENERAL CONTRACT PROVISIONS

10	Definition of Terms	GP-1
20	Proposal Requirements and Conditions	GP-5
30	Award and Execution of Contract	GP-8
40	Scope of Work	GP-11
50	Control of Work	GP-14
60	Control of Materials	GP-21
70	Legal Regulations and Responsibility to Public	GP-25
80	Execution and Progress	GP-32
90	Measurement and Payment	GP-38

## REQUIRED CONTRACT PROVISIONS FOR AIP PROJECTS

A1.	Access to Records and Reports	2
A2.	Affirmative Action Requirement	3
A3.	Breach of Contract Terms	4
A4.	Buy American Preference	5
A5.	Civil Rights-General	7
A6.	Civil Rights-Title VI Assurances	7
A7.	Clean Air and Water Pollution Control	10
A8.	Contract Workhours and Safety Standards Act Requirements	11
A9.	Copeland “Anti-kickback” Act	12
A10.	Davis-Bacon Requirements	13
A11.	Debarment and Suspension	19
A12.	Disadvantaged Business Enterprise	20
A13.	Distracted Driving	21
A14.	Energy Conservation Requirements	22
A15.	Drug Free Workplace Requirements ( <i>Not Applicable for Construction Contract</i> )	n/a

A16.	Equal Employment Opportunity (EEO)	23
A17.	Federal Fair Labor Standards Act (Federal Minimum Wage)	29
A18.	Lobbying and Influencing Federal Employees	30
A19.	Prohibition of Segregated Facilities	31
A20.	Occupational Safety and Health Act of 1970	32
A21.	Procurement of Recovered Materials	33
A22.	Rights to Inventions ( <i>Not Applicable for this Construction Contract</i> )	n/a
A23.	Seismic Safety ( <i>Not Applicable for this Construction Contract</i> )	n/a
A24.	Tax Delinquency and Felony Convictions	34
A25.	Termination of Contract	35
A26.	Trade Restriction Certification	37
A27.	Veteran's Preference	39

**DAVIS-BACON ACT WAGE RATES SCHEDULE – ROCKINGHAM HIGHWAY  
SCHEDULE A - TAXIWAYS A1 & A2 HOLD LINE RECONFIGURATION**

**DAVIS-BACON ACT WAGE RATES SCHEDULE – HILLSBOROUGH HIGHWAY  
SCHEDULES B & C - TAXIWAY H RECONFIGURATION TO TAXIWAY K**

**SUPPLEMENTAL PROVISIONS**

I	Contract Document Drawings	SP-1
II	Special Inspection Requirements	SP-1
III	“Or Equal” Clause	SP-2
IV	Contractor Agreement Indemnification	SP-2
V	Insurance	SP-2
VI	Special Hazards	SP-3
VII	Protection of Lives and Health	SP-3
VIII	Pricing of Construction Contract Change Order or Supplemental Agreement	SP-4
IX	Airport Security	SP-6
X	Badging Requirements	SP-7

**CONSTRUCTION SAFETY AND PHASING PLAN  
SCHEDULE A - TAXIWAY A1 & A2 HOLD LINES RECONFIGURATION**

**CONSTRUCTION SAFETY AND PHASING PLAN  
SCHEDULES B & C - TAXIWAY H RECONFIGURATION TO TAXIWAY K**

**GEOTECHNICAL REPORT  
SCHEDULES B & C - TAXIWAY H RECONFIGURATION TO TAXIWAY K**

**TECHNICAL SPECIFICATIONS - SCHEDULE A (TAXIWAY A1 & A2 HOLD LINES)**

G-001	Special Work Requirements
C-105	Mobilization
M-100	Gate Guard Allowance
M-200	Maintenance & Protection of Traffic
M-300	Modifications to ALCMS Equipment
P-101	Pavement Preparation
P-152	Excavation, Subgrade and Embankment
P-209	Crushed Aggregate Base Course
P-403	Asphalt Mix Pavement – Surface Course
P-603	Bituminous Tack Coat
P-605	Joint Sealants for Pavements

P-606	Adhesive Compounds, Two Component for Sealing Wires and Lights in Pavement
P-610	Structural Portland Cement Concrete
P-620	Runway and Taxiway Marking
L-108	Underground Power Cable for Airports
L-110	Airport Underground Electrical Duct Banks and Conduits
L-125	Installation of Airport Lighting Systems

#### **TECHNICAL SPECIFICATIONS - SCHEDULES B & C (TAXIWAY H RECONFIGURATION)**

G-001	Special Work Requirements
M-100	Gate Guard Allowance Items
M-200	Maintenance and Protection of Traffic
M-300	Modifications to ALCMS Equipment Allowance
M-400	Record Documents
M-500	Engineer's Field Office
M-600	Construction Access Modifications
M-700	Electrical Work Allowance
C-100	Contractor Quality Control Program
C-102	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control
C-105	Mobilization
C-110	Method of Estimating Percentage of Materials Within Specification Limits (PWL)
P-101	Preparation/Removal of Existing Pavement
P-152	Excavation, Subgrade and Embankment
P-154	Subbase Course
P-209	Crushed Aggregate Base Course
P-401	Asphalt Mix Pavement
P-403	Asphalt Mix Pavement – Base Course
P-603	Emulsified Asphalt Tack Coat
P-605	Joint Sealants for Pavements
P-606	Adhesive Compounds, Two Component for Sealing Wires and Lights in Pavement
P-610	Concrete for Miscellaneous Structures
P-620	Runway and Taxiway Marking
F-162	Chain Link Fence
D-701	Pipe for Storm Drains and Culverts
D-705	Pipe Underdrains for Airports
D-751	Manholes, Catch Basins, Inlets and Inspection Holes
T-901	Seeding
T-905	Topsoil
T-908	Mulching
L-107	Airport Wind Cones
L-108	Underground Power Cable for Airports
L-109	Airport Transformer Vault and Vault Equipment
L-110	Airport Underground Electrical Duct Banks and Conduits
L-115	Electrical Manholes and Junction Structures
L-125	Installation of Airport Lighting Systems

**ADVERTISEMENT FOR BIDS  
CITY OF MANCHESTER - DEPARTMENT OF AVIATION  
REQUEST FOR BIDS FOR**

***RUNWAY INCURSION MITIGATION PROJECTS  
TAXIWAYS 'A1' AND 'A2' HOLD LINE RECONFIGURATION  
AND  
TAXIWAY 'H' RECONFIGURATION TO TAXIWAY K***

***At  
MANCHESTER-BOSTON REGIONAL AIRPORT***

***AIP # 3-33-0011-xxx-2021***

***City Bid # FY21-805-25 (Taxiway A1 & A2 Hold Line Reconfiguration)***

***City Bid # FY21-805-26 (Taxiway H Reconfiguration to Taxiway K)***

The City of Manchester, New Hampshire, Department of Aviation is seeking bids for the completion of two combined Runway Incursion Mitigation construction projects at Manchester-Boston Regional Airport. Under Schedule A, **the Runway Incursion Mitigation Project – Taxiways 'A1' and 'A2' Hold Line Reconfiguration** project. The scope of the work includes conduit installation, elevated Runway Guard Light relocation, in-pavement Runway Guard Light removal and installation, pavement marking removal, surface sealant and installation of new markings, HMA milling and paving, airfield signage panel relocations, ALCMS graphic modification, and turf establishment. Under Schedules B & C, the **Taxiway 'H' Reconfiguration to Taxiway K (Runway Incursion Mitigation Project)**. The project will reconfigure the northerly portion of Taxiway H alignment from Runway 6-24 to the Runway 17 End and include construction of a new by-pass stub at the Runway 17 End and be renamed to be Taxiway K. The project will also reconfigure the Taxiway L intersection into the Northeast Ramp. The scope of the work will include: horizontal and vertical geometry modifications, new subbase and base materials for widened and new geometry layout, removal of existing pavement materials for new geometry layout, milling of existing surface pavement to remain, new bituminous pavement materials, new airport lighting systems and cabling (TW edge, TW centerline, elevated and in-pavement RGLs), new airport guidance signs and panel upgrades and cabling, ALCMS upgrades, drainage improvements, temporary erosion and sedimentation controls, new turfed areas due to new geometry layout, restoration of turf growth for all disturbed areas, pavement markings, and all other incidental items for a completed project.

Bids will be accepted only from contractors that have been pre-qualified with the Department of Aviation. Reference section INSTRUCTION TO BIDDERS (00100) or the Manchester-Boston Regional Airport website at <https://www.flymanchester.com/doing-business-with-mht/procurement-services/> for pre-qualification requirements. Each bidder must deposit with his/her bid, security in the amount of 5% of the total bid. A 100% performance and payment bond will be required with the contract. In addition, a warranty bond will also be required for the contract.

Bid documents are available for direct download upon registration at the McFarland Johnson Bid Portal (<https://bidportal.mjinc.com/bidportal/index>) at no cost after **12:00 PM (Noon) on March 19, 2021** and providing the Contractor's email address as part of the registration. Contract documents may also be viewed and downloaded, at no cost, in Portable Document Format at the Manchester-Boston Regional Airport's website link located at <https://www.flymanchester.com/doing-business-with-mht/procurement-opportunities/>. It is the bidder's sole responsibility to provide an e-mail address to the Engineer, as noted above, for use in issuance of any addenda.

After 12:00 PM on Monday, **March 22, 2021** documents may also be examined, by appointment, at:

- Manchester Boston Regional Airport – Airport Administration Offices, Terminal Building 3<sup>rd</sup> Floor, 1 Airport Road, Manchester NH 03103

A pre-bid informational meeting will be a “hybrid”-type meeting with both an “in -person” meeting being held at the Airport MHT Administrative Offices boardroom, located on the third floor of the Airport terminal at One Airport Road, Manchester, NH, AND simultaneously being available with a “virtual link” to view the presentation. The meeting will be held on **March 30, 2021 at 2:30 PM**. Prospective bidders shall RSVP, not less 24 hours prior to the meeting, through Ms. Christina Adams at the Airport Administrative Offices, who can be reached at (603) 628-6539 Ext. 307 or [cadams@flymanchester.com](mailto:cadams@flymanchester.com). The virtual meeting link will be provided upon registration by the prospective bidders for attendance and shown on the download websites. No individual or group “on-site” visits will be provided for the Runway Incursion Mitigation projects.

Bids will be publicly opened and read aloud on **April 16, 2021 at 2:30 PM (local time)** at the Airport Administrative Offices boardroom located on the third floor of the Airport terminal at One Airport Road, Manchester, NH. The contract will be awarded to lowest responsive and responsible bidder.

The Owner reserves the right to waive any informality in the bidding or to reject any or all bids.

In this bid process and the resulting Contract, if executed, all Bidders and Contractors must fully comply with the Contract Provision Guidelines for Obligated Sponsors and Airport Improvement Program Projects and contained within the Contract Documents. All requirements of the Federal funding and, as well as all administrative regulations shall apply to this project, as if herein written out in full. The attention of prospective bidders is called to the fact that this project is to be bid upon and the contract executed, under the Federal Funding Rules and Regulations for carrying out the provisions of:

- Affirmative Action Requirement (Executive Order 11246, as amended, and DOL Regulation 41 CFR Part 60-4)
- Buy American Preferences (Title 49 United States Code, §50101)
- Title VI Provisions of the Civil Rights Act of 1964, as amended and supplemented (Title 49 United States Code, § 47123 & FAA Order 1400.01)
- Davis-Bacon Act (2 CFR §200, Appendix II(D) and Regulation 29 CFR Part 5)
- Government Debarment and Suspension (2 CFR Part 180 (Subpart C), 2 CFR part 1200, DOT Order 4200.5 DOT Suspension & Debarment Procedures & Ineligibility)
- Disadvantaged Business Enterprise (49 CFR Part 26)
- Foreign Trade Restriction (Title 49 United States Code, §50104 and DOT Regulation 49 CFR Part 30)
- Lobbying and Influencing Federal Employees (Title 31 United States Code, §1352-Byrd Anti-Lobbying Amendment, 2 CFR part 200, Appendix II(J), and 49 CFR Part 20, Appendix A)
- Procurement of Recovered Materials (2 CFR §200.322, 40 CFR Part 247, and Solid Waste Disposal Act)

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION  
to ENSURE EQUAL EMPLOYMENT OPPORTUNITY**

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

**Timetable**

Goals for minority participation for each trade: **4.0%** Schedule A - Town of Londonderry, County of Rockingham  
Goals for minority participation for each trade: **0.7%** Schedules B/C - City of Manchester, County of Hillsborough  
Goals for female participation in each trade: **6.9%**

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is **State of New Hampshire, County of Rockingham, Town of Londonderry and County of Hillsborough, City of Manchester.**

The, Manchester-Boston Regional Airport, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin



in consideration for an award. It is the policy of the Manchester-Boston Regional Airport to practice nondiscrimination based on race, color, sex, or national origin in the award or performance of this contract. All disadvantaged business enterprise firms qualifying under this solicitation are encouraged to submit bids/proposals. Award of this contract will be conditioned upon satisfying the requirements of this section.

The requirements of 49 CFR Part 26, Regulations of the U.S. Department of Transportation, apply to this contract. Award of this contract will be conditioned upon satisfying the requirements of this section. These requirements apply to all bidders/offerors, including those who qualify as a DBE. A DBE contract goal of ***Three and seven tenths percent (3.7%)*** has been established for all Schedules of this contract work. The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

As a condition of bid responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

- 1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
- 2) A description of the work that each DBE firm will perform;
- 3) The dollar amount of the participation of each DBE firm listed under (1)
- 4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal; and
- 5) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

All bidders will be required to execute a sworn Non-Collusion Affidavit statement, certifying that the bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such Contract.

All requests for information should be directed in writing to: Brian Bennett, PE, McFarland Johnson, located at 53 Regional Drive, Concord, NH 03301, by email @ [bbennett@mjinc.com](mailto:bbennett@mjinc.com) with a cc: copy to Carl Braley, Assistant Airport Director for Operations and Facilities, by email @ [cbraley@flymanchester.com](mailto:cbraley@flymanchester.com).

**END OF SECTION 00030**

THIS PAGE INTENTIONALLY LEFT BLANK

## **INFORMATION FOR BIDDERS**

THIS PAGE INTENTIONALLY LEFT BLANK

## **INFORMATION FOR BIDDERS**

### **1.01 RECEIPT AND OPENING BIDS**

The City of Manchester, Department of Aviation, Manchester, New Hampshire (herein called the Owner), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Manchester-Boston Regional Airport Administration Office at One Airport Road Manchester, NH until **April 16, 2021 at 2:30 pm** and then at said office publicly opened and read aloud.

The envelopes containing the bid must be sealed, addressed and designated as:

**RUNWAY INCURSION MITIGATION PROJECTS**  
**TAXIWAYS A1 & A2 HOLD LINE RECONFIGURATION AND**  
**TAXIWAY H RECONFIGURATION TO TAXIWAY K**

The Owner may consider irregular any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. After submitting a bid, no Bidder may withdraw a bid for one-hundred eighty (180) calendar days.

### **1.02 DESCRIPTION OF WORK**

#### **SCHEDULE A - TAXIWAYS A1 & A2 HOLD LINE RECONFIGURATION**

The work involves eliminating the Runway Safety Area (RSA) hold lines on Taxiways A1 and A2. The project includes reconfiguring the existing signage, lighting, and pavement markings to have a single hold line on each taxiway at the current Runway Approach Surface (RA) hold line location. Project details consist of: relocating elevated Runway Guard Light fixtures and associated electrical equipment; removing the existing in-pavement Runway Guard Light lighting cans at RSA hold line with pavement and base restoration; installation of new airfield in-pavement Runway Guard Light fixtures and conduit at the RA hold line; removal of the runway mandatory guidance sign at the RSA hold line; relocate and replace sign panels at the RA hold line; extend the conduit system from the existing conduit/manhole system to the relocated equipment at the RA hold line; remove existing pavement markings at the RSA hold line by milling with pavement replacement; remove existing pavement along the taxiway centerline between the RSA hold line and the RA hold line with a sealant on the removal surface; and new pavement markings at the RA hold line from new in-pavement light installations and for the new surface painted hold signs. Restoration work will be completed for any disturbed turf grass within the project area.

#### **SCHEDULES B & C - TAXIWAY H RECONFIGURATION TO TAXIWAY K**

The work will include reconfiguring the northerly portion of Taxiway H alignment from Runway 6-24 to the Runway 17 End and construction of a new by-pass stub at the Runway 17 End. The work will also reconfigure Taxiway L intersection into Taxiway H from the Northeast Ramp. The reconfigured Taxiway H will be renamed to be Taxiway K. The scope of the work will include: horizontal and vertical geometry modifications, new subbase and base materials for widened and new geometry layout, removal of existing pavement materials for new geometry layout, milling of existing surface pavement to remain, new bituminous pavement materials, new airport lighting systems and cabling (TW edge, TW centerline, elevated and in-pavement RGLs), new airport guidance signs and panel upgrades and cabling, ALCMS upgrades, drainage improvements, temporary erosion and sedimentation controls, new turfed areas due to new geometry layout, restoration of turf growth for all disturbed areas, pavement markings, and all other incidental items for a completed project.

All areas of the airport disturbed by the Contractor's operations not within the construction limits as set forth by the Owner shall be restored at least equal to original condition at no cost to the Owner.

Attention shall be directed to the Contract Documents for specific information of the work to be performed.

### **1.03 PREPARATION OF BID**

Each bid must be prepared in strict accordance with the requirements of Section 20 of the General Provisions of these specifications.

### **1.04 SUBCONTRACTS**

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the Owner and the Federal Aviation Administration.

The successful bidder will be required to submit a list of his/her subcontractors within four (4) days of the opening of Bids and before the award of a contract. The successful bidder will be required to submit all subcontracts to the Engineer for approval after the contract is awarded.

### **1.05 BIDDER'S QUALIFICATIONS**

All Bidders for projects with an estimated cost in excess of \$250,000 must be pre-qualified. Refer to Section 20-02 of the FAA General Contract Provisions for additional information.

### **1.06 BID MODIFICATION**

Any bidder may modify his/her bid by written communication at any time prior to the schedule closing time for receipt of bids, providing such written communication is received by the Owner prior to the bid closing time. The written communication should not reveal the bid price but should provide the addition or subtraction or any other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened.

### **1.07 PROPOSAL GUARANTY BID SECURITY**

Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the form of bid bond included in the Contract Documents in the amount of five percent (5%) of the bid, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner. The bid bond shall be executed or countersigned for the surety by a person who has current power of attorney for the surety.

The bid security will be returned to all except the two lowest bidders within three (3) days after the opening of bids, and the remaining cash, checks, or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the Contract, or, if no award has been made prior to **One Hundred Eighty (180) calendar days after the bid opening**, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

### **1.08 TIME OF COMPLETION AND LIQUIDATED DAMAGES**

It is anticipated that Schedule A – Taxiways A1 and A2 Hold Line Reconfiguration and Schedules B & C will have separate construction periods based on federal grant approvals of the funding. It is anticipated Schedule A will have a Notice to Proceed issued for the work to be constructed during late Summer or early Fall 2021, while the Notice to Proceed for Schedules B & C will be issued for the work to be constructed during late Spring/early Summer 2022.

#### **For Schedule A – Taxiways A1 & A2 Hold Line Reconfiguration**

The bidder must agree to commence work on a date to be specified in the written Notice to Proceed of the Owner and to fully complete the project within **thirty (30) calendar days**. Bidder must agree to pay to the

Owner as liquidated damages the sum of **six hundred dollars (\$600.00)** for each and every calendar day the work remains incomplete beyond the above specified time for Schedule A.

#### **For Schedules B & C – Taxiway H Reconfiguration to Taxiway K**

The bidder must agree to commence work on a date to be specified in the written Notice to Proceed of the Owner and to fully complete the project within **Ninety-Five (95) calendar days**. Bidder must agree to pay to the Owner as liquidated damages the sum of **two thousand five hundred dollars (\$2,500.00)** for each and every calendar day the work remains incomplete beyond the above specified time for Schedules B & C.

### **1.09 SECURITY FOR FAITHFUL PERFORMANCE**

Simultaneously with his/her delivery of the executed Contract, the successful bidder shall furnish Surety bonds as security for faithful performance of this Contract and for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract, as specified in the General Provisions included herein. The bonds shall be of the form provided hereinafter and shall be executed by Surety acceptable to the Owner. The bonds shall be executed by or countersigned by an agent for Surety and said agent to have current power of attorney for the Surety. Each bond shall be in the amount of one hundred percent (100%) of Contract awarded. Contractors should also submit with all bonds evidence showing the financial strength of the Surety.

Prior to the final payment for the project, the Contractor shall deliver to the Owner a Warranty Bond in the amount of five percent (5%) of the final cost of the construction.

### **1.10 ADDENDA AND INTERPRETATIONS**

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally. Every request for such interpretation shall be in writing addressed to Brian Bennett, Project Manager with McFarland Johnson, 53 Regional Drive, Concord, NH 03301, by fax at (603) 225-0095 or email [bbennett@mjinc.com](mailto:bbennett@mjinc.com) and to be given consideration, must be received at three (3) working days and a minimum of seventy-two (72) hours prior to the date fixed for the public opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be faxed or emailed to all prospective bidders (at the respective fax number or email address furnished for such purposes), not later than one (1) working days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the Contract Documents. All requests for interpretation must be received at least seven (72) hours prior to the bid opening.

### **1.11 POWER OF ATTORNEY**

Attorneys-in-fact or others who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

### **1.12 LAWS AND REGULATIONS**

The bidder's attention is directed to the fact that all applicable Federal and State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though therein written out in Full. The Contractor shall be responsible for payment of all taxes, fees, and assessments as levied by Federal, State and Local authorities.

### **1.13 EXECUTION OF CONTRACT**

The individual, firm, partnership, or corporation to whom or to which the Contract has been awarded shall sign the necessary agreements entering into a Contract with the Owner and return them to the Office of the Owner (with the required contract bonds) within fifteen (15) calendar days after the Contract is mailed.

*Due to the different anticipated construction dates and periods for construction, it is anticipated the work will be performed under separate contracts, even though the different Schedules of work are considered to be part of the same overall Project and the basis of award.*

### **1.14 APPROVAL OF CONTRACT**

Approval of the Contract shall be in accordance with paragraph 30-07 of the General Provisions. No Contract is binding upon the Owner until it has been executed by the Owner and delivered to the Contractor.

### **1.15 FAILURE TO EXECUTE CONTRACT**

Failure of a bidder to comply with any of the requirements of the proposal, failure to execute the Contract within fifteen (15) calendar days after mailing, as specified, or failure to furnish contract bonds as required shall be just cause for the annulment of the award. In the event of such annulment of the award, the amount of bid security shall become the property of the Owner, not as a penalty but as fixed and agreed liquidated damages. Award may then be made to the next best qualified bidder, or the work re-bid, or otherwise handled as the Owner may elect.

### **1.16 NOTICE OF SPECIAL CONDITIONS**

Attention is particularly called to those parts of the Contract Documents which deal with the following:

- a. Inspection of work.
- b. Insurance requirements.
- c. Scheduling the contract work.
- d. Liquidated damages for failure to complete the various portions of the specified times.
- e. Airport safety and security.
- f. Buy American Act.
- g. Wage Rates.

### **1.17 EMPLOYMENT OF WOMEN**

Women will be afforded equal opportunity in all areas of employment. However, the employment of women shall not diminish the standards or requirements for the employment of minorities.

### **1.18 EQUAL EMPLOYMENT OPPORTUNITY**

- a. Each bidder will be required to comply with the affirmative action plan for equal employment opportunity prescribed by the OFCC, United States Department of Labor, Regulations of the Secretary of Labor (41 CFR 60), or by other designated trades used in the performance of the contract and other nonfederally involved contracts in the area geographically defined in the plan.
- b. The proposed contract is under and subject to Executive Order 11246 of September 26, 1965, as amended, and to the equal opportunity clause; and
- c. The successful bidder will be required to submit a Certification of Nonsegregated Facilities prior to award of the contract, and to notify prospective subcontractors of the requirement for such a certification where the subcontract exceeds \$10,000. Samples of the certification and the notice to subcontractors appear in the specifications.



- d. When a determination has been made to award a contract or subcontract to a specific contractor, such contractor is required, prior to the award or after the award, or both, to furnish such other information as the FAA, the sponsor, or the Director of OFCC requests.
- e. A bidder must indicate whether he has previously had a contract subject to the equal opportunity clause, whether he has filed all report forms required in such contract, and if not, compliance report Standard Form (SF) 100 must be submitted with his bid.
- f. Equal Employment Opportunity (EEO) and labor provisions, when applicable, are included in the bidding documents of specifications.
- g. Contractors and subcontractors may satisfy EEO requirements of paragraph 2 of the EEO contract clause by stating in all solicitations or advertisements for employees that: "All qualified applicants will receive consideration for employment without regard to race, color, sex, or national origin." or by using a single advertisement in which appears in clearly distinguished type, the phrase: "an equal opportunity employer".
- h. A contractor having 50 or more employees and his subcontractors having 50 or more employees and who may be awarded a subcontract of \$50,000 or more will, within 120 days from contract commencement, be required to develop a written affirmative action compliance program for each of its establishments (state and local governments are exempt).

#### **1.19 ELECTRONICALLY PROVIDED BID DOCUMENTS**

Bid Documents provided electronically are provided as a convenience to the Bidder and are not the controlling data for the contract. The original hard copy (paper) contract plans and specifications and modifications thereto reviewed and signed by the Engineer are the legal construction documents and shall be used for interpretations and determinations for the project, overriding any alterable electronic files. Bidder agrees to accept full responsibility for their use of the electronic files and the completeness, correctness, and/or readability of the electronic media file, and shall indemnify, defend and hold harmless, McFarland Johnson Inc. and the Owner from any and all claims (including third party) arising from discrepancies between the electronic media file and the sealed drawings or report.

END OF INFORMATION FOR BIDDERS

PAGE LEFT BLANK INTENTIONALLY

## **BID PROPOSAL**

THIS PAGE INTENTIONALLY LEFT BLANK

## BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE UNDERSIGNED,

---

*(Name of Principal)*

as PRINCIPAL, and

---

*(Name of Surety)*

as SURETY, are held and are firmly bound unto **The City of Manchester, New Hampshire, Department of Aviation** hereinafter called the Owner, in the penal sum of

---

lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**THE CONDITION OF THIS OBLIGATION IS SUCH**, that whereas the Principal has submitted the accompanying Bid, for:

**Runway Incursion Mitigation Projects:**

---

**Schedule A: Taxiways 'A1' & 'A2' Hold Line Reconfiguration and**

---

**Schedules B & C: Taxiway 'H' Reconfiguration to Taxiway 'K'**

---

---

**FAA AIP 3-33-0011-xxx-2021**

---

---

**MHT Bid No. FY21-805-25 (Taxiways 'A1' & 'A2' Hold Line Reconfiguration)**

---

**MHT Bid No. FY21-805-26 (Taxiway 'H' Reconfiguration to Taxiway 'K')**

---

*(Enter Title and Number of Contract/Project)*

NOW, THEREFORE, if the Principal shall not withdraw said bid within 180 calendar days after the opening thereof, and shall within fifteen (15) calendar days after the prescribed forms are presented to him/her for signature, enter into a written Contract with the Owner in accordance with the bid as accepted, and give bonds with good and sufficient Surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract; or in the event of the withdrawal of said bid within the period specified, or the failure to enter into such Contract and give such bonds within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said bid and the amount for which the Owner may procure the required work or supplies or both, if the latter amount be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above named Principal and Surety have executed this instrument under their several seals this \_\_\_\_\_ day of \_\_\_\_\_, name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In presence of:

\_\_\_\_\_  
*Individual Principal* SEAL

\_\_\_\_\_  
*Business Address*

\_\_\_\_\_  
*Individual Principal* SEAL

\_\_\_\_\_  
*Business Address*

Attest:

\_\_\_\_\_  
*Corporate Principal*

\_\_\_\_\_  
*Business Address*

**Affix  
Corporate  
Seal**

By: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
*Corporate Surety*

\_\_\_\_\_  
*Business Address*

**Affix  
Corporate  
Seal**

By: \_\_\_\_\_  
*Attorney-in-Fact*

*\* Power of attorney for person(s) signing for surety company must be attached to this bond.*

**CERTIFICATE AS TO CORPORATE PRINCIPAL**

**BID BOND**

I, \_\_\_\_\_, certify that I am the  
\_\_\_\_\_ of the Corporation named as principal in the within  
bond; that \_\_\_\_\_, who signed the said bond on  
behalf of the Principal was then \_\_\_\_\_  
of said Corporation; that I know his/her signature, and his/her signature thereto is genuine, and  
that said bond was duly signed, sealed, and attested to for and in behalf of said Corporation by  
authority of its governing body.

\_\_\_\_\_

**Affix  
Corporate  
Seal**

THIS PAGE INTENTIONALLY LEFT BLANK



## BID PROPOSAL

for

***RUNWAY INCURSION MITIGATION PROJECTS  
TAXIWAYS 'A1' & 'A2' HOLD LINE RECONFIGURATION  
AND  
TAXIWAY 'H' RECONFIGURATION TO TAXIWAY 'K'***

at

**Manchester-Boston Regional Airport**

Proposal of \_\_\_\_\_ \* hereinafter called "Bidder") a  
corporation organized under the laws of the State of \_\_\_\_\_, a partnership, or an  
individual\*\* doing business as \_\_\_\_\_, to the **City of Manchester,**  
**New Hampshire, Department of Aviation** (hereinafter called "Owner").

The bidder in compliance with your invitation for bids for the construction of airport improvements having examined the plans and specifications with related documents and the site of the proposed work if required, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials, and labor, hereby proposes to furnish all plant, labor, materials, supplies, equipment, services, and to construct the work in accordance with the Contract Documents, within the time set forth therein, and at the amount in U.S. dollars provided herein. This price is to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

### Time of Completion and Liquidated Damages

Bidder hereby agrees to commence work under this Contract on the date to be specified in written "Notice to Proceed" of the Owner, and to fully complete the project within:

**Schedule A: Taxiways 'A1' & 'A2' Hold Line Reconfiguration: Thirty (30) calendar days.**

**Schedules B & C: Taxiways 'H' Reconfiguration to Taxiway 'K': Ninety-Five (95) calendar days.**

Bidder further agrees to pay to the Owner, as liquidated damages:

For Schedule A time duration, the sum of **six hundred dollars (\$600.00)** for each and every **calendar day** that the work remains incomplete beyond the time specified for milestone dates and completion as hereinafter provided in the Contract Documents.

For Schedules B & C time duration, the sum of **two thousand five hundred dollars (\$2,500.00)** for each and every **calendar day** that the work remains incomplete beyond the time specified for milestone dates and completion as hereinafter provided in the Contract Documents.

Bidder acknowledges receipt of the addenda shown on the attached form entitled:

### **ACKNOWLEDGMENT OF ADDENDA.**

Bidder agrees to perform all the work described in the specifications, shown on the plans or directed, for the following unit prices:

***\*The name of the bidder must be exactly the same as the name under which the bidder was pre-qualified with the City of Manchester.***

***\*\* Strike out inapplicable terms.***

***NOTE: The line items listed in both Schedules B & C shall use the same unit price. If unbalanced between the schedules, the lower unit price shall govern.***

**ACKNOWLEDGMENT OF ADDENDA**

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

Addendum No. \_\_\_\_\_ Date:

**Manchester-Boston Regional Airport - RUNWAY INCURSION MITIGATION PROJECT**  
**SCHEDULE A: TAXIWAYS 'A1' & 'A2' HOLD LINE RECONFIGURATION**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
C-105-1	1 LS	MOBILIZATION (LIMIT 10%) _____ Dollars and _____ Cents				
M-100-1	1 ALL	ALLOWANCE – GATE GUARDS Ten Thousand Dollars and Zero Cents	\$10,000	00	\$10,000	00
M-200-1	1 LS	MAINTENANCE AND PROTECTION OF TRAFFIC _____ Dollars and _____ Cents				
M-300-1	1 ALL	ALLOWANCE – MODIFICATIONS TO ALCMS EQUIPMENT Fifteen Thousand Dollars and Zero Cents	\$15,000	00	\$15,000	00
P-101-5.2	1,100 SY	COLD MILLING (2"-4.5") _____ Dollars and _____ Cents				
P-152-4.1	155 CY	UNCLASSIFIED EXCAVATION _____ Dollars and _____ Cents				
P-209-5.1	125 CY	CRUSHED AGGREGATE BASE COURSE _____ Dollars and _____ Cents				
P-403-8.1	220 TON	ASPHALT MIXTURE SURFACE COURSE _____ Dollars and _____ Cents				
P-603-5.1	130 GAL	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport - RUNWAY INCURSION MITIGATION PROJECT**  
**SCHEDULE A: TAXIWAYS 'A1' & 'A2' HOLD LINE RECONFIGURATION**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-605-5.1	1,300 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				
P-608-8.1	215 SY	ASPHALT SURFACE TREATMENT _____ Dollars and _____ Cents				
P-620-5.1a	1,900 SF	SURFACE PREPARATION _____ Dollars and _____ Cents				
P-620-5.2b	5,100 SF	MARKING _____ Dollars and _____ Cents				
P-620-5.3c	190 LBS	REFLECTIVE MEDIA _____ Dollars and _____ Cents				
T-901-5.1	1 (1000 SF)	SEEDING _____ Dollars and _____ Cents				
T-905-5.2	6 CY	TOPOIL (FURNISHED FROM OFF THE SITE) _____ Dollars and _____ Cents				
T-908-5.1	100 SY	MULCHING _____ Dollars and _____ Cents				
L-108-5.1	2,600 LF	#8 AWG, 5KV, L-824, TYPE C CABLE INSTALLED IN TRENCH, DUCT BANK, OR CONDUIT _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport - RUNWAY INCURSION MITIGATION PROJECT**  
**SCHEDULE A: TAXIWAYS 'A1' & 'A2' HOLD LINE RECONFIGURATION**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-108-5.2	500 LF	#6 AWG, SOLID, BARE COPPER COUNTERPOISE WIRE, INSTALLED ABOVE THE DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/TERMINALS  _____ Dollars and _____ Cents				
L-110-5.1	310 LF	CONCRETE ENCASED ELECTRICAL CONDUIT – 1 WAY - 2-INCH  _____ Dollars and _____ Cents				
L-110-5.2	190 LF	NON-ENCASED ELECTRICAL CONDUIT – 1 WAY - 2-INCH  _____ Dollars and _____ Cents				
L-110-5.3	1,900 LF	REMOVAL OF EXISTING CABLE IN ELECTRICAL CONDUIT/DUCT  _____ Dollars and _____ Cents				
L-125-5.1	19 EA	L-852G(L) IN-PAVEMENT RUNWAY GUARD LIGHT  _____ Dollars and _____ Cents				
L-125-5.2	4 EA	RELOCATE EXISTING ELEVATED L-804(L) RUNWAY GUARD LIGHT  _____ Dollars and _____ Cents				
L-125-5.6	12 EA	RELOCATE EXISTING AIRFIELD GUIDANCE SIGN PANELS  _____ Dollars and _____ Cents				

<b>Manchester-Boston Regional Airport - RUNWAY INCURSION MITIGATION PROJECT</b> <b>SCHEDULE A: TAXIWAYS 'A1' &amp; 'A2' HOLD LINE RECONFIGURATION</b> <b>BID FORM</b>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-125-5.4	2 EA	REMOVE AIRFIELD GUIDANCE SIGN & FOUNDATION _____ Dollars and _____ Cents				
L-125-5.5	18 EA	REMOVE EXISTING L-852G(L) IN-PAVEMENT RUNWAY GUARD LIGHT _____ Dollars and _____ Cents				
L-125-5.6	1 EA	RELOCATE EXISTING L-852C(L) IN-PAVEMENT TAXIWAY CENTERLINE LIGHT _____ Dollars and _____ Cents				
L-125-5.7	1 EA	INSTALL NEW L-867 TYPE 1A, SIZE B LIGHT BASE JUNCTION CAN _____ Dollars and _____ Cents				

**SCHEDULE A SUBTOTAL (Pages BP-7 to BP-10)**

(Transfer the Subtotal Amount to Page BP-21)

\$ \_\_\_\_\_

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
C-105-6.1	1 LS	MOBILIZATION (LIMIT 3%) ____ Dollars and ____ Cents				
M-001-1	1 ALL	ALLOWANCE – GATE GUARDS <u>Thirty-five Thousand</u> Dollars and <u>Zero</u> Cents	\$35,000	00	\$35,000	00
M-200-1	1 LS	MAINTENANCE & PROTECTION OF TRAFFIC ____ Dollars and ____ Cents				
M-300-1	1 ALL	ALLOWANCE – ALCMS MODIFICATIONS <u>Eighty-five Thousand</u> Dollars and <u>Zero</u> Cents	\$85,000	00	\$85,000	00
M-400-1	1 LS	RECORD DOCUMENTS ____ Dollars and ____ Cents				
M-400-2	1 LS	FIELD DATA COLLECTION FOR GIS SURVEY CONVERSION ____ Dollars and ____ Cents				
M-500-4.1	1 LS	ENGINEER FIELD OFFICE ____ Dollars and ____ Cents				
M-600-1	1 LS	CONSTRUCTION ACCESS MODIFICATIONS ____ Dollars and ____ Cents				
M-600-2	240 TONS	VEHICLE SERVICE ROAD ASPHALT PAVEMENT ____ Dollars and ____ Cents				

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-700-1	1 ALL	ALLOWANCE FOR FAA AND MHT CABLE REPLACEMENT <u>Sixty Thousand</u> Dollars and <u>Zero</u> Cents	\$60,000	00	\$60,000	00
C-100	1 LS	CONTRATOR QUALITY CONTROL PROGRAM _____ Dollars and _____ Cents				
C-102-5.1	14 EA	INSTALLATION AND REMOVAL OF INLET PROTECTION FILTER BAGS _____ Dollars and _____ Cents				
C-102-5.2	1,500 LF	INSTALLATION AND REMOVAL OF EROSION CONTROL LOGS _____ Dollars and _____ Cents				
C-102-5.3	1 LS	INSTALLATION AND REMOVAL OF STABILIZED CONSTRUCTION ENTRANCE _____ Dollars and _____ Cents				
C-102-5.2	2,600 SY	INSTALLATION OF EROSION CONTROL BLANKET _____ Dollars and _____ Cents				
P-101-5.1	44,800 SY	PAVEMENT REMOVAL _____ Dollars and _____ Cents				
P-101-5.2	2,000 LF	JOINT AND CRACK REPAIR _____ Dollars and _____ Cents				



**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-101-5.6	2,450 SY	COLD MILLING _____ Dollars and _____ Cents				
P-101-5.7A	1,100 LF	REMOVAL OF PIPE _____ Dollars and _____ Cents				
P-101-5.7B	3 EA	REMOVAL OF DRAIN INLET/MANHOLE _____ Dollars and _____ Cents				
P-101-5.7C	6 EA	REMOVAL OF ELECTRIC MANHOLE/HANDHOLE _____ Dollars and _____ Cents				
P-101-5.7D	2,500 LF	REMOVAL OF CABLING (IN CONDUIT TO REMAIN) _____ Dollars and _____ Cents				
P-152-4.1	49,000 CY	UNCLASSIFIED EXCAVATION _____ Dollars and _____ Cents				
P-152-4.2	2,500 CY	UNSUITABLE EXCAVATION _____ Dollars and _____ Cents				
P-154-5.1	27,400 CY	SUBBASE COURSE _____ Dollars and _____ Cents				
P-209-5.1	8,100 CY	CRUSHED AGGREGATE BASE COURSE _____ Dollars and _____ Cents				
P-401-8.1	8,000 TON	ASPHALT SURFACE COURSE _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-403-8.1	13,200 TON	ASPHALT BASE COURSE/SHOULDER PAVEMENT _____ Dollars and _____ Cents				
P-603-5.1	7,500 GAL	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				
P-605-5.1	1,820 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				
P-620-5.1a	1,800 SF	SURFACE PREPARATION _____ Dollars and _____ Cents				
P-620-5.2b	35,000 SF	MARKINGS _____ Dollars and _____ Cents				
P-620-5.3c	1,000 LBS	REFLECTIVE MEDIA _____ Dollars and _____ Cents				
P-620-5.4d	400 SF	TEMPORARY RUNWAY AND TAXIWAY MARKING _____ Dollars and _____ Cents				
F-162-5.1	75 EA	CHAIN-LINK FENCE _____ Dollars and _____ Cents				
F-162-5.2b	1 EA	VEHICLE GATES _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
D-701-5.1A	500 LF	4-INCH SDR 35 PVC PIPE _____ Dollars and _____ Cents				
D-701-5.1B	8 LF	12-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-701-5.1C	270 LF	15-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-701-5.1D	350 LF	18-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-705-5.4	4,700 LF	6-INCH PIPE DOUBLE-WALL HIGH DENSITY POLYETHYLENE (SMOOTH INTERIOR/CORRUGATED EXTERIOR) _____ Dollars and _____ Cents				
D-751-5.2	1 EA	CATCH BASINS _____ Dollars and _____ Cents				
D-751-5.3	1 EA	ADJUST STRUCTURE RIM/GRATE ELEVATION _____ Dollars and _____ Cents				
D-751-5.4	1 EA	CONCRETE HEADWALL _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
T-901-5.1	250 (1000 SF)	SEEDING  _____ Dollars and _____ Cents				
T-905-5.1	1,700 CY	TOPSOIL (OBTAINED ON SITE OR FROM STOCKPILE)  _____ Dollars and _____ Cents				
T-905-5.2	330 CY	TOPSOIL (FURNISHED FROM OFF THE SITE)  _____ Dollars and _____ Cents				
T-908-5.1	27,570 SY	MULCHING  _____ Dollars and _____ Cents				
L-107-5.1	1 EA	TYPE L-806 STYLE I-B, SIZE 1 WIND CONE  _____ Dollars and _____ Cents				
L-108-5.1	49,600 LF	No. 8 AWG, 5 KV, L-824, TYPE C CABLE INSTALLED IN DUCT BANK OR CONDUIT  _____ Dollars and _____ Cents				
L-108-5.2	11,660 LF	#6 AWG, SOLID, BARE COPPER COUNTERPOISE WIRE, INSTALLED ABOVE THE DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/TERMINATIONS  _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-109-7.4A	1 UNIT	INSTALLATION OF EQUIPMENT WITHIN EXISTING VAULT, 15 kW L- 829 CCR – TW K CENTERLINE  _____ Dollars and _____ Cents				
L-109-7.4B	1 UNIT	INSTALLATION OF EQUIPMENT WITHIN EXISTING VAULT, 10 kW L- 829 CCR – TW K EDGE  _____ Dollars and _____ Cents				
L-110-5.1	9,900 LF	CONCRETE ENCASED ELECTRICAL CONDUIT – 1 WAY - 2-INCH  _____ Dollars and _____ Cents				
L-110-5.2A	470 LF	CONCRETE ENCASED ELECTRICAL DUCT BANK – 2-WAY - 4-INCH  _____ Dollars and _____ Cents				
L-110-5.2B	1,060 LF	CONCRETE ENCASED ELECTRICAL DUCT BANK – 4-WAY - 4-INCH  _____ Dollars and _____ Cents				
L-110-5.3	700 LF	NON-ENCASED ELECTRICAL CONDUIT – 1 WAY - 2-INCH  _____ Dollars and _____ Cents				
L-110-5.4	7,200 LF	REMOVAL OF CONCRETE ENCASED OR NON-ENCASED ELECTRICAL CONDUIT/DUCT & CABLE  _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-115-5.3	7 EA	EXISTING ELECTRICAL MANHOLE/JUNCTION STRUCTURE ELEVATION ADJUSTMENT  _____ Dollars and _____ Cents				
L-115-5.4	7 EA	ELECTRICAL HANDHOLE (4' x 4' PRECAST CONCRETE)  _____ Dollars and _____ Cents				
L-125-5.1	97 EA	NEW L-861T ELEVATED TAXIWAY EDGE LIGHT  _____ Dollars and _____ Cents				
L-125-5.2	35 EA	NEW L-852C(L) IN-PAVEMENT TAXIWAY CENTERLINE LIGHT  _____ Dollars and _____ Cents				
L-125-5.3	31 EA	NEW L-852K(L) IN-PAVEMENT TAXIWAY CENTERLINE LIGHT  _____ Dollars and _____ Cents				
L-125-5.4	36 EA	NEW L-852G(L) IN-PAVEMENT RUNWAY GUARD LIGHT  _____ Dollars and _____ Cents				
L-125-5.5	6 EA	NEW L-804(L) ELEVATED RUNWAY GUARD LIGHT  _____ Dollars and _____ Cents				
L-125-5.6A	3 EA	NEW L-850C IN-PAVEMENT RUNWAY EDGE LIGHT  _____ Dollars and _____ Cents				

**Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects**  
**SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**BID FORM**

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-125-5.6B	1 EA	REPLACE L-850C IN-PAVEMENT RUNWAY EDGE LIGHT ON EXISTING BASE CAN _____ Dollars and _____ Cents				
L-125-5.7A	2 EA	NEW AIRFIELD GUIDANCE SIGN – 1 MODULE _____ Dollars and _____ Cents				
L-125-5.7B	5 EA	NEW AIRFIELD GUIDANCE SIGN – 2 MODULE _____ Dollars and _____ Cents				
L-125-5.7C	7 EA	NEW AIRFIELD GUIDANCE SIGN – 3 MODULE _____ Dollars and _____ Cents				
L-125-5.8	1 EA	REPLACE AIRFIELD GUIDANCE SIGN PANEL _____ Dollars and _____ Cents				
L-125-5.9	10 EA	REMOVE AIRFIELD GUIDANCE SIGN & FOUNDATION _____ Dollars and _____ Cents				
L-125-5.10	75 EA	REMOVE ELEVATED RUNWAY/TAXIWAY EDGE LIGHT _____ Dollars and _____ Cents				
L-125-5.11	4 EA	REMOVE ELEVATED RUNWAY GUARD LIGHT _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects <b>SCHEDULE B - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’</b> <b>BID FORM</b>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-125-5.12	43 EA	REMOVE IN-PAVEMENT RUNWAY GUARD LIGHT _____ Dollars and _____ Cents				
L-125-5.13	8 EA	REMOVE, STORE AND REINSTALL EXISTING ELEVATED RUNWAY END/THRESHOLD LIGHT _____ Dollars and _____ Cents				
L-125-5.14	4 EA	REMOVE, STORE AND REINSTALL EXISTING FAA IN-PAVEMENT RUNWAY THRESHOLD LIGHT _____ Dollars and _____ Cents				

**SCHEDULE B SUBTOTAL (Pages BP-11 to BP-20)**     \$ \_\_\_\_\_  
 (Transfer the Subtotal Amount to Page BP-22)



Manchester-Boston Regional Airport – Runway Incursion Mitigation Projects <b>SCHEDULE C - TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’</b> <b>RUNWAY 6-24 PAVEMENT MAINTENANCE</b> <b>BID FORM</b>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-101-5.6	1,150 SY	COLD MILLING _____ Dollars and _____ Cents				
P-403-8.1	300 TON	ASPHALT BASE COURSE/SHOULDER PAVEMENT _____ Dollars and _____ Cents				
P-603-5.1	170 GALS	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				
P-605-5.1	1,800 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				

**SCHEDULE C SUBTOTAL (Page BP-21)**  
 (Transfer the Subtotal Amount to Page BP-22)

\$ \_\_\_\_\_

**SCHEDULE A: SUBTOTAL AMOUNT***(FROM PAGE BP-10)*

\$ \_\_\_\_\_

**SCHEDULE B: SUBTOTAL AMOUNT***(FROM PAGE BP-20)*

\$ \_\_\_\_\_

**SCHEDULE C: SUBTOTAL AMOUNT***(FROM PAGE BP-21)*

\$ \_\_\_\_\_

**BID SUMMARY**

**TOTAL BID:** \_\_\_\_\_ **dollars**  
(amount in words)

(\$ \_\_\_\_\_).  
(amount in figures)

The stated prices shall include-all plant, labor, materials, supplies, equipment, services, incidentals, expenses, overhead, profit, insurance, etc., perform all work required by the Contract Documents.

The Bidder agrees that the Owner may base the low bid on the Base Bid plus any, or all, of the Additive Alternates (in ascending order), if applicable.

The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn prior to a period of one-hundred eighty (180) calendar days after the bid opening.

The Bidder agrees that the Owner may reduce the quantities or may delete work items altogether if necessary to bring the contract awarded within funds available to finance the project. Such reduction or deletion of work shall not constitute a basis for withdrawal of this proposal.

Upon receipt of written notice of acceptance of this Bid, Bidder will execute the formal contract attached within fifteen (15) calendar days and deliver the Surety Bonds as required by the General Provisions. The bid security attached in the sum of \_\_\_\_\_ is to become the property of the Owner in the event the contract and bonds are not executed within the time above set forth, as liquidated damages for the delay and additional expenses to the Owner caused thereby.

Respectfully submitted:

Name of Bidder: \_\_\_\_\_

By: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Business Address: \_\_\_\_\_

(Affix corporate seal if bid is by a corporation)

**CERTIFICATE AS TO CORPORATE PRINCIPAL**

**BID PROPOSAL**

I, \_\_\_\_\_ certify that I am the \_\_\_\_\_ of the corporation named as Bidder in the above Proposal; that who signed the said Proposal on behalf of the Bidder was then of said Corporation; that I know his/her signature and his/her signature thereto is genuine; and that said Proposal was duly signed, sealed and attested to for and in behalf of said Corporation by authority of its governing body and is within the scope of its corporate powers.

\_\_\_\_\_  
(Signature) (Corporate Seal)

PAGE LEFT BLANK INTENTIONALLY

**BID PROPOSAL CERTIFICATES OF COMPLIANCE  
FOR AIP PROJECTS**

THIS PAGE INTENTIONALLY LEFT BLANK

## **CERTIFICATIONS TO ACCOMPANY PROPOSAL BID FORMS**

### **1.01 ALL CONTRACTS**

- a. The bidder (proposer) must supply all the information required by the proposal forms and specifications.
- b. The City of Manchester Department of Aviation, New Hampshire, in accordance with Title VI of the Civil Rights Act of 1964, hereby notifies all bidders that they (bidders) must affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for award.

### **1.02 INSTRUCTIONS TO BIDDERS**

- a. Section 60-1.7(b) of the Regulations of the Secretary of Labor requires each bidder or prospective prime Contractor and proposed subcontractors, where appropriate, to state in the bid whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and if so, whether it has filed with the Joint Reporting Committee, the Director, an agency, or the former President's Committee on Equal Employment Opportunity all reports due under the applicable filing requirements. In any case in which a bidder or prospective prime Contractor or proposed subcontractor has participated in a previous contract subject to Executive Orders 10Y25, 11114, or 11246 and has not filed a report due under the applicable filing requirements, no contract nor subcontract shall be awarded unless such Contractor submits a report covering the delinquent period or such other period specified by the FAA or the Director, OFCC.
- b. To achieve these requirements, the Bidder shall complete and sign the attached statement.

## AFFIRMATIVE ACTION CERTIFICATION

The Bidder (has / has not)\* participated in a previous contract subject to the equal opportunity clause prescribed by Executive Order 10925, or Executive Order 11246, or Executive Order 11114.

The Bidder (has / has not)\* submitted all compliance reports in connection with any such contract due under the applicable filing requirements; and that representations indicating submission of required compliance reports signed by proposed subcontractors will be obtained prior to award of subcontracts.

If the Bidder has participated in a previous contract subject to the equal opportunity clause and has not submitted compliance reports due under applicable filing requirements, the Bidder (Proposer) shall submit a compliance report on Standard Form 100, "Employee Information Report EE0-1" prior to the award of contract.

The Bidder (has / has not) been considered for sanction due to violation of Executive Order 11246, as amended.

Dated \_\_\_\_\_, 20\_\_\_\_  
\_\_\_\_\_  
*Legal Name of Person, Firm or Corporation*

By: \_\_\_\_\_  
\_\_\_\_\_  
*Title*

***\*Strike out inappropriate term.***



## **CERTIFICATE OF BUY AMERICAN COMPLIANCE FOR MANUFACTURED PRODUCTS**

(Non-building construction projects, equipment acquisition projects)

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with their proposal. The bidder or offeror must indicate how they intend to comply with 49 USC § 50101 by selecting one on the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (not both) by inserting a checkmark (✓) or the letter "X".

- ☐ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:
- a) Only installing steel and manufactured products produced in the United States, or;
  - b) Installing manufactured products for which the FAA has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing, or;
  - c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

1. To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
2. To faithfully comply with providing US domestic product
3. To furnish US domestic product for any waiver request that the FAA rejects
4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

- ☐ The bidder or offeror hereby certifies it cannot comply with the 100% Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:

1. To the submit to the Owner within 15 calendar days of the bid opening, a formal waiver request and required documentation that support the type of waiver being requested.
2. That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination may result in rejection of the proposal.
3. To faithfully comply with providing US domestic products at or above the approved US domestic content percentage as approved by the FAA.
4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

### **Required Documentation**

**Type 3 Waiver** - The cost of the item components and subcomponents produced in the United States is more that 60% of the cost of all components and subcomponents of the "item". The required documentation for a type 3 waiver is:

- a) Listing of all product components and subcomponents that are not comprised of 100% US domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart

25.108; products of unknown origin must be considered as non-domestic products in their entirety)

- b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture.
- c) Percentage of non-domestic component and subcomponent cost as compared to total “item” component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

**Type 4 Waiver** – Total cost of project using US domestic source product exceeds the total project cost using non-domestic product by 25%. The required documentation for a type 4 of waiver is:

- a) Detailed cost information for total project using US domestic product
- b) Detailed cost information for total project using non-domestic product

**False Statements:** Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

---

Date

---

Signature

---

Company Name

---

Title

## **GOALS AND ASSURANCES FOR DISADVANTAGED BUSINESS ENTERPRISES**

The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex, in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

The requirements of CFR 49 Part 26, Regulations of the U. S. Department of Transportation, apply to this contract. It is the policy of The City of Manchester-Department of Aviation to practice nondiscrimination based on race, color, sex, or national origin in the award or performance of this contract. All firms qualifying under this solicitation are encouraged to submit bids/proposals. Award of this contract will be conditioned upon satisfying the requirements of this bid specification. These requirements apply to all bidders/offers, including those who qualify as a DBE. A DBE goal of **three and seven tenths percent (3.7%)** has been established for this contract. **The DBE Goal is the same for all Schedules of the Project.** The bidder/offeror shall make good faith efforts, as defined in Appendix A, 49 CRF Part 26 (Attachment 1), to meet the contract goal for DBE participation in the performance of this contract.

As a condition of bid responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

- 1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
- 2) A description of the work that each DBE firm will perform;
- 3) The dollar amount of the participation of each DBE firm listed under (1)
- 4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal; and
- 5) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

## DISADVANTAGED BUSINESS ENTERPRISE (DBE) UTILIZATION

The undersigned bidder/offeror has satisfied the requirements of the bid specification in the following manner (please check the appropriate space):

\_\_\_\_\_ The bidder/offeror is committed to a minimum of **3.7%** DBE utilization on this contract.

\_\_\_\_\_ The bidder/offeror (if unable to meet the DBE goal of **3.7%**) is committed to a minimum of \_\_\_\_ % DBE utilization on this contract and submits documentation demonstrating good faith efforts.

Name of bidder/offeror's firm:

\_\_\_\_\_

State Registration No. \_\_\_\_\_

By \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

## DBE LETTER OF INTENT

Name of bidder'/offeror's firm: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Name of DBE firm: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Telephone: \_\_\_\_\_

Description of work to be performed by DBE firm:

---

---

---

---

The bidder/offeror is committed to utilizing the above-named DBE firm for the work described above. The estimated dollar value of this work is \$ \_\_\_\_\_.

### **Affirmation**

The above named DBE firm affirms that it will perform the portion of the contract for the estimated dollar value as stated above.

By: \_\_\_\_\_  
(Signature) (Title)

**If the bidder/offeror does not receive award of the prime contract, any and all representations in this letter of Intent and Affirmation shall be null and void.**

(Submit this page for each DBE subcontractor.)

**NON-COLLUSION AFFIDAVIT  
(Bidder or Offeror)**

I, (enter full legal name), \_\_\_\_\_  
representing (name of person, firm, association, or corporation) \_\_\_\_\_  
\_\_\_\_\_ of (Town or City and State) \_\_\_\_\_

being duly sworn, depose and certify that, under the penalties of perjury under the laws of this state and the United States that on behalf of, the person, firm, association, or corporation submitting this bid, that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with submitting a bid for this project.

**Runway Incursion Management Projects  
Taxiways A1 & A2 Hold Line Reconfiguration  
Taxiway 'H' Reconfiguration to Taxiway 'K'  
Manchester-Boston Regional Airport  
AIP# 3-33-0011-xxx-2021**

\_\_\_\_\_  
Name of Individual, Partnership, or Corporation (Please Print or Type)

\_\_\_\_\_  
Signature of Official Authorized to Sign Contracts and Agreements

\_\_\_\_\_  
Name of Individual Signing Affidavit

\_\_\_\_\_  
Title of Individual Signing Affidavit

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

**CERTIFICATION OF PROHIBITION OF SEGREGATED FACILITIES  
INSTRUCTIONS**

1. Notice to Prospective Federal Assisted Construction Contractors.
  - a. A Certification of Prohibition of Segregated Facilities must be submitted prior to the award of a contract exceeding \$10,000 which is not exempt from the provisions of the equal opportunity clause.
  - b. Contractors receiving contract awards exceeding \$10,000 which are not exempt from the provisions of the equal opportunity clause will be required to provide for the forwarding of the notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the equal opportunity clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.
2. Notice to Prospective Construction Subcontractors.
  - a. A Certification of Prohibition of Segregated Facilities must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the equal opportunity clause.
  - b. Contractors receiving subcontract awards exceeding \$10,000 which are not exempt from the provisions of the equal opportunity clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontractors exceed \$10,000 and are not exempt from the provisions of the equal opportunity clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.
3. Notice to Prospective Contractors of Requirement for Certification for Prohibition of Segregated Facilities.

A Certification of Prohibition of Segregated Facilities must be submitted prior to the award of a contract or subcontract exceeding \$10,000 which is not exempt from the provisions of the equal opportunity clause.

**CERTIFICATION OF PROHIBITION OF SEGREGATED FACILITIES  
(CONTRACTORS/ SUBCONTRACTORS)**

- (a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Employment Opportunity clause in this contract.
- (b) "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.
- (c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Employment Opportunity clause of this contract.

Certification - The information above is true and complete to the best of my knowledge and belief.

---

*Name and Title of Signer (Please type)*

---

*Signature*

---

*Date*

**NOTE:** The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.



**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY  
AND VOLUNTARY EXCLUSION (For Bids Exceeding \$25,000)**

The bidder/offeror certifies, by submission of this proposal or acceptance of this contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this proposal that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder/offeror/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this solicitation/proposal.

Certification - The information above is true and complete to the best of my knowledge and belief.

---

Name and Title of Signer (Please type)

---

Signature

---

Date

**NOTE:** The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

## TRADE RESTRICTION CERTIFICATION

The Contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

- a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);
- b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;
- c. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a contractor or subcontractor who is unable to certify to the above. If the Contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract at no cost to the Government.

Further, the Contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The Contractor shall provide immediate written notice to the sponsor if the Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide written notice to the contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

---

Date

---

Signature

---

Company Name

---

Title

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352

Page BPC-13 of 16

**DISCLOSURE OF LOBBYING ACTIVITIES  
CONTINUATION SHEET**

Reporting Entity:

— Page \_ of \_\_\_\_\_

Authorized for Local Reproduction Standard Form – LLL-A

## CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

The Bidder must complete the following two certification statements. The Bidder must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark (✓) in the space following the applicable response. The Bidder agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

### Certifications

- 1) The Bidder represents that it is ( ✓ ) is not ( ✓ ) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.
- 2) The Bidder represents that it is ( ✓ ) is not ( ✓ ) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

### Note

If a Bidder responds in the affirmative to either of the above representations, the Bidder is ineligible to receive an award unless the Sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The Bidder therefore must provide information to the Owner about its tax liability or conviction to the Owner, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

### Term Definitions

**Felony conviction:** Felony conviction means a conviction within the preceding twenty-four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

**Tax Delinquency:** A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

---

Date

---

Signature

---

Company Name

---

Title

THIS PAGE INTENTIONALLY LEFT BLANK

**CONTRACT DOCUMENTS**  
**SCHEDULE A – TAXIWAYS ‘A1’ & ‘A2’ HOLD LINE RECONFIGURATION**

THIS PAGE INTENTIONALLY LEFT BLANK



## CONTRACT AGREEMENT

THIS AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, 2021, (execution date by Owner) by and between **City of Manchester - Department of Aviation**, hereinafter called "OWNER" and

---

doing business as a corporation hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the project entitled:

***RUNWAY INCURSION MITIGATION PROJECTS  
SCHEDULE A - TAXIWAYS 'A1' & 'A2' HOLD LINE RECONFIGURATION  
AIRPORT IMPROVEMENT PROGRAM NO. 3-33-0011-xxx-2021  
City Bid # FY21-805-25***

2. CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS on or before a date to be specified in the NOTICE TO PROCEED and will complete the work within the **thirty (30) calendar days** from the effective date of the NOTICE TO PROCEED unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

The CONTRACTOR shall pay as liquidated damages the sum of **six hundred dollars (\$600.00)** for each and every calendar day that the work remains incomplete beyond the above specified time, as provided in the General Provisions of the CONTRACT DOCUMENTS.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of \_\_\_\_\_, or as shown in the BID Schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

- (A) This Contract Agreement
- (B) Addenda as listed herein
- (C) Advertisement for Bids
- (D) Information for Bidders
- (E) Signed Copy of Bid Proposal
- (F) Bid Proposal Certificates of Compliance
- (G) Contract Documents (Bonds, Insurance)
- (H) General Contract Provisions
- (I) Supplemental Provisions
- (J) FAA Required Contract Provisions for AIP Projects
- (K) Construction Safety and Phasing Plan (CSPP)
- (L) Safety Plan Compliance Document (SPCD)
- (M) Technical Specifications
- (N) Contract Drawings (as listed in Schedule of Drawings)

In the event that any provision in any component part of the CONTRACT DOCUMENTS conflicts with any provision of any other component part, the provision of the component part first enumerated in this Paragraph 5 shall govern. The various provisions in Addenda shall be construed in the order of preference of the component part of the CONTRACT DOCUMENTS which each modified.

**Addenda Issued:**

Addendum No.	Dated
_____	_____
_____	_____
_____	_____
_____	_____

6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the General Provisions such amounts as required by the CONTRACT DOCUMENTS.

7. This Contract Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

8. The CONTRACTOR shall indemnify, hold harmless and defend the OWNER, the United States of America, the Engineer, the Engineer's consultants, and their officers, board members, agents and employees (the "Indemnities") from and against all losses, suits, claims, liabilities, penalties, fines, judgments, costs and expenses, including without limitation attorneys' fees, consultants' fees and experts' fees arising out of, or in any manner predicated upon personal injury, death or property damage resulting from, relating to, caused by or arising out of (or which may be claimed to arise out of) the CONTRACTOR's performance of its obligations under this Contract Agreement; and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR, its subcontractors, anyone directly or indirectly employed by either the CONTRACTOR or its subcontractors, or anyone for whose acts any of the foregoing may be liable. The agreements contained in the preceding sentence do not extend to claims for damages caused by gross negligence or willful misconduct of the Indemnities without contributory fault on the part of any person, firm, or corporation.

In any and all claims against the Indemnatee or any one of the Indemnitees by any employee of the CONTRACTOR, its subcontractors, anyone directly or indirectly employed by an employee or subcontractor of the CONTRACTOR, or anyone for whose acts of such employees and subcontractors may be liable, the indemnification obligation shall not be limited to in any way by a limitation on the amount of damages, compensation or benefits payable by or for the CONTRACTOR or any subcontractor under workers compensation acts, disability benefit acts or other employee benefits acts.

In the event that any action or proceeding is brought against the Indemnatee or any one of the Indemnitee by reason of any matter for which the CONTRACTOR has hereby agreed to indemnify, hold harmless and defend, the CONTRACTOR, upon notice from the Indemnatee or any one of them, covenants to resist or defend such action or proceeding with counsel acceptable to the Indemnatee or any one of them as the case may be.

Notwithstanding the foregoing, nothing herein shall be deemed to constitute a waiver of the sovereign immunity of the **City of Manchester - Department of Aviation** which is hereby reserved to the **City of Manchester - Department of Aviation**.

The provision of this indemnification shall survive the expiration or termination of this Contract Agreement, and the CONTRACTOR's obligations hereunder shall apply whenever any one of the Indemnitees incurs costs or liabilities described above.

9. This Contract Agreement is executed in a number of counterparts, each of which is an original and constitutes the entire agreement between the parties. This Contract Agreement shall be construed according to the laws of the **City of Manchester - Department of Aviation**. No portion of this Contract Agreement shall be understood to waive the sovereign immunity of the **City of Manchester - Department of Aviation**. This Contract Agreement shall not be amended, except as specified in the FAA General Contract Provisions.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in Six (6) Originals on the date first above written.

**CITY OF MANCHESTER –  
DEPARTMENT OF AVIATION**

Witnessed:

By: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Name: \_\_\_\_\_  
(type or print)

My Commission Expires: \_\_\_\_\_

(SEAL)

Title: \_\_\_\_\_

**CONTRACTOR**

Witnessed:

By: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Name: \_\_\_\_\_  
(type or print)

My Commission Expires: \_\_\_\_\_

(SEAL)

Title: \_\_\_\_\_

## CERTIFICATES OF INSURANCE

The Contractor shall furnish Certificates of Insurance as described in Supplemental Provisions, INSURANCE REQUIREMENTS and shall list the policies as follows:

Type of Insurance	Limits of Policy Coverage	Number	Insurance Co.	Expiration Date
Workman's Compensation	_____			
General Liability	_____			
Automobile Liability	_____			
	_____			

These Insurance Certificates as well as Performance and Payment Bonds must be furnished at or before the time of the execution of this document. Such certificates shall, with respect to comprehensive general liability and auto liability insurance, name the City of Manchester, Departments of Aviation, and any Architect and Engineering firms designated by the Owner as an additional insured (except worker's compensation).

**IN WITNESS WHEREOF**, the parties to these presents have executed this Contract Agreement in six (6) counterparts each of which shall be deemed an original, as of the year and day first above mentioned.

(Seal)  
ATTEST:

_____	By: _____	
Witness	CONTRACTOR	Date

_____	By: _____	
Witness	Department of Aviation	Date

## **SAFETY RESPONSIBILITY COVENANT**

It is hereby understood and agreed that the CONTRACTOR is responsible for health and safety on this project including, but not limited to, compliance with all applicable federal, state, and local regulations, codes, rules, orders, laws and ordinances regarding health and safety and shall, at all times, exercise and enforce reasonable precautions for the safety and welfare of all persons and property associated with or affected by this project. The CONTRACTOR's responsibility shall include providing adequate equipment and facilities necessary (including, if required, removal to a hospital) to furnish first aid to any person or person's who may be injured on the project site.

The CONTRACTOR further agrees to defend, indemnify and hold harmless the OWNER and the ENGINEER from any expense, cost or loss including but not limited to fines, demands, suits, legal fees, or penalties, including costs of corrective measures, that the CONTRACTOR, OWNER or ENGINEER may sustain by reason of the CONTRACTOR's failure to provide a safe workplace or to comply with all health and safety laws, rules and regulations in connection with the performance of this Contract Agreement.

To achieve the safety goals for this project, the CONTRACTOR shall designate a SAFETY OFFICER whose duty shall be to monitor the project on a daily basis in order to insure that all required safety measures are strictly adhered to and site safety is insured. The SAFETY OFFICER shall act for the CONTRACTOR on safety issues and shall have the right to shut down work on the site until safety deficiencies have been corrected. The project SAFETY OFFICER is designated as:

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

THIS PAGE INTENTIONALLY LEFT BLANK

**CONTRACT BONDS**  
**SCHEDULE A – TAXIWAYS ‘A1’ & ‘A2’ HOLD LINE RECONFIGURATION**

THIS PAGE INTENTIONALLY LEFT BLANK



## FORM OF PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS

That we, \_\_\_\_\_

an individual\*, a partnership\*, a corporation\* organized under the laws of the State of \_\_\_\_\_

\_\_\_\_\_ having a usual place of business in the State of \_\_\_\_\_

\_\_\_\_\_ as Principal, and \_\_\_\_\_

a corporation organized under the laws of the State of \_\_\_\_\_

and having a usual place of business in the State of \_\_\_\_\_

as Surety, are holden and stand firmly bound and obligated unto the City of Manchester, New Hampshire,

Department of Aviation (hereinafter the Owner), its successors and assigns, in the sum of \_\_\_\_\_

\_\_\_\_\_ ---- Dollars

(\$ \_\_\_\_\_ ).

lawful money of the United States of America, to and for the true payment whereof, we bind ourselves and each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents. WHEREAS, the said Principal has by means of a written agreement dated \_\_\_\_\_

\_\_\_\_\_, 2021, entered into a Contract Agreement with the Owner for:

**Runway Incursion Mitigation Projects – Schedule A – Taxiways ‘A1’ & ‘A2’ Hold Line Reconfiguration at Manchester-Boston Regional Airport**

a copy of which Contract Agreement is attached hereto and by reference made a part hereon.

\*Strike out inapplicable terms.

NOW, THEREFORE, THE CONDITION of this obligation is such that if the said Principal and his/her subcontractors shall well and truly keep and perform all the agreements, terms and conditions in said Contract Agreement set forth and specified to be by said Principal kept and performed, and shall well and truly indemnify and save harmless the Owner against all counsel fees paid or incurred by the Owner as a result of a breach of any condition of this bond, and against all claims and suits for damage to person or property arising from carelessness or want of due care, or any act or omission on the part of said Principal during the performance of said Contract Agreement, then this obligation shall be void; otherwise, it shall remain in full force and virtue.

PROVIDED, FURTHER, that said Surety, for value received, hereby stipulates and agrees that no extension of time, or change in, alteration or addition to the terms of the Contract Agreement or to the work to be performed there under or the Contract Documents accompanying the same and no failure or refusal of the Owner to withhold any monies from the Principal shall in any way affect its obligations on this bond, and it does hereby waive notice of any such extension of time, change, alterations or addition to the terms of the Contract Agreement or the work or to the Contract Documents.

In the event that the Contract Agreement is abandoned by the Principal, or is terminated by the Owner under the provisions of said Contract Agreement, said Surety hereby further agrees that said Surety shall, if requested in writing by the Owner, take action as is necessary to complete said Contract Agreement.

This bond shall become effective at the same time as the Contract Agreement annexed hereto for the work hereinbefore mentioned.

IN WITNESS WHEREOF, we have hereunto set out hands and seals to this bond this \_\_\_\_\_ day of \_\_\_\_\_, 2021.

WITNESS:

(SEAL)  
Name of Principal

By: \_\_\_\_\_

WITNESS:

(SEAL)  
Name of Surety

Power of Attorney for person signing for the Surety Company must be attached.

**CERTIFICATE AS TO CORPORATE PRINCIPAL**

**PERFORMANCE BOND**

I, \_\_\_\_\_, certify that I am the \_\_\_\_\_ of the  
Corporation named as Principal in the within bond; that, \_\_\_\_\_ who signed  
the said bond on behalf of the principal was then \_\_\_\_\_,  
of said Corporation; that I know his/her signature and his/her signature thereto is genuine; and that said bond  
was duly signed, sealed and attested to for and in behalf of said Corporation by authority of its governing  
body and is within the scope of its corporate powers.

\_\_\_\_\_ SEAL

(Power of attorney of person(s) signing Bond for Surety Company must be attached.)

NOTE: Date of Bond must not be prior to date of Contract Agreement. If Principal is Partnership, all partners  
must execute bond.

THIS PAGE INTENTIONALLY LEFT BLANK

## FORM OF PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS

That we \_\_\_\_\_  
an individual\*, a partnership\*, a corporation\* organized under the laws of the State of \_\_\_\_\_  
\_\_\_\_\_  
having a usual place of business in the State of \_\_\_\_\_  
as Principal, and \_\_\_\_\_,  
a corporation organized under the laws of the State of \_\_\_\_\_  
and having a usual place of business in the State of \_\_\_\_\_,  
as Surety, are holden and stand firmly bound and obligated unto the City of Manchester, New Hampshire,  
Department of Aviation (hereinafter the Owner), its successors and assigns, in the sum of \_\_\_\_\_  
\_\_\_\_\_ Dollars (\$ \_\_\_\_\_), lawful money of the United  
States of America, to and for the true payment whereof, we bind ourselves and each of us, our heirs,  
executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has by means of a written agreement dated \_\_\_\_\_, 2021  
entered into a Contract Agreement with the Owner for:

**Runway Incursion Mitigation Projects – Schedule A – Taxiways ‘A1’ & ‘A2’ Hold Line  
Reconfiguration at Manchester-Boston Regional Airport.**

a copy of which Contract Agreement is attached hereto and by reference made a part hereof.

\* Strike out inapplicable terms.

NOW, THEREFORE, THE CONDITION Of this obligation is such that is the said Principal and his/her subcontractors shall pay for all labor performed or furnished, for all equipment hired, including trucks, for all material used or employed in such construction, including lumber so employed which is not incorporated in the work, and for fuels, lubricants, power, tools, hardware, and supplies purchased by said principal and used in carrying out said Contract Agreement, and for labor and parts furnished upon the order of said Contractor for the repair of equipment used in carrying out said Contract Agreement, this agreement to make such payments being in compliance with the requirements of Section 16 of Chapter 447, of New Hampshire Revised Statutes, Annotated, 1955, to furnish security there under and being in fact such security, and if said Principal shall well and fully indemnify and save harmless the Owner against all counsel fees paid or incurred by the Owner as a result of a breach of any condition of this bond, and against all claims and suits for damage to person or property arising from carelessness or want of due care, or any act or omission on the part of said Principal during the performance of said Contract Agreement, then this obligation shall be void; otherwise, it shall remain in full force and virtue.

PROVIDED, FURTHER, that said Surety, for value received, hereby stipulates and agrees (1) that no extension of time, or change in, alteration or addition to the terms of the Contract Agreement or to the work to be performed there under or the Contract Documents accompanying the same and no failure or refusal of the Owner to withhold any monies from the Principal shall in any way affect its obligations on this bond, and it does hereby waive notice of any such extension of time, change, alterations, or addition to the terms of the Contract Agreement or the work or to the Contract Documents; (2) that in case of liabilities not covered by said Section 16 of Chapter 447 RSA, as amended, but covered by this bond, then the provisions of this bond shall control.

In addition to the obligations of the undersigned enumerated above, the bond is also made for the use and benefit of all persons, firms and corporations, who may furnish any material or perform any labor on account of said Contract Agreement, or rent or hire out any appliances or equipment used or employed in the execution of said Contract Agreement and they and each of them are hereby made Obligees hereunder the same as if their own proper respective names were written herein as such, and they and each of them may proceed or sue hereon, and in case of failure of said Principal to carry out the foregoing provisions made for the use and benefit of any said persons, firms and corporations, the Owner as an additional remedy may maintain an action against the undersigned in its own name, but in trust for and for the benefit of said persons, firms and corporations.

This bond shall become effective at the same time as the Contract Agreement annexed hereto for the work hereinbefore mentioned.

IN WITNESS WHEREOF, we have set our hands and seals to this bond, this \_\_\_\_\_ day of \_\_\_\_\_, 2021 In presence of:

\_\_\_\_\_  
*Individual Principal* SEAL

\_\_\_\_\_  
*Business Address*

\_\_\_\_\_  
*Individual Principal* SEAL

\_\_\_\_\_  
*Business Address*

Attest:

\_\_\_\_\_  
*Corporate Principal* SEAL

By: \_\_\_\_\_

Attest:

\_\_\_\_\_  
*Corporate Surety* SEAL

\_\_\_\_\_  
*Business Address*

Countersigned: By: \_\_\_\_\_

By: \_\_\_\_\_

**CERTIFICATE AS TO CORPORATE PRINCIPAL**  
**PAYMENT BOND**

I, \_\_\_\_\_, certify that I am the  
\_\_\_\_\_ of the Corporation named \_\_\_\_\_ as Principal in  
the within bond; that, \_\_\_\_\_ who signed the said  
bond on behalf of the principal was then \_\_\_\_\_,  
of said Corporation; that I know his/her signature and his/her signature thereto is genuine; and that said  
bond was duly signed, sealed and attested to for and in behalf of said Corporation by authority of its  
governing body and is within the scope of its corporate powers.

\_\_\_\_\_  
SEAL

(Power of attorney of person(s) signing Bond for Surety Company must be attached.)

NOTE: Date of Bond must not be prior to date of Contract Agreement. If Principal is Partnership, all partners must execute bond.



**WARRANTY BOND**  
**SCHEDULE A – TAXIWAYS ‘A1’ & ‘A2’ HOLD LINE RECONFIGURATION**

KNOW ALL MEN BY THESE PRESENTS

That we \_\_\_\_\_, an individual\*, a partnership\*, a company\* organized under the laws of the State of \_\_\_\_\_, having a usual place of business in the State of \_\_\_\_\_, Principal, and \_\_\_\_\_, a company organized under the laws of the State of \_\_\_\_\_, and having a usual place of business in the State of \_\_\_\_\_, as Surety, are holden and stand firmly bound and obligated unto the City of Manchester, New Hampshire – Department of Aviation, (hereinafter the Owner), its successors and assigns, in the sum of \_\_\_\_\_ (\$\_\_\_\_\_.00), lawful money of the United States of America, to and for the true payment whereof, we bind ourselves and each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has, by means of a written agreement dated \_\_\_\_\_, 2021, entered into a Contract Agreement with the Owner for a copy of which contract is attached hereto and by reference made a part hereof.

\* Strike out inapplicable terms.

NOW, THEREFORE, THE CONDITION of this obligation is such that is the said Principal and his subcontractors shall remedy any defects due the contractor's failure to conform to the contract requirements or to faulty materials or workmanship, defect of equipment, or design furnished by the Contractor, and pay for any damage to other work resulting therefrom, which shall appear **within a period of one (1) year from the date of final acceptance** of the work provided for in the Contract Agreement, then this obligation to be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that the Owner shall give Contractor and Surety notice of Observed defects with reasonable promptness.

PROVIDED, FURTHER, that said Surety, for value received, hereby stipulates and agrees that no extension of time, or change in, alteration or addition to the terms of the Contract Agreement or to the work to be performed thereunder or the specifications accompanying the same and no failure or refusal of the Owner to withhold any monies from the Principal shall in any way affect its obligations on this bond, and it does hereby waive notice of any such extension of time, change, alterations, or addition to the terms of the Contract Agreement or the work or to the specifications.

IN WITNESS WHEREOF, we have set our hands and seals to this bond, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ In presence of:

\_\_\_\_\_, SEAL  
*Individual Principal*

\_\_\_\_\_  
*Business Address*

\_\_\_\_\_, SEAL  
*Individual Principal*

\_\_\_\_\_  
*Business Address*

Attest:

\_\_\_\_\_, \_\_\_\_\_, SEAL  
*Corporate Principal*

By: \_\_\_\_\_

Attest:

\_\_\_\_\_, \_\_\_\_\_, SEAL  
*Corporate Surety*

\_\_\_\_\_  
*Business Address*

Countersigned: By: \_\_\_\_\_

By: \_\_\_\_\_

**CERTIFICATE AS TO CORPORATE PRINCIPAL**

**WARRANTY BOND**

I, \_\_\_\_\_, certify that I am the  
\_\_\_\_\_ of the Corporation named as Principal in the  
within bond; that, \_\_\_\_\_ who signed the said bond on  
behalf of the principal was then \_\_\_\_\_, of said  
Corporation; that I know his/her signature and his/her signature thereto is genuine; and that said bond was  
duly signed, sealed and attested to for and in behalf of said Corporation by authority of its governing body  
and is within the scope of its corporate powers.

\_\_\_\_\_ SEAL

THIS PAGE INTENTIONALLY LEFT BLANK

**CONTRACT DOCUMENTS**  
**SCHEDULES B & C – TAXIWAY H RECONFIGURATION TO TAXIWAY K**

THIS PAGE INTENTIONALLY LEFT BLANK

## CONTRACT AGREEMENT

THIS AGREEMENT, made this \_\_\_\_\_ day of \_\_\_\_\_, 2021, (execution date by Owner) by and between **City of Manchester - Department of Aviation**, hereinafter called "OWNER" and

---

doing business as a corporation hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the project entitled:

***RUNWAY INCURSION MITIGATION PROJECTS  
SCHEDULE B – TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’  
AIRPORT IMPROVEMENT PROGRAM NO. 3-33-0011-xxx-2021  
City Bid # FY21-805-26***

2. CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS on or before a date to be specified in the NOTICE TO PROCEED and will complete the work within the **ninety-five (95) calendar days** from the effective date of the NOTICE TO PROCEED unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

The CONTRACTOR shall pay as liquidated damages the sum of **two thousand five hundred dollars (\$2,500.00)** for each and every calendar day that the work remains incomplete beyond the above specified time, as provided in the General Provisions of the CONTRACT DOCUMENTS.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of \_\_\_\_\_, or as shown in the BID Schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

- (A) This Contract Agreement
- (B) Addenda as listed herein
- (C) Advertisement for Bids
- (D) Information for Bidders
- (E) Signed Copy of Bid Proposal
- (F) Bid Proposal Certificates of Compliance
- (G) Contract Documents (Bonds, Insurance)
- (H) General Contract Provisions
- (I) Supplemental Provisions
- (J) FAA Required Contract Provisions for AIP Projects
- (K) Construction Safety and Phasing Plan (CSPP)
- (L) Safety Plan Compliance Document (SPCD)
- (M) Technical Specifications
- (N) Engineering Reports (Geotechnical)
- (O) Contract Drawings (as listed in Schedule of Drawings)

In the event that any provision in any component part of the CONTRACT DOCUMENTS conflicts with any provision of any other component part, the provision of the component part first enumerated in this Paragraph 5 shall govern. The various provisions in Addenda shall be construed in the order of preference of the component part of the CONTRACT DOCUMENTS which each modified.

**Addenda Issued:**

Addendum No.	Dated
_____	_____
_____	_____
_____	_____
_____	_____

6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the General Provisions such amounts as required by the CONTRACT DOCUMENTS.

7. This Contract Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

8. The CONTRACTOR shall indemnify, hold harmless and defend the OWNER, the United States of America, the Engineer, the Engineer's consultants, and their officers, board members, agents and employees (the "Indemnities") from and against all losses, suits, claims, liabilities, penalties, fines, judgments, costs and expenses, including without limitation attorneys' fees, consultants' fees and experts' fees arising out of, or in any manner predicated upon personal injury, death or property damage resulting from, relating to, caused by or arising out of (or which may be claimed to arise out of) the CONTRACTOR's performance of its obligations under this Contract Agreement; and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR, its subcontractors, anyone directly or indirectly employed by either the CONTRACTOR or its subcontractors, or anyone for whose acts any of the foregoing may be liable. The agreements contained in the preceding sentence do not extend to claims for damages caused by gross negligence or willful misconduct of the Indemnities without contributory fault on the part of any person, firm, or corporation.

In any and all claims against the Indemnitee or any one of the Indemnities by any employee of the CONTRACTOR, its subcontractors, anyone directly or indirectly employed by an employee or subcontractor of the CONTRACTOR, or anyone for whose acts of such employees and subcontractors may be liable, the indemnification obligation shall not be limited to in any way by a limitation on the amount of damages, compensation or benefits payable by or for the CONTRACTOR or any subcontractor under workers compensation acts, disability benefit acts or other employee benefits acts.

In the event that any action or proceeding is brought against the Indemnitee or any one of the Indemnities by reason of any matter for which the CONTRACTOR has hereby agreed to indemnify, hold harmless and defend, the CONTRACTOR, upon notice from the Indemnitee or any one of them, covenants to resist or defend such action or proceeding with counsel acceptable to the Indemnitee or any one of them as the case may be.



Notwithstanding the foregoing, nothing herein shall be deemed to constitute a waiver of the sovereign immunity of the **City of Manchester - Department of Aviation** which is hereby reserved to the **City of Manchester - Department of Aviation**.

The provision of this indemnification shall survive the expiration or termination of this Contract Agreement, and the CONTRACTOR's obligations hereunder shall apply whenever any one of the Indemnitees incurs costs or liabilities described above.

9. This Contract Agreement is executed in a number of counterparts, each of which is an original and constitutes the entire agreement between the parties. This Contract Agreement shall be construed according to the laws of the **City of Manchester - Department of Aviation**. No portion of this Contract Agreement shall be understood to waive the sovereign immunity of the **City of Manchester - Department of Aviation**. This Contract Agreement shall not be amended, except as specified in the FAA General Contract Provisions.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in Six (6) Originals on the date first above written.

**CITY OF MANCHESTER –  
DEPARTMENT OF AVIATION**

Witnessed:

By: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Name: \_\_\_\_\_  
(type or print)

My Commission Expires: \_\_\_\_\_

(SEAL)

Title: \_\_\_\_\_

**CONTRACTOR**

Witnessed:

By: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Name: \_\_\_\_\_  
(type or print)

My Commission Expires: \_\_\_\_\_

(SEAL)

Title: \_\_\_\_\_

## CERTIFICATES OF INSURANCE

The Contractor shall furnish Certificates of Insurance as described in Supplemental Provisions, INSURANCE REQUIREMENTS and shall list the policies as follows:

Type of Insurance	Limits of Policy Coverage	Number	Insurance Co.	Expiration Date
Workman's Compensation	_____			
General Liability	_____			
Automobile Liability	_____			
	_____			

These Insurance Certificates as well as Performance and Payment Bonds must be furnished at or before the time of the execution of this document. Such certificates shall, with respect to comprehensive general liability and auto liability insurance, name the City of Manchester, Departments of Aviation, and any Architect and Engineering firms designated by the Owner as an additional insured (except worker's compensation).

**IN WITNESS WHEREOF**, the parties to these presents have executed this Contract Agreement in six (6) counterparts each of which shall be deemed an original, as of the year and day first above mentioned.

(Seal)  
ATTEST:

_____	By: _____	
Witness	CONTRACTOR	Date

_____	By: _____	
Witness	Department of Aviation	Date

## **SAFETY RESPONSIBILITY COVENANT**

It is hereby understood and agreed that the CONTRACTOR is responsible for health and safety on this project including, but not limited to, compliance with all applicable federal, state, and local regulations, codes, rules, orders, laws and ordinances regarding health and safety and shall, at all times, exercise and enforce reasonable precautions for the safety and welfare of all persons and property associated with or affected by this project. The CONTRACTOR's responsibility shall include providing adequate equipment and facilities necessary (including, if required, removal to a hospital) to furnish first aid to any person or person's who may be injured on the project site.

The CONTRACTOR further agrees to defend, indemnify and hold harmless the OWNER and the ENGINEER from any expense, cost or loss including but not limited to fines, demands, suits, legal fees, or penalties, including costs of corrective measures, that the CONTRACTOR, OWNER or ENGINEER may sustain by reason of the CONTRACTOR's failure to provide a safe workplace or to comply with all health and safety laws, rules and regulations in connection with the performance of this Contract Agreement.

To achieve the safety goals for this project, the CONTRACTOR shall designate a SAFETY OFFICER whose duty shall be to monitor the project on a daily basis in order to insure that all required safety measures are strictly adhered to and site safety is insured. The SAFETY OFFICER shall act for the CONTRACTOR on safety issues and shall have the right to shut down work on the site until safety deficiencies have been corrected. The project SAFETY OFFICER is designated as:

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

THIS PAGE INTENTIONALLY LEFT BLANK

**CONTRACT BONDS**  
**SCHEDULES B & C – TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**

THIS PAGE INTENTIONALLY LEFT BLANK

## FORM OF PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS

That we, \_\_\_\_\_

an individual\*, a partnership\*, a corporation\* organized under the laws of the State of \_\_\_\_\_

\_\_\_\_\_ having a usual place of business in the State of \_\_\_\_\_

\_\_\_\_\_ as Principal, and \_\_\_\_\_

a corporation organized under the laws of the State of \_\_\_\_\_

and having a usual place of business in the State of \_\_\_\_\_

as Surety, are holden and stand firmly bound and obligated unto the City of Manchester, New Hampshire,

Department of Aviation (hereinafter the Owner), its successors and assigns, in the sum of \_\_\_\_\_

\_\_\_\_\_ ---- Dollars

(\$ \_\_\_\_\_ ).

lawful money of the United States of America, to and for the true payment whereof, we bind ourselves and each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents. WHEREAS, the said Principal has by means of a written agreement dated \_\_\_\_\_

\_\_\_\_\_, 2021, entered into a Contract Agreement with the Owner for:

**Runway Incursion Mitigation Projects – Schedules B & C - Taxiways ‘H’ Reconfiguration to Taxiway ‘K’1 at Manchester-Boston Regional Airport**

a copy of which Contract Agreement is attached hereto and by reference made a part hereon.

\*Strike out inapplicable terms.

NOW, THEREFORE, THE CONDITION of this obligation is such that if the said Principal and his/her subcontractors shall well and truly keep and perform all the agreements, terms and conditions in said Contract Agreement set forth and specified to be by said Principal kept and performed, and shall well and truly indemnify and save harmless the Owner against all counsel fees paid or incurred by the Owner as a result of a breach of any condition of this bond, and against all claims and suits for damage to person or property arising from carelessness or want of due care, or any act or omission on the part of said Principal during the performance of said Contract Agreement, then this obligation shall be void; otherwise, it shall remain in full force and virtue.

PROVIDED, FURTHER, that said Surety, for value received, hereby stipulates and agrees that no extension of time, or change in, alteration or addition to the terms of the Contract Agreement or to the work to be performed there under or the Contract Documents accompanying the same and no failure or refusal of the Owner to withhold any monies from the Principal shall in any way affect its obligations on this bond, and it does hereby waive notice of any such extension of time, change, alterations or addition to the terms of the Contract Agreement or the work or to the Contract Documents.

In the event that the Contract Agreement is abandoned by the Principal, or is terminated by the Owner under the provisions of said Contract Agreement, said Surety hereby further agrees that said Surety shall, if requested in writing by the Owner, take action as is necessary to complete said Contract Agreement.

This bond shall become effective at the same time as the Contract Agreement annexed hereto for the work hereinbefore mentioned.

IN WITNESS WHEREOF, we have hereunto set out hands and seals to this bond this \_\_\_\_\_ day of \_\_\_\_\_, 2021.

WITNESS:

(SEAL)  
Name of Principal

By: \_\_\_\_\_

WITNESS:

(SEAL)  
Name of Surety

Power of Attorney for person signing for the Surety Company must be attached.



**CERTIFICATE AS TO CORPORATE PRINCIPAL**

**PERFORMANCE BOND**

I, \_\_\_\_\_, certify that I am the \_\_\_\_\_ of the  
Corporation named as Principal in the within bond; that, \_\_\_\_\_ who signed  
the said bond on behalf of the principal was then \_\_\_\_\_,  
of said Corporation; that I know his/her signature and his/her signature thereto is genuine; and that said bond  
was duly signed, sealed and attested to for and in behalf of said Corporation by authority of its governing  
body and is within the scope of its corporate powers.

\_\_\_\_\_ SEAL

(Power of attorney of person(s) signing Bond for Surety Company must be attached.)

NOTE: Date of Bond must not be prior to date of Contract Agreement. If Principal is Partnership, all partners  
must execute bond.

THIS PAGE INTENTIONALLY LEFT BLANK

## FORM OF PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS

That we \_\_\_\_\_  
an individual\*, a partnership\*, a corporation\* organized under the laws of the State of \_\_\_\_\_  
\_\_\_\_\_  
having a usual place of business in the State of \_\_\_\_\_  
as Principal, and \_\_\_\_\_,  
a corporation organized under the laws of the State of \_\_\_\_\_  
and having a usual place of business in the State of \_\_\_\_\_,  
as Surety, are holden and stand firmly bound and obligated unto the City of Manchester, New Hampshire,  
Department of Aviation (hereinafter the Owner), its successors and assigns, in the sum of \_\_\_\_\_  
\_\_\_\_\_ Dollars (\$ \_\_\_\_\_), lawful money of the United  
States of America, to and for the true payment whereof, we bind ourselves and each of us, our heirs,  
executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has by means of a written agreement dated \_\_\_\_\_, 2021  
entered into a Contract Agreement with the Owner for:

**Runway Incursion Mitigation Project – Schedules B & C - Taxiway 'H' Reconfiguration to Taxiway  
'K' at Manchester-Boston Regional Airport.**

a copy of which Contract Agreement is attached hereto and by reference made a part hereof.

\* Strike out inapplicable terms.

NOW, THEREFORE, THE CONDITION Of this obligation is such that is the said Principal and his/her subcontractors shall pay for all labor performed or furnished, for all equipment hired, including trucks, for all material used or employed in such construction, including lumber so employed which is not incorporated in the work, and for fuels, lubricants, power, tools, hardware, and supplies purchased by said principal and used in carrying out said Contract Agreement, and for labor and parts furnished upon the order of said Contractor for the repair of equipment used in carrying out said Contract Agreement, this agreement to make such payments being in compliance with the requirements of Section 16 of Chapter 447, of New Hampshire Revised Statutes, Annotated, 1955, to furnish security there under and being in fact such security, and if said Principal shall well and fully indemnify and save harmless the Owner against all counsel fees paid or incurred by the Owner as a result of a breach of any condition of this bond, and against all claims and suits for damage to person or property arising from carelessness or want of due care, or any act or omission on the part of said Principal during the performance of said Contract Agreement, then this obligation shall be void; otherwise, it shall remain in full force and virtue.

PROVIDED, FURTHER, that said Surety, for value received, hereby stipulates and agrees (1) that no extension of time, or change in, alteration or addition to the terms of the Contract Agreement or to the work to be performed there under or the Contract Documents accompanying the same and no failure or refusal of the Owner to withhold any monies from the Principal shall in any way affect its obligations on this bond, and it does hereby waive notice of any such extension of time, change, alterations, or addition to the terms of the Contract Agreement or the work or to the Contract Documents; (2) that in case of liabilities not covered by said Section 16 of Chapter 447 RSA, as amended, but covered by this bond, then the provisions of this bond shall control.

In addition to the obligations of the undersigned enumerated above, the bond is also made for the use and benefit of all persons, firms and corporations, who may furnish any material or perform any labor on account of said Contract Agreement, or rent or hire out any appliances or equipment used or employed in the execution of said Contract Agreement and they and each of them are hereby made Obligees hereunder the same as if their own proper respective names were written herein as such, and they and each of them may proceed or sue hereon, and in case of failure of said Principal to carry out the foregoing provisions made for the use and benefit of any said persons, firms and corporations, the Owner as an additional remedy may maintain an action against the undersigned in its own name, but in trust for and for the benefit of said persons, firms and corporations.

This bond shall become effective at the same time as the Contract Agreement annexed hereto for the work hereinbefore mentioned.

IN WITNESS WHEREOF, we have set our hands and seals to this bond, this \_\_\_\_\_ day of \_\_\_\_\_, 2021 In presence of:

\_\_\_\_\_  
*Individual Principal* SEAL

\_\_\_\_\_  
*Business Address*

\_\_\_\_\_  
*Individual Principal* SEAL

\_\_\_\_\_  
*Business Address*

Attest:

\_\_\_\_\_  
*Corporate Principal* SEAL

By: \_\_\_\_\_

Attest:

\_\_\_\_\_  
*Corporate Surety* SEAL

\_\_\_\_\_  
*Business Address*

Countersigned: By: \_\_\_\_\_

By: \_\_\_\_\_

**CERTIFICATE AS TO CORPORATE PRINCIPAL**  
**PAYMENT BOND**

I, \_\_\_\_\_, certify that I am the  
\_\_\_\_\_ of the Corporation named \_\_\_\_\_ as Principal in  
the within bond; that, \_\_\_\_\_ who signed the said  
bond on behalf of the principal was then \_\_\_\_\_,  
of said Corporation; that I know his/her signature and his/her signature thereto is genuine; and that said  
bond was duly signed, sealed and attested to for and in behalf of said Corporation by authority of its  
governing body and is within the scope of its corporate powers.

\_\_\_\_\_  
SEAL

(Power of attorney of person(s) signing Bond for Surety Company must be attached.)

NOTE: Date of Bond must not be prior to date of Contract Agreement. If Principal is Partnership, all partners must execute bond.

**WARRANTY BOND**  
**SCHEDULES B & C – TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**

KNOW ALL MEN BY THESE PRESENTS

That we \_\_\_\_\_, an individual\*, a partnership\*, a company\* organized under the laws of the State of \_\_\_\_\_, having a usual place of business in the State of \_\_\_\_\_, Principal, and \_\_\_\_\_, a company organized under the laws of the State of \_\_\_\_\_, and having a usual place of business in the State of \_\_\_\_\_, as Surety, are holden and stand firmly bound and obligated unto the City of Manchester, New Hampshire – Department of Aviation, (hereinafter the Owner), its successors and assigns, in the sum of \_\_\_\_\_ (\$\_\_\_\_\_.00), lawful money of the United States of America, to and for the true payment whereof, we bind ourselves and each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has, by means of a written agreement dated \_\_\_\_\_, 2021, entered into a Contract Agreement with the Owner for a copy of which contract is attached hereto and by reference made a part hereof.

\* Strike out inapplicable terms.

NOW, THEREFORE, THE CONDITION of this obligation is such that is the said Principal and his subcontractors shall remedy any defects due the contractor’s failure to conform to the contract requirements or to faulty materials or workmanship, defect of equipment, or design furnished by the Contractor, and pay for any damage to other work resulting therefrom, which shall appear **within a period of one (1) year from the date of final acceptance** of the work provided for in the Contract Agreement, then this obligation to be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that the Owner shall give Contractor and Surety notice of Observed defects with reasonable promptness.

PROVIDED, FURTHER, that said Surety, for value received, hereby stipulates and agrees that no extension of time, or change in, alteration or addition to the terms of the Contract Agreement or to the work to be performed thereunder or the specifications accompanying the same and no failure or refusal of the Owner to withhold any monies from the Principal shall in any way affect its obligations on this bond, and it does hereby waive notice of any such extension of time, change, alterations, or addition to the terms of the Contract Agreement or the work or to the specifications.

IN WITNESS WHEREOF, we have set our hands and seals to this bond, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ In presence of:

\_\_\_\_\_, SEAL  
*Individual Principal*

\_\_\_\_\_  
*Business Address*

\_\_\_\_\_, SEAL  
*Individual Principal*

\_\_\_\_\_  
*Business Address*

Attest:

\_\_\_\_\_, \_\_\_\_\_, SEAL  
*Corporate Principal*

By: \_\_\_\_\_

Attest:

\_\_\_\_\_, \_\_\_\_\_, SEAL  
*Corporate Surety*

\_\_\_\_\_  
*Business Address*

Countersigned: By: \_\_\_\_\_

By: \_\_\_\_\_



**CERTIFICATE AS TO CORPORATE PRINCIPAL**

**WARRANTY BOND**

I, \_\_\_\_\_, certify that I am the  
\_\_\_\_\_ of the Corporation named as Principal in the  
within bond; that, \_\_\_\_\_ who signed the said bond on  
behalf of the principal was then \_\_\_\_\_, of said  
Corporation; that I know his/her signature and his/her signature thereto is genuine; and that said bond was  
duly signed, sealed and attested to for and in behalf of said Corporation by authority of its governing body  
and is within the scope of its corporate powers.

\_\_\_\_\_ SEAL

THIS PAGE INTENTIONALLY LEFT BLANK

## **FAA GENERAL CONTRACT PROVISIONS**

THIS PAGE INTENTIONALLY LEFT BLANK

FAA GENERAL CONTRACT PROVISIONS  
TABLE OF CONTENTS

Section 10 Definition of Terms.....	1
Section 20 Proposal Requirements and Conditions .....	7
Section 30 Award and Execution of Contract.....	11
Section 40 Scope of Work .....	13
Section 50 Control of Work.....	17
Section 60 Control of Materials .....	23
Section 70 Legal Regulations and Responsibility to Public .....	27
Section 80 Execution and Progress.....	33
Section 90 Measurement and Payment .....	39

THIS PAGE INTENTIONALLY LEFT BLANK

## Section 10 Definition of Terms

When the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be defined as follows:

<b>Paragraph Number</b>	<b>Term</b>	<b>Definition</b>
<b>10-01</b>	<b>AASHTO</b>	The American Association of State Highway and Transportation Officials.
<b>10-02</b>	<b>Access Road</b>	The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.
<b>10-03</b>	<b>Advertisement</b>	A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.
<b>10-04</b>	<b>Airport</b>	Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; airport buildings and facilities located in any of these areas, and a heliport.
<b>10-05</b>	<b>Airport Improvement Program (AIP)</b>	A grant-in-aid program, administered by the Federal Aviation Administration (FAA).
<b>10-06</b>	<b>Air Operations Area (AOA)</b>	The term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.
<b>10-07</b>	<b>Apron</b>	Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.
<b>10-08</b>	<b>ASTM International (ASTM)</b>	Formerly known as the American Society for Testing and Materials (ASTM).
<b>10-09</b>	<b>Award</b>	The Owner's notice to the successful bidder of the acceptance of the submitted bid.
<b>10-10</b>	<b>Bidder</b>	Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.
<b>10-11</b>	<b>Building Area</b>	An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.
<b>10-12</b>	<b>Calendar Day</b>	Every day shown on the calendar.
<b>10-13</b>	<b>Certificate of Analysis (COA)</b>	The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.

<b>Paragraph Number</b>	<b>Term</b>	<b>Definition</b>
<b>10-14</b>	<b>Certificate of Compliance (COC)</b>	The manufacturer's certification stating that materials or assemblies furnished fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer's authorized representative.
<b>10-15</b>	<b>Change Order</b>	A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for work within the scope of the contract and necessary to complete the project.
<b>10-16</b>	<b>Contract</b>	A written agreement between the Owner and the Contractor that establishes the obligations of the parties including but not limited to performance of work, furnishing of labor, equipment and materials and the basis of payment. The awarded contract includes but may not be limited to: Advertisement, Contract form, Proposal, Performance bond, payment bond, General provisions, certifications and representations, Technical Specifications, Plans, Supplemental Provisions, standards incorporated by reference and issued addenda.
<b>10-17</b>	<b>Contract Item (Pay Item)</b>	A specific unit of work for which a price is provided in the contract.
<b>10-18</b>	<b>Contract Time</b>	The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.
<b>10-19</b>	<b>Contractor</b>	The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.
<b>10-20</b>	<b>Contractors Quality Control (QC) Facilities</b>	The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).
<b>10-21</b>	<b>Contractor Quality Control Program (CQCP)</b>	Details the methods and procedures that will be taken to assure that all materials and completed construction required by the contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors.
<b>10-22</b>	<b>Control Strip</b>	A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.



<b>Paragraph Number</b>	<b>Term</b>	<b>Definition</b>
<b>10-23</b>	<b>Construction Safety and Phasing Plan (CSPP)</b>	The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.
<b>10-24</b>	<b>Drainage System</b>	The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.
<b>10-25</b>	<b>Engineer</b>	The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering, inspection, and/or observation of the contract work and acting directly or through an authorized representative.
<b>10-26</b>	<b>Equipment</b>	All machinery, together with the necessary supplies for upkeep and maintenance; and all tools and apparatus necessary for the proper construction and acceptable completion of the work.
<b>10-27</b>	<b>Extra Work</b>	An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Owner's Engineer or Resident Project Representative (RPR) to be necessary to complete the work within the intended scope of the contract as previously modified.
<b>10-28</b>	<b>FAA</b>	The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.
<b>10-29</b>	<b>Federal Specifications</b>	The federal specifications and standards, commercial item descriptions, and supplements, amendments, and indices prepared and issued by the General Services Administration.
<b>10-30</b>	<b>Force Account</b>	<p><b>a.</b> Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis.</p> <p><b>b.</b> Owner Force Account - Work performed for the project by the Owner's employees.</p>
<b>10-31</b>	<b>Intention of Terms</b>	<p>Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer and/or Resident Project Representative (RPR) is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer and/or RPR, subject in each case to the final determination of the Owner.</p> <p>Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard</p>

<b>Paragraph Number</b>	<b>Term</b>	<b>Definition</b>
		shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.
<b>10-32</b>	<b>Lighting</b>	A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.
<b>10-33</b>	<b>Major and Minor Contract Items</b>	A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.
<b>10-34</b>	<b>Materials</b>	Any substance specified for use in the construction of the contract work.
<b>10-35</b>	<b>Modification of Standards (MOS)</b>	Any deviation from standard specifications applicable to material and construction methods in accordance with FAA Order 5300.1.
<b>10-36</b>	<b>Notice to Proceed (NTP)</b>	A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.
<b>10-37</b>	<b>Owner</b>	The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only. The Owner for this project is: <b>City of Manchester, NH – Department of Aviation d/b/a Manchester-Boston Regional Airport</b>
<b>10-38</b>	<b>Passenger Facility Charge (PFC)</b>	Per 14 Code of Federal Regulations (CFR) Part 158 and 49 United States Code (USC) § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.
<b>10-39</b>	<b>Pavement Structure</b>	The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.
<b>10-40</b>	<b>Payment bond</b>	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.
<b>10-41</b>	<b>Performance bond</b>	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.
<b>10-42</b>	<b>Plans</b>	The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications. Plans may also be referred to as 'contract drawings.'

<b>Paragraph Number</b>	<b>Term</b>	<b>Definition</b>
<b>10-43</b>	<b>Project</b>	The agreed scope of work for accomplishing specific airport development with respect to a particular airport.
<b>10-44</b>	<b>Proposal</b>	The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.
<b>10-45</b>	<b>Proposal guaranty</b>	The security furnished with a proposal to guarantee that the bidder will enter into a contract if their own proposal is accepted by the Owner.
<b>10-46</b>	<b>Quality Assurance (QA)</b>	Owner's responsibility to assure that construction work completed complies with specifications for payment.
<b>10-47</b>	<b>Quality Control (QC)</b>	Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.
<b>10-48</b>	<b>Quality Assurance (QA) Inspector</b>	An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.
<b>10-49</b>	<b>Quality Assurance (QA) Laboratory</b>	The official quality assurance testing laboratories of the Owner or such other laboratories as may be designated by the Engineer or RPR. May also be referred to as Engineer's, Owner's, or QA Laboratory.
<b>10-50</b>	<b>Resident Project Representative (RPR)</b>	The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor, and acting directly or through an authorized representative.
<b>10-51</b>	<b>Runway</b>	The area on the airport prepared for the landing and takeoff of aircraft.
<b>10-52</b>	<b>Runway Safety Area (RSA)</b>	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft. See the construction safety and phasing plan (CSPP) for limits of the RSA.
<b>10-53</b>	<b>Safety Plan Compliance Document (SPCD)</b>	Details how the Contractor will comply with the CSPP.
<b>10-54</b>	<b>Specifications</b>	A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.
<b>10-55</b>	<b>Sponsor</b>	A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

<b>Paragraph Number</b>	<b>Term</b>	<b>Definition</b>
<b>10-56</b>	<b>Structures</b>	Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.
<b>10-57</b>	<b>Subgrade</b>	The soil that forms the pavement foundation.
<b>10-58</b>	<b>Superintendent</b>	The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the RPR, and who shall supervise and direct the construction.
<b>10-59</b>	<b>Supplemental Agreement</b>	A written agreement between the Contractor and the Owner that establishes the basis of payment and contract time adjustment, if any, for the work affected by the supplemental agreement. A supplemental agreement is required if: (1) in scope work would increase or decrease the total amount of the awarded contract by more than 25%; (2) in scope work would increase or decrease the total of any major contract item by more than 25%; (3) work that is not within the scope of the originally awarded contract; or (4) adding or deleting of a major contract item.
<b>10-60</b>	<b>Surety</b>	The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.
<b>10-61</b>	<b>Taxilane</b>	A taxiway designed for low speed movement of aircraft between aircraft parking areas and terminal areas.
<b>10-62</b>	<b>Taxiway</b>	The portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.
<b>10-63</b>	<b>Taxiway/Taxilane Safety Area (TSA)</b>	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft. See the construction safety and phasing plan (CSPP) for limits of the TSA.
<b>10-64</b>	<b>Work</b>	The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.
<b>10-65</b>	<b>Working day</b>	A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

END OF SECTION 10

## Section 20 Proposal Requirements and Conditions

**20-01 Advertisement (Notice to Bidders).** See Advertisement for Bids and Instruction to Bidders of these specifications.

**20-02 Qualification of bidders.** Each bidder shall submit evidence of competency and evidence of financial responsibility to perform the work to the Owner at the time of bid opening.

Evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, and a list of equipment and a list of key personnel that would be available for the work.

Each bidder shall furnish the Owner satisfactory evidence of their financial responsibility. Evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether their financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.

Unless otherwise specified, a bidder may submit evidence that they are prequalified with the State Highway Division and are on the current "bidder's list" of the state in which the proposed work is located. Evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

**Bidders must be pre-qualified for this project in accordance with the City of Manchester Procurement code. Please refer to the Airport's website for additional information regarding pre qualification.**

Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

**20-03 Contents of proposal forms.** The Owner's proposal forms state the location and description of the proposed construction; the place, date, and time of opening of the proposals; and the estimated quantities of the various items of work to be performed and materials to be furnished for which unit bid prices are asked. The proposal form states the time in which the work must be completed, and the amount of the proposal guaranty that must accompany the proposal. The Owner will accept only those Proposals properly executed on physical forms or electronic forms provided by the Owner. Bidder actions that may cause the Owner to deem a proposal irregular are given in paragraph 20-09 *Irregular proposals*.

A prebid conference is required on this project to discuss as a minimum, the following items: material requirements; submittals; Quality Control/Quality Assurance requirements; the construction safety and phasing plan including airport access and staging areas; and unique airfield paving construction requirements. Refer to the Advertisement of Bids for the time, date, and place of the meeting.

**20-04 Issuance of proposal forms.** The Owner reserves the right to refuse to issue a proposal form to a prospective bidder if the bidder is in default for any of the following reasons:

**a.** Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

**b.** Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force

with the Owner at the time the Owner issues the proposal to a prospective bidder.

- c. Documented record of Contractor default under previous contracts with the Owner.
- d. Documented record of unsatisfactory work on previous contracts with the Owner.

**20-05 Interpretation of estimated proposal quantities.** An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as provided in the Section 40, paragraph 40-02, Alteration of Work and Quantities, without in any way invalidating the unit bid prices.

**20-06 Examination of plans, specifications, and site.** The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves to the character, quality, and quantities of work to be performed, materials to be furnished, and to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied to the conditions to be encountered in performing the work and the requirements of the proposed contract, plans, and specifications.

**20-07 Preparation of proposal.** The bidder shall submit their proposal on the forms furnished by the Owner. All blank spaces in the proposal forms, unless explicitly stated otherwise, must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals which they propose for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall correctly sign the proposal in ink. If the proposal is made by an individual, their name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state where the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of their authority to do so and that the signature is binding upon the firm or corporation.

**20-08 Responsive and responsible bidder.** A responsive bid conforms to all significant terms and conditions contained in the Owner's invitation for bid. It is the Owner's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 2 CFR § 200.318(h). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

**20-09 Irregular proposals.** Proposals shall be considered irregular for the following reasons:

- a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.
- b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

- c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.
- d. If the proposal contains unit prices that are obviously unbalanced.
- e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.
- f. If the applicable Disadvantaged Business Enterprise information is incomplete.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

**20-10 Bid guarantee.** Each separate proposal shall be accompanied by a bid bond, certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such bond, check, or collateral, shall be made payable to the Owner.

**20-11 Delivery of proposal.** Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

**20-12 Withdrawal or revision of proposals.** A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner in writing or by email before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

**20-13 Public opening of proposals.** Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

**20-14 Disqualification of bidders.** A bidder shall be considered disqualified for any of the following reasons:

- a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.
- b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.
- c. If the bidder is considered to be in "default" for any reason specified in paragraph 20-04, *Issuance of Proposal Forms*, of this section.

**20-15 Discrepancies and Omissions.** A Bidder who discovers discrepancies or omissions with the project bid documents shall immediately notify the Owner's Engineer of the matter. A bidder that has doubt as to the true meaning of a project requirement may submit to the Owner's Engineer a written request for interpretation no later than the number of days outlined in the Advertisement of Bids prior to bid opening.

Any interpretation of the project bid documents by the Owner's Engineer will be by written addendum issued by the Owner. The Owner will not consider any instructions, clarifications or interpretations of the bidding documents in any manner other than written addendum.

THIS PAGE INTENTIONALLY LEFT BLANK

END OF SECTION 20



## Section 30 Award and Execution of Contract

**30-01 Consideration of proposals.** After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit bid price written in words shall govern. Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in Section 20, paragraph 20-09, *Irregular Proposals*.

b. If the bidder is disqualified for any of the reasons specified Section 20, paragraph 20-14, *Disqualification of Bidders*.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

**30-02 Award of contract.** The award of a contract, if it is to be awarded, shall be made within **One Hundred Eighty (180) calendar days** of the date specified for publicly opening proposals, unless otherwise specified herein.

If the Owner elects to proceed with an award of contract, the Owner will make award to the responsible bidder whose bid, conforming with all the material terms and conditions of the bid documents, is the lowest in price.

**30-03 Cancellation of award.** The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with paragraph 30-07 *Approval of Contract*.

**30-04 Return of proposal guaranty.** All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the paragraph 30-01, *Consideration of Proposals*. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in paragraph 30-05, *Requirements of Contract Bonds*.

**30-05 Requirements of contract bonds.** At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

**30-06 Execution of contract.** The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in paragraph 30-05, *Requirements of Contract Bonds*, of this section, within **fifteen (15) calendar days** from the date mailed or otherwise delivered to the successful bidder.

**30-07 Approval of contract.** Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

**30-08 Failure to execute contract.** Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the period specified in paragraph 30-06, *Execution of Contract*, of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidated damages to the Owner.

END OF SECTION 30

## Section 40 Scope of Work

**40-01 Intent of contract.** The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

**40-02 Alteration of work and quantities.** The Owner reserves the right to make such changes in quantities and work as may be necessary or desirable to complete, in a satisfactory manner, the original intended work. Unless otherwise specified in the Contract, the Owner's Engineer or RPR shall be and is hereby authorized to make, in writing, such in-scope alterations in the work and variation of quantities as may be necessary to complete the work, provided such action does not represent a significant change in the character of the work.

For purpose of this section, a significant change in character of work means: any change that is outside the current contract scope of work; any change (increase or decrease) in the total contract cost by more than 25%; or any change in the total cost of a major contract item by more than 25%.

Work alterations and quantity variances that do not meet the definition of significant change in character of work shall not invalidate the contract nor release the surety. Contractor agrees to accept payment for such work alterations and quantity variances in accordance with Section 90, paragraph 90-03, *Compensation for Altered Quantities*.

Should the value of altered work or quantity variance meet the criteria for significant change in character of work, such altered work and quantity variance shall be covered by a supplemental agreement. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

Supplemental agreements shall be approved by the FAA and shall include all applicable Federal contract provisions for procurement and contracting required under AIP. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds.

**40-03 Omitted items.** The Owner, the Owner's Engineer or the RPR may provide written notice to the Contractor to omit from the work any contract item that does not meet the definition of major contract item. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with Section 90, paragraph 90-04, *Payment for Omitted Items*.

**40-04 Extra work.** Should acceptable completion of the contract require the Contractor to perform an item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, Owner may issue a Change Order to cover the necessary extra work. Change orders for extra work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the RPR's opinion, is necessary for completion of the extra work.

When determined by the RPR to be in the Owner's best interest, the RPR may order the Contractor to proceed with extra work as provided in Section 90, paragraph 90-05, *Payment for Extra Work*. Extra work

that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a supplemental agreement as defined in Section 10, paragraph 10-59, *Supplemental Agreement*.

If extra work is essential to maintaining the project critical path, RPR may order the Contractor to commence the extra work under a Time and Material contract method. Once sufficient detail is available to establish the level of effort necessary for the extra work, the Owner shall initiate a change order or supplemental agreement to cover the extra work.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

All change orders, supplemental agreements, and contract modifications must be reviewed by the FAA.

**40-05 Maintenance of traffic.** It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. The Contractor shall maintain traffic in the manner detailed in the Construction Safety and Phasing Plan (CSPP).

**a.** It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to their own operations and the operations of all subcontractors as specified in Section 80, paragraph 80-04, *Limitation of Operations*. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in Section 70, paragraph 70-15, *Contractor's Responsibility for Utility Service and Facilities of Others*.

**b.** With respect to their own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport in accordance with the construction safety and phasing plan (CSPP) and the safety plan compliance document (SPCD). The Contractor shall also refer to AC 150/5210-5 (latest revision), *Painting, Marking and Lighting of Vehicles Used on an Airport* and AC 150/5370-2 (latest revision), *Operational Safety on Airports During Construction* for applicable standards.

**c.** When the contract requires the maintenance of an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep the road, street, or highway open to all traffic and shall provide maintenance as may be required to accommodate traffic. The Contractor, at their expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (<http://mutcd.fhwa.dot.gov/>), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

**40-06 Removal of existing structures.** All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Resident Project Representative (RPR) shall be notified prior

to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the RPR in accordance with the provisions of the contract.

Except as provided in Section 40, paragraph 40-07, *Rights in and Use of Materials Found in the Work*, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

**40-07 Rights in and use of materials found in the work.** Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be embankment, the Contractor may at their own option either:

- a. Use such material in another contract item, providing such use is approved by the RPR and is in conformance with the contract specifications applicable to such use; or,
- b. Remove such material from the site, upon written approval of the RPR; or
- c. Use such material for the Contractor's own temporary construction on site; or,
- d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the RPR's approval in advance of such use.

Should the RPR approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at their expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the RPR approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of their own exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

**40-08 Final cleanup.** Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of the property Owner.

END OF SECTION 40

THIS PAGE INTENTIONALLY LEFT BLANK

## Section 50 Control of Work

**50-01 Authority of the Resident Project Representative (RPR).** The RPR has final authority regarding the interpretation of project specification requirements. The RPR shall determine acceptability of the quality of materials furnished, method of performance of work performed, and the manner and rate of performance of the work. The RPR does not have the authority to accept work that does not conform to specification requirements.

**50-02 Conformity with plans and specifications.** All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans, or specifications.

If the RPR finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications, but that the portion of the work affected will, in their opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the RPR will advise the Owner of their determination that the affected work be accepted and remain in place. The RPR will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. Changes in the contract price must be covered by contract change order or supplemental agreement as applicable.

If the RPR finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the RPR's written orders.

The term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the RPR's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the RPR's opinion, such compliance is essential to provide an acceptable finished portion of the work.

The term "reasonably close conformity" is also intended to provide the RPR with the authority, after consultation with the Sponsor and FAA, to use sound engineering judgment in their determinations to accept work that is not in strict conformity, but will provide a finished product equal to or better than that required by the requirements of the contract, plans and specifications.

The RPR will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

**50-03 Coordination of contract, plans, and specifications.** The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. If electronic files are provided and used on the project and there is a conflict between the electronic files and hard copy plans, the hard copy plans shall govern. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs

contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the RPR for an interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, Contractor shall immediately notify the Owner or the designated representative in writing requesting their written interpretation and decision.

**50-04 List of Special Provisions.** Special Provisions (as applicable) are included in the Supplemental General Conditions and Special Provision Section of the Contract Documents.

**50-05 Cooperation of Contractor.** The Contractor shall be supplied with **five (5)** hard copies or an electronic PDF of the plans and specifications. The Contractor shall have available on the construction site at all times one hardcopy each of the plans and specifications. Additional hard copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the RPR and their inspectors and with other Contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as their agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the RPR or their authorized representative.

**50-06 Cooperation between Contractors.** The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with their own contract and shall protect and hold harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange their work and shall place and dispose of the materials being used to not interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join their work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

**50-07 Construction layout and stakes.** The Engineer/RPR shall establish necessary horizontal and vertical control. The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor. Contractor is responsible for preserving integrity of horizontal and vertical controls established by Engineer/RPR. In case of negligence on the part of the Contractor or their employees, resulting in the destruction of any horizontal and vertical control, the resulting costs will be deducted as a liquidated damage against the Contractor.

Prior to the start of construction, the Contractor will check all control points for horizontal and vertical accuracy and certify in writing to the RPR that the Contractor concurs with survey control established for the project. All lines, grades and measurements from control points necessary for the proper execution and



control of the work on this project will be provided to the RPR. The Contractor is responsible to establish all layout required for the construction of the project.

Copies of survey notes will be provided to the RPR for each area of construction and for each placement of material as specified to allow the RPR to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. Surveys will be provided to the RPR prior to commencing work items that cover or disturb the survey staking. Survey(s) and notes shall be provided in the following format(s): **AutoCAD, Microsoft Excel and PDF Format.**

Laser, GPS, String line, or other automatic control shall be checked with temporary control as necessary. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

**50-08 Authority and duties of Quality Assurance (QA) inspectors.** QA inspectors shall be authorized to inspect all work done and all material furnished. Such QA inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. QA inspectors are not authorized to revoke, alter, or waive any provision of the contract. QA inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

QA Inspectors are authorized to notify the Contractor or their representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the RPR for a decision.

**50-09 Inspection of the work.** All materials and each part or detail of the work shall be subject to inspection. The RPR shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the RPR requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Provide advance written notice to the RPR of work the Contractor plans to perform each week and each day. Any work done or materials used without written notice and allowing opportunity for inspection by the RPR may be ordered removed and replaced at the Contractor's expense.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

**50-10 Removal of unacceptable and unauthorized work.** All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the RPR as provided in paragraph 50-02, *Conformity with Plans and Specifications*.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of Section 70, paragraph 70-14, *Contractor's Responsibility for Work*.

No removal work made under provision of this paragraph shall be done without lines and grades having been established by the RPR. Work done contrary to the instructions of the RPR, work done beyond the lines shown on the plans or as established by the RPR, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the RPR made under the provisions of this subsection, the RPR will have authority to cause unacceptable work to be remedied or removed and replaced; and unauthorized work to be removed and recover the resulting costs as a liquidated damage against the Contractor.

**50-11 Load restrictions.** The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor, at their own expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel.

**50-12 Maintenance during construction.** The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

**50-13 Failure to maintain the work.** Should the Contractor at any time fail to maintain the work as provided in paragraph 50-12, *Maintenance during Construction*, the RPR shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the RPR's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be recovered as a liquidated damage against the Contractor.

**50-14 Partial acceptance.** If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the RPR to make final inspection of that unit. If the RPR finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the RPR may accept it as being

complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

**50-15 Final acceptance.** Upon due notice from the Contractor of presumptive completion of the entire project, the RPR and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The RPR shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the RPR will notify the Contractor and the Contractor shall correct the unsatisfactory work. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the RPR will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

**50-16 Claims for adjustment and disputes.** If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the RPR in writing of their intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the RPR is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the RPR has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within ten (10) calendar days, submit a written claim to the RPR who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

THIS PAGE INTENTIONALLY LEFT BLANK

## Section 60 Control of Materials

**60-01 Source of supply and quality requirements.** The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish documentation to the RPR as to the origin, composition, and manufacture of all materials to be used in the work. Documentation shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the RPR's option, materials may be approved at the source of supply before delivery. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that meets the requirements of the specifications; and is listed in AC 150/5345-53, *Airport Lighting Equipment Certification Program and Addendum*, that is in effect on the date of advertisement.

**60-02 Samples, tests, and cited specifications.** All materials used in the work shall be inspected, tested, and approved by the RPR before incorporation in the work unless otherwise designated. Any work in which untested materials are used without approval or written permission of the RPR shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the RPR, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests will be made by and at the expense of the Owner in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), federal specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the RPR. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the RPR.

A copy of all Contractor QC test data shall be provided to the RPR daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the RPR showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

All Contractor QC test data may be provided to the RPR in electronic PDF format, in lieu of hard copies.

The Contractor shall employ a Quality Control (QC) testing organization to perform all Contractor required QC tests in accordance with Item C-100 Contractor Quality Control Program (CQCP), as applicable.

**60-03 Certification of compliance/analysis (COC/COA).** The RPR may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's COC stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified. The COA is the manufacturer's COC and includes all applicable test results.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the RPR.

When a material or assembly is specified by “brand name or equal” and the Contractor elects to furnish the specified “or equal,” the Contractor shall be required to furnish the manufacturer’s certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

- a. Conformance to the specified performance, testing, quality or dimensional requirements; and,
- b. Suitability of the material or assembly for the use intended in the contract work.

The RPR shall be the sole judge as to whether the proposed “or equal” is suitable for use in the work.

The RPR reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

**60-04 Plant inspection.** The RPR or their authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the RPR conduct plant inspections, the following conditions shall exist:

- a. The RPR shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.
- b. The RPR shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.
- c. If required by the RPR, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Place office or working space in a convenient location with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The RPR shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

**60-05 Engineer/ Resident Project Representative (RPR) field office.** The Contractor shall provide dedicated space for the use of the engineer, RPR, and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity.

**60-06 Storage of materials.** Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the RPR. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans and/or CSPP, the storage of materials and the location of the Contractor’s plant and parked equipment or vehicles shall be as directed by the RPR. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the RPR a copy of the property Owner’s permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at their expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

**60-07 Unacceptable materials.** Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the RPR.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the RPR has approved its use in the work.

**60-08 Owner furnished materials.** The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

THIS PAGE INTENTIONALLY LEFT BLANK



## **Section 70 Legal Regulations and Responsibility to Public**

**70-01 Laws to be observed.** The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all their officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

**70-02 Permits, licenses, and taxes.** The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

**70-03 Patented devices, materials, and processes.** If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

**70-04 Restoration of surfaces disturbed by others.** The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) must be shown on the plans and is indicated as follows:

**No other major work anticipated within or adjacent to the project location during construction.**

**Runway Incursion Mitigation Project – Schedule A: Taxiways A1 & A2 Hold Line Reconfiguration is anticipated to begin construction during late Summer 2021 or early Fall 2021. Project located at the southerly end of Runway 17-35.**

**Runway Incursion Mitigation Project – Schedules B & C: Taxiway H Reconfiguration to Taxiway K is anticipated to begin construction during Spring 2022. Project located at the northerly end of Runway 17-35.**

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the RPR.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the RPR, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided

for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

**70-05 Federal Participation.** The United States Government has agreed to reimburse the Owner for some portion of the contract costs. The contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator. No requirement of this contract shall be construed as making the United States a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

**70-06 Sanitary, health, and safety provisions.** The Contractor's worksite and facilities shall comply with applicable federal, state, and local requirements for health, safety and sanitary provisions.

**70-07 Public convenience and safety.** The Contractor shall control their operations and those of their subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to their own operations and those of their own subcontractors and all suppliers in accordance with Section 40, paragraph 40-05, *Maintenance of Traffic*, and shall limit such operations for the convenience and safety of the traveling public as specified in Section 80, paragraph 80-04, *Limitation of Operations*.

The Contractor shall remove or control debris and rubbish resulting from its work operations at frequent intervals, and upon the order of the RPR. If the RPR determines the existence of Contractor debris in the work site represents a hazard to airport operations and the Contractor is unable to respond in a prompt and reasonable manner, the RPR reserves the right to assign the task of debris removal to a third party and recover the resulting costs as a liquidated damage against the Contractor.

**70-08 Construction Safety and Phasing Plan (CSPP).** The Contractor shall complete the work in accordance with the approved Construction Safety and Phasing Plan (CSPP) developed in accordance with AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP is on the CS sheet(s) of the project plans and in the narrative located within the specifications.

**70-09 Use of explosives.** The use of explosives is not permitted on this project.

**70-10 Protection and restoration of property and landscape.** The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer/RPR has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at their expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

**70-11 Responsibility for damage claims.** The Contractor shall indemnify and hold harmless the

Engineer/RPR and the Owner and their officers, agents, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of their own contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, their own surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

**70-12 Third party beneficiary clause.** It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third-party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

**70-13 Opening sections of the work to traffic.** If it is necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work must be specified below and indicated on the approved Construction Safety and Phasing Plan (CSPP) and the project plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified.

**REFER TO THE INDIVIDUAL CSPP PLANS (TAXIWAYS A1 & A2 HOLD LINE RECONFIGURATION FOR SCHEDULE A AND TAXIWAY H RECONFIGURATION TO TAXIWAY K FOR SCHEDULES B & C) FOR THE SCHEDULE OF WORK FOR ALL PROJECT PHASING AND ALLOWED TIME FOR EACH PHASE.**

Upon completion of any portion of work listed above, such portion shall be accepted by the Owner in accordance with Section 50, paragraph 50-14, *Partial Acceptance*.

No portion of the work may be opened by the Contractor until directed by the Owner in writing. Should it become necessary to open a portion of the work to traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the RPR, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at their expense.

The Contractor shall make their own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

The Contractor must conform to safety standards contained AC 150/5370-2 and the approved CSPP.

Contractor shall refer to the plans, specifications, and the approved CSPP to identify barricade requirements, temporary and/or permanent markings, airfield lighting, guidance signs and other safety requirements prior to opening up sections of work to traffic.

**70-14 Contractor's responsibility for work.** Until the RPR's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with Section 50,

paragraph 50-14, *Partial Acceptance*, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at their own expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

**70-15 Contractor's responsibility for utility service and facilities of others.** As provided in paragraph 70-04, *Restoration of Surfaces Disturbed by Others*, the Contractor shall cooperate with the owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and/or in the contract documents.

**REFER TO THE PROJECT PLANS FOR ANY KNOWN UTILITY SERVICE LOCATIONS WITHIN THE PROJECT LIMITS AND ASSOCIATED CONTACT INFORMATION.**

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of their plan of operations. Such notification shall be in writing addressed to "The Person to Contact" as provided in this paragraph and paragraph 70-04, *Restoration of Surfaces Disturbed By Others*. A copy of each notification shall be given to the RPR.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's "Person to Contact" no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the RPR.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the RPR and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the RPR continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or their own surety.

**70-15.1 FAA facilities and cable runs.** The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

**a.** The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

**b.** The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport Owner a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

**c.** If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

**d.** Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

**e.** If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

**70-16 Furnishing rights-of-way.** The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

**70-17 Personal liability of public officials.** In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, RPR, their authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

**70-18 No waiver of legal rights.** Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after

completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or their surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill their obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

**70-19 Environmental protection.** The Contractor shall comply with all federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, asphalts, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

**70-20 Archaeological and historical findings.** Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during their operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the RPR. The RPR will immediately investigate the Contractor's finding and the Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in Section 40, paragraph 40-04, *Extra Work*, and Section 90, paragraph 90-05, *Payment for Extra Work*. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with Section 80, paragraph 80-07, *Determination and Extension of Contract Time*.

**70-21 Insurance Requirements.** Refer to the Project Contract Agreement for the insurance requirements.

END OF SECTION 70

## Section 80 Execution and Progress

**80-01 Subletting of contract.** The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Resident Project Representative (RPR).

The Contractor shall perform, with his organization, an amount of work equal to at least **twenty-five percent (25%)** of the total contract cost.

Should the Contractor elect to assign their contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

**The Contractor shall provide copies of all subcontracts to the RPR fourteen (14) days prior to being utilized on the project. As a minimum, the information shall include the following:**

- Subcontractor's legal company name.
- Subcontractor's legal company address, including County name.
- Principal contact person's name, telephone and fax number.
- Complete narrative description, and dollar value of the work to be performed by the subcontractor.
- Copies of required insurance certificates in accordance with the specifications.
- Minority/ non-minority status.

**80-02 Notice to proceed (NTP).** The Owners notice to proceed will state the date on which contract time commences. The Contractor is expected to commence project operations within **ten (10) days** of the NTP date. The Contractor shall notify the RPR at least **twenty-four (24) hours** in advance of the time contract operations begins. The Contractor shall not commence any actual operations prior to the date on which the notice to proceed is issued by the Owner.

**80-03 Execution and progress.** Unless otherwise specified, the Contractor shall submit their coordinated construction schedule showing all work activities for the RPR's review and acceptance at least **ten (10) days** prior to the start of work. The Contractor's progress schedule, once accepted by the RPR, will represent the Contractor's baseline plan to accomplish the project in accordance with the terms and conditions of the Contract. The RPR will compare actual Contractor progress against the baseline schedule to determine that status of the Contractor's performance. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the RPR's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the RPR at least **twenty-four (24) hours** in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the NTP is issued by the Owner.

The project schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified. It shall include information on the sequence of work activities, milestone dates, and activity duration. The schedule shall

show all work items identified in the project proposal for each work area and shall include the project start date and end date.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a **twice** monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

**80-04 Limitation of operations.** The Contractor shall control their operations and the operations of their subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct their operations within an AOA of the airport, the work shall be coordinated with airport operations (through the RPR) at least **forty-eight (48) hours** prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the RPR and until the necessary temporary marking, signage and associated lighting is in place as provided in Section 70, paragraph 70-08, *Construction Safety and Phasing Plan (CSPP)*.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; and immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until satisfactory conditions are provided. The areas of the AOA identified in the Construction Safety Phasing Plan (CSPP) and as listed below, cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

**REFER TO THE PROJECT PLANS FOR THE CSPP AND THE OPERATIONS IMPACTS.**

The Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction and the approved CSPP.

**80-04.1 Operational safety on airport during construction.** All Contractors' operations shall be conducted in accordance with the approved project Construction Safety and Phasing Plan (CSPP) and the Safety Plan Compliance Document (SPCD) and the provisions set forth within the current version of AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a SPCD that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and SPCD and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP and SPCD unless approved in writing by the Owner. The necessary coordination actions to review Contractor proposed modifications to an approved CSPP or approved SPCD can require a significant amount of time. The Owner shall coordinate any changes with the FAA.

**80-05 Character of workers, methods, and equipment.** The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.



All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the RPR, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the RPR, be removed immediately by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the RPR.

Should the Contractor fail to remove such person or persons, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the RPR may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall not cause injury to previously completed work, adjacent property, or existing airport facilities due to its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless otherwise authorized by the RPR. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the RPR to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the RPR determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the RPR may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this paragraph.

**80-06 Temporary suspension of the work.** The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods the Owner may deem necessary, due to unsuitable weather, or other conditions considered unfavorable for the execution of the work, or for such time necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the written order to suspend work to the effective date of the written order to resume the work. Claims for such compensation shall be filed with the RPR within the time period stated in the RPR's order to resume work. The Contractor shall submit with their own claim information substantiating the amount shown on the claim. The RPR will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather or for any other delay provided for in the contract, plans, or specifications.

If it becomes necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

**80-07 Determination and extension of contract time.** The **number of calendar days** shall be stated in the proposal and contract and shall be known as the Contract Time.

If the contract time requires extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

**80-07.1 Contract time based on calendar days.** Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

**80-08 Failure to complete on time.** For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in paragraph 80-07, *Determination and Extension of Contract Time*) the sum specified in the contract and proposal as liquidated damages (LD) will be deducted from any money due or to become due the Contractor or their own surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

**REFER TO THE INFORMATION TO BIDDERS, BID PROPOSAL SUMMARY, AND AGREEMENT OF THE CONTRACT DOCUMENTS FOR THE LIQUIDATED DAMAGES AND ALLOWED CONSTRUCTION TIME.**

The maximum construction time allowed for the Project will be the sum of the time allowed for individual phase schedules as outlined in the CSPP but not more than the overall calendar days allowed. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the contract.

**80-09 Default and termination of contract.** The Contractor shall be considered in default of their contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons, if the Contractor:

- a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or
- b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or
- c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such

work as may be rejected as unacceptable and unsuitable, or

**d.** Discontinues the execution of the work, or

**e.** Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

**f.** Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

**g.** Allows any final judgment to stand against the Contractor unsatisfied for a period of ten (10) days,  
or

**h.** Makes an assignment for the benefit of creditors, or

**i.** For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Owner consider the Contractor in default of the contract for any reason above, the Owner shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of ten (10) days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the RPR of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the RPR will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

**80-10 Termination for national emergencies.** The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the RPR.

Termination of the contract or a portion thereof shall neither relieve the Contractor of their responsibilities for the completed work nor shall it relieve their surety of its obligation for and concerning any just claim arising out of the work performed.

**80-11 Work area, storage area and sequence of operations.** The Contractor shall obtain approval from the RPR prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall

plan and coordinate work in accordance with the approved CSPP and SPCD.

END OF SECTION 80

## Section 90 Measurement and Payment

**90-01 Measurement of quantities.** All work completed under the contract will be measured by the RPR, or their authorized representatives, using United States Customary Units of Measurement.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the RPR.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract. When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When requested by the Contractor and approved by the RPR in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the RPR and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

### Measurement and Payment Terms

Term	Description
<b>Excavation and Embankment Volume</b>	In computing volumes of excavation, the average end area method will be used unless otherwise specified.
<b>Measurement and Proportion by Weight</b>	The term "ton" will mean the short ton consisting of 2,000 pounds (907 kg) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, independently certified scales by competent, qualified personnel at locations designated by the RPR. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the RPR directs, and each truck shall bear a plainly legible identification mark.
<b>Measurement by Volume</b>	Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.
<b>Asphalt Material</b>	Asphalt materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be

<b>Term</b>	<b>Description</b>
	corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts. Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when asphalt material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, will be used for computing quantities.
<b>Cement</b>	Cement will be measured by the ton (kg) or hundredweight (km).
<b>Structure</b>	Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
<b>Timber</b>	Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.
<b>Plates and Sheets</b>	The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.
<b>Miscellaneous Items</b>	When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.
<b>Scales</b>	<p>Scales must be tested for accuracy and serviced before use. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end. Scales shall be accurate within 0.5% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the RPR before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed 0.1% of the nominal rated capacity of the scale, but not less than one pound (454 grams). The use of spring balances will not be permitted.</p> <p>In the event inspection reveals the scales have been “overweighing” (indicating more than correct weight) they will be immediately adjusted. All materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of 0.5%.</p> <p>In the event inspection reveals the scales have been under-weighing (indicating less than correct weight), they shall be immediately adjusted. No additional payment to the Contractor will be allowed for materials previously weighed and recorded.</p> <p>Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the RPR can safely and conveniently view them.</p> <p>Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.</p> <p>All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other</p>

Term	Description
	items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.
<b>Rental Equipment</b>	Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered in connection with extra work will be measured as agreed in the change order or supplemental agreement authorizing such work as provided in paragraph 90-05 <i>Payment for Extra Work</i> .
<b>Pay Quantities</b>	When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the RPR. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

**90-02 Scope of payment.** The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of Section 70, paragraph 70-18, *No Waiver of Legal Rights*.

When the “basis of payment” subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

**90-03 Compensation for altered quantities.** When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in Section 40, paragraph 40-02, *Alteration of Work and Quantities*, will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from their own unbalanced allocation of overhead and profit among the contract items, or from any other cause.

**90-04 Payment for omitted items.** As specified in Section 40, paragraph 40-03, *Omitted Items*, the RPR shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the RPR omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the RPR’s order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the RPR’s order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the RPR’s order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

**90-05 Payment for extra work.** Extra work, performed in accordance with Section 40, paragraph 40-04, *Extra Work*, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

**90-06 Partial payments.** Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the RPR, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with paragraph 90-07, *Payment for Materials on Hand*. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

**a.** From the total of the amount determined to be payable on a partial payment, **ten percent (10%)** of such total amount will be deducted and retained by the Owner for protection of the Owner's interests. Unless otherwise instructed by the Owner, the amount retained by the Owner will be in effect until the final payment is made except as follows:

(1) Contractor may request release of retainage on work that has been partially accepted by the Owner in accordance with Section 50-14. Contractor must provide a certified invoice to the RPR that supports the value of retainage held by the Owner for partially accepted work.

(2) In lieu of retainage, the Contractor may exercise at its option the establishment of an escrow account per paragraph 90-08.

**b.** The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than thirty (30) days after the Contractor has received a partial payment. Contractor must provide the Owner evidence of prompt and full payment of retainage held by the prime Contractor to the subcontractor within thirty (30) days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

**c.** When at least ninety-five percent (95%) of the work has been completed to the satisfaction of the RPR, the RPR shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done. The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the RPR to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in paragraph 90-09, *Acceptance and Final Payment*.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

**90-07 Payment for materials on hand.** Partial payments may be made to the extent of the delivered cost



of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

**a.** The material has been stored or stockpiled in a manner acceptable to the RPR at or on an approved site.

**b.** The Contractor has furnished the RPR with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

**c.** The Contractor has furnished the RPR with satisfactory evidence that the material and transportation costs have been paid.

**d.** The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material stored or stockpiled.

**e.** The Contractor has furnished the Owner evidence that the material stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of their responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this paragraph.

**90-08 Payment of withheld funds.** At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in paragraph 90-06 *Partial Payments*, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

**a.** The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

**b.** The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

**c.** The Contractor shall enter into an escrow agreement satisfactory to the Owner.

**d.** The Contractor shall obtain the written consent of the surety to such agreement.

**90-09 Acceptance and final payment.** When the contract work has been accepted in accordance with the requirements of Section 50, paragraph 50-15, *Final Acceptance*, the RPR will prepare the final estimate of the items of work actually performed. The Contractor shall approve the RPR's final estimate or advise the RPR of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the RPR shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within thirty (30) calendar days of the Contractor's receipt of the RPR's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the RPR's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with Section 50, paragraph 50-16, *Claims for Adjustment and*

### *Disputes.*

After the Contractor has approved, or approved under protest, the RPR's final estimate, and after the RPR's receipt of the project closeout documentation required in paragraph 90-11, *Contractor Final Project Documentation*, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of Section 50, paragraph 50-16, *Claims for Adjustments and Disputes*, or under the provisions of this paragraph, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

### **90-10 Construction warranty.**

**a.** In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

**b.** This warranty shall continue for a period of one (1) year from the date of final acceptance of the work, except as noted. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one (1) year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work. Light Emitting Diode emitting diode (LED) light fixtures with the exception of obstruction lighting, must be warranted by the manufacturer for a minimum of four (4) years after date of installation inclusive of all electronics.

**c.** The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements; or any defect of equipment, material, workmanship, or design furnished by the Contractor.

**d.** The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

**e.** The Owner will notify the Contractor, in writing, within seven (7) days after the discovery of any failure, defect, or damage.

**f.** If the Contractor fails to remedy any failure, defect, or damage within fourteen (14) days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

**g.** With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

**h.** This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

### **90-11 Contractor Final Project Documentation.** Approval of final payment to the Contractor is

contingent upon completion and submittal of the items listed below. The final payment will not be approved until the RPR approves the Contractor's final submittal. The Contractor shall:

- a.** Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.
- b.** Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.
- c.** Complete final cleanup in accordance with Section 40, paragraph 40-08, *Final Cleanup*.
- d.** Complete all punch list items identified during the Final Inspection.
- e.** Provide complete release of all claims for labor and material arising out of the Contract.
- f.** Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.
- g.** When applicable per state requirements, return copies of sales tax completion forms.
- h.** Manufacturer's certifications for all items incorporated in the work.
- i.** All required record drawings, as-built drawings or as-constructed drawings.
- j.** Project Operation and Maintenance (O&M) Manual(s).
- k.** Security for Construction Warranty.
- l.** Equipment commissioning documentation submitted, if required.

END OF SECTION 90

THIS PAGE INTENTIONALLY LEFT BLANK



**FAA  
Airports**

## **Contract Provision Guidelines for Obligated Sponsors and Airport Improvement Program Projects**

### **Contents**

ACCESS TO RECORDS AND REPORTS .....	2
AFFIRMATIVE ACTION REQUIREMENT .....	3
BREACH OF CONTRACT TERMS .....	4
BUY AMERICAN PREFERENCE.....	5
CIVIL RIGHTS - GENERAL.....	7
CIVIL RIGHTS – TITLE VI ASSURANCES .....	7
CLEAN AIR AND WATER POLLUTION CONTROL .....	10
CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS .....	11
COPELAND “ANTI-KICKBACK” ACT .....	12
DAVIS-BACON REQUIREMENTS .....	13
DEBARMENT AND SUSPENSION.....	19
DISADVANTAGED BUSINESS ENTERPRISE.....	20
DISTRACTED DRIVING.....	21
ENERGY CONSERVATION REQUIREMENTS.....	22
EQUAL EMPLOYMENT OPPORTUNITY (EEO).....	23
FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE) .....	29
LOBBYING AND INFLUENCING FEDERAL EMPLOYEES .....	30
PROHIBITION OF SEGREGATED FACILITIES.....	31
OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970.....	32
PROCUREMENT OF RECOVERED MATERIALS .....	33
TAX DELINQUENCY AND FELONY CONVICTIONS .....	34
TERMINATION OF CONTRACT .....	35
TRADE RESTRICTION CERTIFICATION .....	37
VETERAN’S PREFERENCE .....	39

**ACCESS TO RECORDS AND REPORTS**  
**(2 CFR § 200.333, 2 CFR § 200.336, FAA Order 5100.38)**

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Owner, the Federal Aviation Administration and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION to  
ENSURE EQUAL EMPLOYMENT OPPORTUNITY  
(41 CFR part 60-4, Executive Order 11246)**

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

**Timetables**

Goals for minority participation for each trade ( <a href="#">Hillsborough County</a> ):	<b>0.7%</b>
Goals for minority participation for each trade ( <a href="#">Rockingham County</a> ):	<b>4.0%</b>
Goals for female participation in each trade:	6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area; including but not limited to pits, quarries, etc.; they shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is [State of New Hampshire, Rockingham County, Town of Londonderry AND State of New Hampshire, Hillsborough County, City of Manchester](#).

**BREACH OF CONTRACT TERMS**  
**(2 CFR § 200 Appendix II(A))**

Any violation or breach of terms of this contract on the part of the **Contractor** or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Owner will provide **Contractor** written notice that describes the nature of the breach and corrective actions the **Contractor** must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the **Contractor** must correct the breach. Owner may proceed with termination of the contract if the **Contractor** fails to correct the breach by the deadline indicated in the Owner's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.



**BUY AMERICAN PREFERENCE**  
**(Title 49 USC § 50101)**

The Contractor agrees to comply with 49 USC § 50101, which provides that Federal funds may not be obligated unless all steel and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

**Certificate of Buy American Compliance for Manufactured Products**

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with their proposal. The bidder or offeror must indicate how they intend to comply with 49 USC § 50101 by selecting one on the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (not both) by inserting a checkmark (✓) or the letter “X”.

- ☐ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:
- a) Only installing steel and manufactured products produced in the United States;
  - b) Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or
  - c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

1. To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
2. To faithfully comply with providing U.S. domestic product.
3. To furnish U.S. domestic product for any waiver request that the FAA rejects
4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

- ☐ The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:

1. To the submit to the Owner within 15 calendar days of the bid opening, a formal waiver request and required documentation that supports the type of waiver being requested.
2. That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination may result in rejection of the proposal.
3. To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.
4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

## Required Documentation

**Type 3 Waiver** – The cost of the item components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the “item”. The required documentation for a Type 3 waiver is:

- a) Listing of all product components and subcomponents that are not comprised of 100 percent U.S. domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
- b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture.
- c) Percentage of non-domestic component and subcomponent cost as compared to total “item” component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

**Type 4 Waiver** – Total cost of project using U.S. domestic source product exceeds the total project cost using non-domestic product by 25 percent. The required documentation for a Type 4 of waiver is:

- a) Detailed cost information for total project using U.S. domestic product
- b) Detailed cost information for total project using non-domestic product

**False Statements:** Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

---

Date

---

Signature

---

Company Name

---

Title

**GENERAL CIVIL RIGHTS PROVISIONS**  
**(49 USC § 47123)**

The Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

**GENERAL CIVIL RIGHTS – TITLE VI ASSURANCES**  
**(49 USC § 47123, FAA Order 1400.11)**

**Title VI Solicitation Notice:**

The City of Manchester - Department of Aviation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

**Title VI Contract Clauses for Compliance with Nondiscrimination Requirements**

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “Contractor”), agrees as follows:

1. **Compliance with Regulations:** The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
3. **Solicitations for Subcontracts, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor’s obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.

4. **Information and Reports:** The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
  - a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or
  - b. Cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions:** The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

#### **Title VI List of Pertinent Nondiscrimination Acts and Authorities**

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended (42 USC § 6101 *et seq.*) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);

- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 USC §§ 12131 – 12189) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration’s Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC 1681 et seq).

**CLEAN AIR AND WATER POLLUTION CONTROL**  
**(2 CFR § 200, Appendix II(G))**

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 USC § 740-7671q) and the Federal Water Pollution Control Act as amended (33 USC § 1251-1387). The Contractor agrees to report any violation to the Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceeds \$150,000.

**CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS**  
**(2 CFR § 200, Appendix II(E))**

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

**COPELAND “ANTI-KICKBACK” ACT**  
**(2 CFR § 200, Appendix II(D), 29 CFR Parts 3 and 5)**

Contractor must comply with the requirements of the Copeland “Anti-Kickback” Act (18 USC 874 and 40 USC 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.



**DAVIS-BACON REQUIREMENTS**  
**(2 CFR § 200, Appendix II(D), 29 CFR Part 5)**

1. Minimum Wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized

representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: *Provided* that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

## 2. Withholding.

The Federal Aviation Administration or the sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

## 3. Payrolls and Basic Records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or

costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and that show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (*e.g.* the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at [www.dol.gov/whd/forms/wh347instr.htm](http://www.dol.gov/whd/forms/wh347instr.htm) or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) The payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i), and that such information is correct and complete;

(2) Each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) Each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the sponsor, the Federal Aviation Administration, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, Sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### 4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that

determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

#### 5. Compliance with Copeland Act Requirements.

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

#### 6. Subcontracts.

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

#### 7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

#### 8. Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 USC 1001.

**CERTIFICATION OF OFFERER/BIDDER REGARDING DEBARMENT**  
**(2 CFR part 180 (Subpart C), 2 CFR part 1200, DOT Order 4200.5)**

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

**CERTIFICATION OF LOWER TIER CONTRACTORS REGARDING DEBARMENT**  
**(2 CFR part 180 (Subpart C), 2 CFR part 1200, DOT Order 4200.5)**

The successful bidder, by administering each lower tier subcontract that exceeds \$25,000 as a “covered transaction”, must verify each lower tier participant of a “covered transaction” under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: <http://www.sam.gov>.
2. Collecting a certification statement similar to the Certification of Offerer /Bidder Regarding Debarment, above.
3. Inserting a clause or condition in the covered transaction with the lower tier contract.

If the Federal Aviation Administration later determines that a lower tier participant failed to disclose to a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

**DISADVANTAGED BUSINESS ENTERPRISES**  
**(49 CFR part 26)**

**SOLICITATION PROVISION**

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

As a condition of bid responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

- 1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
- 2) A description of the work that each DBE firm will perform;
- 3) The dollar amount of the participation of each DBE firm listed under (1)
- 4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal; and
- 5) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

**PRIME CONTRACT PROVISIONS**

**Contract Assurance (§ 26.13) –**

The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of Department of Transportation-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Owner deems appropriate, which may include, but is not limited to:

- 1) Withholding monthly progress payments;
- 2) Assessing sanctions;
- 3) Liquidated damages; and/or
- 4) Disqualifying the Contractor from future bidding as non-responsible.

**Prompt Payment (§26.29) –** The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than **fifteen (15)** days from the receipt of each payment the prime contractor receives from the Owner. The prime contractor agrees further to return retainage payments to each subcontractor within **fifteen (15)** days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Owner. This clause applies to both DBE and non-DBE subcontractors.



**DISTRACTED DRIVING**  
**(Executive Order 13513, DOT Order 3902.10)**

**TEXTING WHEN DRIVING**

In accordance with Executive Order 13513, “Federal Leadership on Reducing Text Messaging While Driving”, (10/1/2009) and DOT Order 3902.10, “Text Messaging While Driving”, (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding \$3,500 that involve driving a motor vehicle in performance of work activities associated with the project.

**ENERGY CONSERVATION REQUIREMENTS**  
**(2 CFR § 200, Appendix II(H))**

Contractor and Subcontractor agree to comply with mandatory standards and policies relating to energy efficiency as contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 USC 6201*et seq.*).

**EQUAL OPPORTUNITY CLAUSE**  
**(2 CFR 200, Appendix II(C), 41 CFR § 60-1.4, 41 CFR § 60-4.3, Executive Order 11246)**

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identify, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff, or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

*Provided, however,* that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

## **STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS**

1. As used in these specifications:

- a. “Covered area” means the geographical area described in the solicitation from which this contract resulted;
- b. “Director” means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;
- c. “Employer identification number” means the Federal social security number used on the Employer’s Quarterly Federal Tax Return, U.S. Treasury Department Form 941;
- d. “Minority” includes:
  - (1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
  - (2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);
  - (3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
  - (4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR part 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor’s or subcontractor’s failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the Contractor during the training period and the Contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

- b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

- c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or female sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions, including specific review of these items, with onsite supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other contractors and subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the Contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally), the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these

specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR part 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).



**FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)**  
**(29 USC § 201, et seq)**

**SOLICITATION CLAUSE**

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.

The ***Contractor*** has full responsibility to monitor compliance to the referenced statute or regulation. The ***Contractor*** must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

**CERTIFICATION REGARDING LOBBYING**  
**(31 USC § 1352 – Byrd Anti-Lobbying Amendment, 2 CFR part 200, Appendix II(J),**  
**49 CFR part 20, Appendix A)**

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

**PROHIBITION OF SEGREGATED FACILITIES**  
**(41 CFR § 60)**

(a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Employment Opportunity clause in this contract.

(b) “Segregated facilities,” as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Employment Opportunity clause of this contract.

**OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970**  
**(29 CFR part 1910)**

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The ***Contractor*** must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The ***Contractor*** retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). The ***Contractor*** must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

**PROCUREMENT OF RECOVERED MATERIALS**  
**(2 CFR § 200.322, 40 CFR part 247, Solid Waste Act)**

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

- 1) The contract requires procurement of \$10,000 or more of a designated item during the fiscal year;  
or
- 2) The Contractor has procured \$10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at [www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products](http://www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products).

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

- a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
- b) Fails to meet reasonable contract performance requirements; or
- c) Is only available at an unreasonable price.

**CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY  
AND FELONY CONVICTIONS**  
**(Sections 415 and 416 of Title IV, Division L of the Consolidated Appropriations Act, 2014,  
DOT Order 4200.6)**

The applicant must complete the following two certification statements. The applicant must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark (✓) in the space following the applicable response. The applicant agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

**Certifications**

- 1) The applicant represents that it is ( ✓ ) is not ( ✓ ) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.
- 2) The applicant represents that it is ( ✓ ) is not ( ✓ ) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

**Note**

If an applicant responds in the affirmative to either of the above representations, the applicant is ineligible to receive an award unless the sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must provide information to the owner about its tax liability or conviction to the Owner, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

**Term Definitions**

**Felony conviction:** Felony conviction means a conviction within the preceding twenty-four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

**Tax Delinquency:** A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

## **TERMINATION OF CONTRACT**

### **TERMINATION FOR CONVENIENCE (CONSTRUCTION & EQUIPMENT CONTRACTS) (2 CFR § 200 Appendix II(B))**

The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

1. Contractor must immediately discontinue work as specified in the written notice.
2. Terminate all subcontracts to the extent they relate to the work terminated under the notice.
3. Discontinue orders for materials and services except as directed by the written notice.
4. Deliver to the Owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work, and as directed in the written notice.
5. Complete performance of the work not terminated by the notice.
6. Take action as directed by the Owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

- 1) completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
- 2) documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
- 3) reasonable and substantiated claims, costs, and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
- 4) reasonable and substantiated expenses to the Contractor directly attributable to Owner's termination action.

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

### **TERMINATION FOR DEFAULT (CONSTRUCTION) (FAA Advisory Circular 150/5370-10, Section 80-09)**

Section 80-09 of FAA Advisory Circular 150/5370-10 establishes conditions, rights, and remedies associated with Owner termination of this contract due to default of the Contractor.

**TERMINATION FOR DEFAULT (EQUIPMENT)**  
**(2 CFR § 200 Appendix II(B))**

The Owner may, by written notice of default to the Contractor, terminate all or part of this Contract if the Contractor:

1. Fails to commence the Work under the Contract within the time specified in the Notice- to-Proceed;
2. Fails to make adequate progress as to endanger performance of this Contract in accordance with its terms;
3. Fails to make delivery of the equipment within the time specified in the Contract, including any Owner approved extensions;
4. Fails to comply with material provisions of the Contract;
5. Submits certifications made under the Contract and as part of their proposal that include false or fraudulent statements; or
6. Becomes insolvent or declares bankruptcy.

If one or more of the stated events occur, the Owner will give notice in writing to the Contractor and Surety of its intent to terminate the contract for cause. At the Owner's discretion, the notice may allow the Contractor and Surety an opportunity to cure the breach or default.

If within ten (10) days of the receipt of notice, the Contractor or Surety fails to remedy the breach or default to the satisfaction of the Owner, the Owner has authority to acquire equipment by other procurement action. The Contractor will be liable to the Owner for any excess costs the Owner incurs for acquiring such similar equipment.

Payment for completed equipment delivered to and accepted by the Owner shall be at the Contract price. The Owner may withhold from amounts otherwise due the Contractor for such completed equipment, such sum as the Owner determines to be necessary to protect the Owner against loss because of Contractor default.

Owner will not terminate the Contractor's right to proceed with the Work under this clause if the delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such acceptable causes include: acts of God, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, and severe weather events that substantially exceed normal conditions for the location.

If, after termination of the Contractor's right to proceed, the Owner determines that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the Owner issued the termination for the convenience the Owner.

The rights and remedies of the Owner in this clause are in addition to any other rights and remedies provided by law or under this contract.



**TRADE RESTRICTION CERTIFICATION**  
**(49 USC § 50104, 49 CFR part 30)**

**SOLICITATION CLAUSE**

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –

- 1) is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);
- 2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and
- 3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC Section 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to an Offeror or subcontractor:

- 1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR or
- 2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list or
- 3) who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

**VETERAN'S PREFERENCE**  
**(49 USC § 47112(c))**

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 USC 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

THIS PAGE INTENTIONALLY LEFT BLANK

**DAVIS-BACON WAGE SCHEDULE**  
**SCHEDULE A – TAXIWAYS ‘A1’ & ‘A2’ HOLD LINE RECONFIGURATION**

**STATE OF NEW HAMPSHIRE**  
**ROCKINGHAM COUNTY – HIGHWAY**  
**NH20210013 01/01/2021**

THIS PAGE INTENTIONALLY LEFT BLANK

**General Decision Number: NH20210013 01/01/2021**  
Superseded General Decision Number: NH20200013

State: **New Hampshire**

Construction Type: **Highway**

County: **Rockingham County in New Hampshire.**

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/01/2021

\* SUNH2011-029 08/15/2011

	Rates	Fringes
CARPENTER (Excluding Form Work) .....	\$ 23.13	2.51
CARPENTER (Form Work Only) .....	\$ 20.57	1.06
ELECTRICIAN .....	\$ 23.22	2.78
INSTALLER – GUARDRAIL .....	\$ 22.29	11.84
IRONWORKER, REINFORCING.....	\$ 18.00	0.00
IRONWORKER, STRUCTURAL .....	\$ 34.45	17.20
LABORER: Blaster Rock .....	\$ 28.38	9.46
LABORER: Common or General .....	\$ 16.99	2.60
LABORER: Flagger.....	\$ 10.42	1.37
LABORER: Highway/Parking Lot Striping .....	\$ 16.77	0.00

LABORER: Landscape.....	\$ 14.65	0.00
LABORER: Pipelayer.....	\$ 18.29	4.33
OPERATOR: Auger .....	\$ 26.07	0.00
OPERATOR: Backhoe .....	\$ 27.72	4.17
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 19.25	0.00
OPERATOR: Bucket .....	\$ 30.00	0.00
OPERATOR: Bulldozer.....	\$ 24.59	6.11
OPERATOR: Crane.....	\$ 23.95	3.29
OPERATOR: Drill Rig Caissons .....	\$ 36.86	19.78
OPERATOR: Excavator .....	\$ 24.72	5.58
OPERATOR: Grader/Blade.....	\$ 25.16	6.97
OPERATOR: Loader .....	\$ 24.10	5.72
OPERATOR: Mechanic.....	\$ 16.92	3.44
OPERATOR: Oiler .....	\$ 29.54	16.15
OPERATOR: Paver (Asphalt, Aggregate, and Concrete) .....	\$ 23.43	0.00
OPERATOR: Roller. ....	\$ 22.27	6.57
OPERATOR: Post Driver/Pounder.....	\$ 27.24	7.90
TRUCK DRIVER, Includes all axles including Dump Trucks (Excludes Low Bed Trucks) .....	\$ 17.59	2.99
TRUCK DRIVER: Low Bed Truck.....	\$ 21.43	6.30

=====

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting



from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

-----  
The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data.

EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

-----  
WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====  
END OF GENERAL DECISION"

**DAVIS-BACON WAGE SCHEDULE**

**STATE OF NEW HAMPSHIRE  
HILLSBOROUGH COUNTY – HIGHWAY  
NH20210012 01/01/2021**

THIS PAGE INTENTIONALLY LEFT BLANK

**General Decision Number: NH20200012 01/01/2021**  
Superseded General Decision Number: NH20200012

State: **New Hampshire**

Construction Type: **Highway**

County: **Hillsborough County in New Hampshire.**

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/01/2021

\* SUNH2011-029 08/15/2011

	Rates	Fringes
CARPENTER (Excluding Form Work) .....	\$ 24.27	1.06
CARPENTER (Form Work Only) .....	\$ 19.93	1.06
ELECTRICIAN .....	\$ 23.22	2.78
INSTALLER – GUARDRAIL .....	\$ 20.50	6.30
IRONWORKER, REINFORCING.....	\$ 20.18	0.00
IRONWORKER, STRUCTURAL .....	\$ 34.45	17.20
LABORER: Blaster Rock .....	\$ 29.50	11.21
LABORER: Common or General .....	\$ 16.99	2.60
LABORER: Flagger.....	\$ 11.79	1.37
LABORER: Highway/Parking Lot Striping .....	\$ 17.95	0.00

LABORER: Landscape.....	\$ 14.40	0.00
LABORER: Pipelayer.....	\$ 17.63	2.72
OPERATOR: Auger .....	\$ 26.07	0.00
OPERATOR: Backhoe .....	\$ 27.05	7.95
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 19.25	0.00
OPERATOR: Bucket .....	\$ 25.19	0.00
OPERATOR: Bulldozer.....	\$ 25.39	5.09
OPERATOR: Crane.....	\$ 23.37	2.21
OPERATOR: Drill Rig Caissons .....	\$ 33.46	19.78
OPERATOR: Excavator .....	\$ 24.98	6.56
OPERATOR: Grader/Blade.....	\$ 25.75	6.00
OPERATOR: Loader .....	\$ 25.40	7.51
OPERATOR: Mechanic.....	\$ 25.12	3.44
OPERATOR: Oiler .....	\$ 29.54	16.15
OPERATOR: Paver (Asphalt, Aggregate, and Concrete) .....	\$ 28.88	17.05
OPERATOR: Roller. ....	\$ 25.23	9.69
OPERATOR: Post Driver/Pounder.....	\$ 23.16	6.32
TRUCK DRIVER, Includes all axles including Dump Trucks (Excludes Low Bed Trucks) .....	\$ 17.42	3.37
TRUCK DRIVER: Low Bed Truck.....	\$ 20.77	4.27

=====

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting

from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

-----  
The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data.

EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

-----  
WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====  
END OF GENERAL DECISION"



## **SUPPLEMENTAL PROVISIONS**

### **I. CONTRACT DOCUMENT DRAWINGS**

Attention shall be directed to the General Provisions, FAA Required Contract Provisions for AIP Project, and these Supplemental Provisions for complete definition and enumeration of the Contract Documents. Attention shall be paid to the drawings, specifications, and addenda and other items enumerated in Contract Agreement which also form a part of this Contract.

#### **A. Dimensions**

The drawings are made to scale, unless otherwise noted, but all working dimensions shall be taken from the figured dimensions or by actual measurements at the work, and in no case by scaling the prints. The CONTRACTOR (and his/her subcontractors) shall study and compare all drawings and verify all figures before laying out or constructing the work and shall be responsible for any and all errors in the Contract work which might have been avoided thereby. Whether or not an error is believed to exist, deviations from the drawings and the dimensions given thereon shall be made only after approval in writing is obtained from the Engineer. The CONTRACTOR (and his/her subcontractors) shall take all measurements of existing established conditions notwithstanding the figured dimensions are not in agreement with the CONTRACTOR's (or his/her subcontractors) measurements, the Engineer shall be immediately notified and the Engineer will promptly adjust same.

#### **B. Diagrammatic Drawings**

##### **1. Work and Materials Included**

Plans or drawings where the work is shown diagrammatically indicate approved working systems. Every piece of material, fitting, fixture or small equipment is not shown nor is every difficulty or interference that may be encountered. To carry out the true intent and purpose of the Contract Documents, all necessary parts to make complete, approved working systems, or installations shall be included as if detailed on the drawings.

##### **2. Location of Construction**

The location of construction or installations shown on the drawings, unless exactly dimensioned, shall be considered as approximate only. The CONTRACTOR (and his/her subcontractors) shall adjust the position of the construction and installation in accordance with good working practices and as directed or approved by the Engineer to meet interferences, provide proper clearance and provide proper access space for operations and maintenance.

#### **C. Typical Details**

Where shown on the drawings, typical details shall apply to each and every item of the Contract work where such items are incorporated and the detail is applicable. Unless noted otherwise, such typical details shall be applicable in full.

### **II. SPECIAL INSPECTION REQUIREMENTS**

A. The project will be financially aided by grants from the Federal Aviation Administration (U. S. Government) and from the New Hampshire Department of Transportation, Bureau of Aeronautics. All work done under this Contract will be subject to the rules and regulations and the approval of said Administration and Department. The CONTRACTOR shall provide authorized representatives of said Administration and Department with proper access to the work for inspection purposes at any time during the preparation for or progress on the Contract work.

B. The Contractor shall throughout the course of the work give proper notice to the Engineer and all others having jurisdiction of his/her schedule of operations. It shall be the Contractor's responsibility to have all parts of the work inspected and approved by the proper authorities as required.

C. All applicable inspection and certification requirements of the Standard Specifications referred to herein will be enforced, in addition to any other inspections or certifications deemed necessary by the Engineer.

### III. “OR EQUAL” CLAUSE

Whenever a material, article or piece of equipment is identified on the plans or in the specifications by reference to manufacturer's or vendor's names, trade names, catalogue numbers, etc., it is intended merely to establish a standard; and, any material, article, or equipment of other manufacturers and vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed, is, in the opinion of the Engineer, of equal substance and function. It shall not be purchased or installed by the Contractor without the Engineer's written approval.

### IV . CONTRACTOR AGREEMENT INDEMNIFICATION

In consideration of the utilization of CONTRACTOR’s services by the City of Manchester, Department of Aviation (Owner) – Manchester-Boston Regional Airport (AIRPORT) and other valuable considerations, the receipt of which is hereby acknowledged, CONTRACTOR agrees that all persons furnished by CONTRACTOR shall be considered the CONTRACTOR’s employees or agents and that CONTRACTOR shall be responsible for payment of all unemployment, social security and other payroll taxes including contributions from them when required by law.

CONTRACTOR hereby agrees to protect, defend, indemnify and hold the Owner, AIRPORT and Architect/Engineer and their respective employees, agents, officers and servants free and harmless from any and all losses, claims, liens, demands and causes of action of every kind and character including but not limited to, the amounts of judgements, penalties, interests, court costs, legal fees and all other expenses incurred by the Owner, AIRPORT or Architect/Engineer arising in favor of any party, including claims, liens, debts, personal injuries, including employees of the Owner, AIRPORT and Architect/Engineer death or damages to property (including property of the Owner, AIRPORT and Architect/Engineer) and without limitation by enumeration, all other claims or demands of every character occurring or in any way incident to, in connection with or arising or directly indirectly out of the Contract Agreement. CONTRACTOR agrees to investigate, handle, respond to, provide defense for and defend any such claims, demands or suits at the sole handle, of the CONTRACTOR. CONTRACTOR also agrees to bear all other costs and expense related thereto, even if the claim or claims alleged are groundless, false or fraudulent. This provision is not intended to create any cause of action in favor of any third party against CONTRACTOR or the Owner/AIRPORT or to enlarge in any way the CONTRACTOR'S liability but is intended solely to provide for indemnification of the Owner/AIRPORT from liability for damages or injuries to third persons or property arising from CONTRACTOR’S performance hereunder.

### V. INSURANCE REQUIREMENTS

CONTRACTOR shall maintain in effect certain insurance coverage, which is described as follows:

COVERAGE	LIMIT OF LIABILITY
Commercial General Liability: Bodily and Personal Injury; Products and Completed Operations Coverage	Bodily Injury and Property Damage, Combined Limits of \$2,000,000 each Occurrence, and \$5,000,000 aggregate
Automobile Liability	\$1,000,000 combined single limit for: (1) Any Auto or (2) All Owned, Hired, and Non-Owned Autos
Excess Liability Coverage, or Umbrella Coverage, for Commercial General Liability and Automobile Liability	\$5,000,000.00
All-Risks or Builder’s Risk	Not Applicable for this Project
Workers' Compensation	Statutory for Workers' Compensation
<b>Aggregate Limits are per 12-month policy period unless otherwise indicated.</b>	

At all times during the term of the Contract Agreement and any extensions or renewals, CONTRACTOR shall provide and maintain insurance coverage that meets the Contract Agreement requirements. Prior to beginning performance under this Contract Agreement or any extensions thereof, or at any time upon the AIRPORT'S request, or each time coverage is renewed or updated, the CONTRACTOR shall furnish to the AIRPORT current certificates of insurance, endorsements, all policies, or other policy documents evidencing adequate coverage, as necessary. CONTRACTOR shall be responsible for and pay (a) all premiums and (b) any claims or losses to the extent of any deductible amounts. CONTRACTOR waives any claim it may have for premiums or deductibles against the OWNER, its officers, agents, or employees.

Subcontractor's Commercial General Liability and Property Damage Insurance and Automobile Liability Insurance

The CONTRACTOR shall either: (a) require each of his/her subcontractors to procure, and to maintain during the life of his/her subcontract, Subcontractor's Public Liability and Property Damage Insurance and Automobile Liability and Property Damage Insurance of the types and amount specified above, or (b) insure the activities of all subcontractors under the CONTRACTOR's own policies as specified above.

Form of Insurance. The form of the insurance shall be approved by the AIRPORT; such approval (or lack thereof) shall never (a) excuse non-compliance with the terms of this Section, or (b) waive or estop the Owner from asserting its rights to terminate the Contract Agreement. The policy issuer shall (1) have a Certificate of Authority to transact insurance business in the State of New Hampshire, or (2) be an eligible non-admitted insurer in the State of New Hampshire and have a Best's rating of at least B+, and a Best's Financial Size Category of Class VI or better, according to the most current Best's Key Rating Guide.

Required Coverage. The Owner, AIRPORT and the Architect/Engineer shall be an Additional Insured under this Contract Agreement, and all policies, except Worker's Compensation, shall explicitly name the Owner, AIRPORT and Architect/Engineer as an Additional Insured. The Owner, AIRPORT and Architect/Engineer shall enjoy the same coverage as the Named Insured without regard to other contract provisions. CONTRACTOR waives any claim or right of subrogation to recover against the OWNER, its officers, agents, or employees. Each of CONTRACTOR'S insurance policies, except Worker's Compensation, must contain coverage waiving such claim. Each policy, except Workers' Compensation, must also contain an endorsement that the policy is primary to any other insurance available to the Additional Insured with respect to claims arising under the Contract Agreement.

Notice. CONTRACTOR SHALL GIVE 30 DAYS' ADVANCE WRITTEN NOTICE TO THE AIRPORT IF ANY OF ITS INSURANCE POLICIES ARE CANCELED OR NON-RENEWED. Within the 30-day period, CONTRACTOR shall provide other suitable policies in order to maintain the required coverage. If CONTRACTOR does not comply with this requirement, the AIRPORT, at their sole discretion, may immediately suspend CONTRACTOR from any further performance under the Contract Agreement and begin procedures to terminate the Contract Agreement for default.

## **VI. SPECIAL HAZARDS**

The Contractor's and Subcontractor's Public Liability, Property Damage, Automobile Liability, and Automobile Property Damage insurance coverages shall provide adequate protection against the following special hazards:

- A. Damage or injury to aircraft or persons in aircraft operating on or near the project site, resulting from any operations under this Contract.
- B. Damage or injury resulting from the use, storage, handling or transportation of explosives in connection with the Contract work, as applicable.

## **VII. PROTECTION OF LIVES AND HEALTH**

In order to protect the lives and health of his/her employees under the contract, the CONTRACTOR shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the

Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. He/she alone shall be responsible for the safety, efficiency, and adequacy of his/her plant, appliances, and methods, and for any damage which may result from their failure of their improper construction, maintenance or operation.

## **VIII. PRICING OF CONSTRUCTION CONTRACT CHANGE ORDER OR SUPPLEMENTAL AGREEMENT DOCUMENTATION**

### **A. GENERAL**

1. The contract language contained in this Section will supplement and take precedence over all other Change Order (CO) or Supplemental Agreement (SA) pricing contract provisions in the Contract Documents provided by the Owner, Design-Builder (CONTRACTOR), Construction Manager (CONTRACTOR), General Contractor (CONTRACTOR) and/or Architect/Engineer. It is understood that these contract provisions will govern the pricing and administration of all change order proposals to be submitted by the Construction Manager and/or the General Contractor and/or the Trade Contractors and/or the Subcontractors and/or all other lower tier sub-subcontractors (All referred to as "CONTRACTOR" in this Section). In the event of a conflict between the other Contract Documents used for the Project, the change order pricing contract provisions in this Section shall govern.
2. Contractor agrees that it will incorporate the provisions of this Section into all agreements with lower tier Contractors. It is understood that these change order pricing provisions apply to all types of contracts and/or subcontracts specifically including lump sum (or fixed price contracts), and/or, unit price contracts. It is further understood that these change order provisions will apply to all methods of change order pricing specifically including lump sum change order proposals and unit price change order proposals.
3. Whenever change order or Supplemental Agreement proposals to adjust the contract price become necessary, the Owner will have the right to select the method of pricing to be used by the Contractor in accordance with the pricing provisions found in this Section. The options will be (1) lump sum change order proposal, or (2) unit price change order proposal as defined in the following provisions.
4. The words "Change Order" in this Section applies to both Change Orders and Supplemental Agreements as defined by Section 10-12 and 10-48 of the General Provisions of these specifications.

### **B. CHANGE ORDER TYPES**

1. Lump Sum Change Orders. Provides a single lump sum amount for extra work that comprises of multiple task and a well-defined amount of effort.
2. Unit Price Change Orders. Provides a per unit amount for a single task that will be measured for payment upon completion of the task.
3. If a CO proposal is not acceptable to the Owner and prompt agreement between the two parties cannot be reached, the Owner at its sole option, may order the Contractor to proceed with the work on a "Time and Material" basis. The resulting CO will be treated as a Lump Sum CO for determining cost. A Time and Material worksheet will be used to track time and materials on a daily basis and must be signed by the Contractor and the Engineer each day.

### **C. CHANGE ORDER PROPOSALS**

1. The following will apply to all types of Change Orders:
  - a. For all labor the Contractor shall receive the rate of the personnel reasonably anticipated to perform the work, or in the case of Time and Materials, the wage actually paid as shown by his certified payroll, which shall be at least the minimum rate established by the Contract Documents.
    - i. The labor rate shall include allowable overhead labor burden defined as employer's net actual cost of payroll taxes (FICA, Medicare, SUTA, FUTA), net actual cost for employer's cost of union benefits (or other usual and customary fringe benefits if the employees are not union employees), and net actual cost to employer for worker's compensation insurance.
    - ii. For all foremen in direct charge of the work the Contractor shall receive the actual wage

- paid the foremen, as shown on (his certified payroll). No part of the salary or expense of anyone above the grade of foreman and having general supervision of the work will be included in the labor item.
- iii. Contractor shall receive the actual cost of such labor and labor burden, to which shall be added a maximum of fifteen percent (15%) of the sum thereof.
  - b. For all materials used by the Contractor, he shall receive the actual cost of such materials, less any allowable cash discounts, delivered on the work, including delivery charges as shown by original receipted bills, to which shall be added a maximum of five percent (5%) of the sum thereof.
  - c. For any major power operated machinery, trucks or equipment, which it may be necessary to use, the Owner shall allow the Contractor the rental price as set forth in the standard schedule of equipment rental prices established by the Rental Rate Blue Book for Construction Equipment, current edition as published by Dataquest, or equivalent publication.
    - i. Should the proper completion of the work require equipment of a type not covered by the above-mentioned schedule, the Owner shall allow the Contractor a reasonable rental price to be agreed upon in writing before the work is begun.
    - ii. No percentage shall be added to the amounts of any of the above stated equipment rental prices, but the price as set forth in the schedule or agreed upon shall be total compensation allowed for the use of such equipment.
    - iii. Major equipment is defined as tools and equipment with an individual purchase cost of more than \$750.
  - d. For all cost of all insurance, bonds, and taxes imposed by law on labor employed on the work, the Contractor shall receive the actual amount paid without being marked up.
    - i. In the event the Contractor has been required to furnish comprehensive general liability insurance and/or performance and/or payment bonds as part of the base contract price, a final contract change order will be processed to account for the Contractor's net increase or decrease in comprehensive general liability insurance costs and/or bond premium costs associated with change orders to Contractor's base contract price.
  - e. All extra work performed by a subcontractor will be according to the above requirements as if the work were performed directly by the Contractor. Extra work performed by a subcontractor may be marked up by the General Contractor by a maximum of five percent (5%). If there are second and third tier subcontractors, subcontractors can markup lower tier subcontractors by a maximum of five percent (5%), the aggregate mark-up of all subcontractors involved shall be a maximum of twenty percent (20%), including the General Contractors markup. The maximum mark-up for all labor, materials and subcontractors is twenty-five percent (25%).
  - f. In no event will any lump sum or percentage amounts for "contingency" be allowed to be added as a separate line item in change order estimates. Unknowns attributable to labor hours will be accounted for when estimating labor hours anticipated performing the work. Unknowns attributable to material scrap and waste will be estimated as part of material costs.
  - g. The Contractor's proposals for changes in the contract amount or time shall be submitted within seven (7) calendar days of the Owner's request, unless the Owner extends such period of time due to the circumstances involved. If such proposals are not received in a timely manner, if the proposals are not acceptable to Owner, or if the changed work should be started immediately to avoid damage to the project or costly delay, the Owner may direct the Contractor to proceed with the changes without waiting for the Contractor's proposal or for the formal change order to be issued. In the case of an unacceptable Contractor proposal, the Owner may direct the Contractor to proceed with the changed work on a time and material basis with an agreed upon "not-to-exceed" price for the work to be performed. Such directions to the Contractor by the Owner shall be confirmed in writing within seven (7) calendar days. The cost or credit, and or time extensions will be determined by negotiations as soon as practical thereafter and incorporated in a Change Order to the Contract.

#### D. UNAUTHORIZED CHANGES IN THE WORK

1. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented.

---

#### SUPPLEMENTAL PROVISIONS

## **IX. AIRPORT SECURITY**

### **A. DESCRIPTION**

1. The Contractor shall comply with all applicable federal (FAA, TSA, etc.), state and local laws. This includes but is not limited to: 14 CFR Part 77 (Obstructions to Navigable Airspace), 14 CFR Part 139 (Certification of Airports), 49 CFR 1540 (Civil Aviation Security – General Rules) and 49 CFR Part 1542 (Airport Security), as amended.
2. Provide protection for materials, tools and equipment being employed on the Project including the tools of workers. The Owner shall not be held to have incurred any liability for loss of, and damage to, materials, tools and equipment of the Contractor, or of those employed by him, by contract or otherwise.
3. The Contractor shall employ such security service as he may deem necessary to properly protect and safeguard the work. The Owner shall not in any way be liable or responsible for the damage or loss to the work due to trespass or theft.
4. The Owner may provide such security service as they deem necessary to protect his/her interest during the progress of the work. Any protection provided by the Owner shall not in any way relieve the Contractor of the responsibility for the safety of the work and acceptance thereof.
5. The Contractor shall be responsible for controlling access to the work area and insuring that airport security is maintained at all times, including set-back security clearances enforced at the Airport, parking garage(s) and parking lots. The Federal Aviation Administration (FAA) and Transportation Security Administration (TSA) may impose fines of \$11,000.00 or more for security violations and incursions into active aircraft operation areas. In addition, the Owner may impose additional fines and/or penalties for such violations. The Contractor shall pay all fines assessed against the Airport due to violations caused by the Contractor and his personnel, subcontractors, and vendors.
6. Parking of personal cars at the work sites will not be permitted, except in areas indicated on Contract Drawings. The Contractor, as a subsidiary obligation shall provide adequate and safe transportation for his employees from the area where the cars are parked, to and from the work area. Employees and drivers of work vehicles will be instructed as to proper access roads and will be cautioned that unauthorized use of aircraft pavements or other areas outside the designated work area may lead to their arrest and subsequent payment of fines.
7. Trucks delivering material to an actual work area will be subject to search and provided with an escort.
8. All orders for material shall instruct the supplier of the procedures to be followed.
9. The Contractor shall submit to the Owner within ten (10) days after signing of the contract a written Safety Plan Compliance Document (SPCD) detailing his methods of operations including but not limited the precautions the Contractor proposes for the control of vehicle traffic including flag person, signs, escorts and any other measures the Contractor proposes. After Owner approval of the operations, the Contractor shall follow it explicitly. The Owner may close the work at any time this schedule is violated so as not to endanger airport or aircraft operations. Such closure shall not be considered a valid reason for extending the contract time or for any claim for extras by the Contractor.
10. All security arrangements shall be subject to the approval of the Owner.
11. The Contractor's personnel and vehicles will not have access to the entire airport, but shall be limited to work areas and the staging area.
12. In addition to the information contained herein, the Contractor shall reference the requirements of the Manchester-Boston Regional Airport Safety and Security Phasing Plan, including for the project badging and gate security requirements.
13. This section contains supplemental information and/or requirements for Airport Improvement Program (AIP) projects on the AOA.

### **B. PROTECTION**

1. Continuously maintain protection as necessary to protect the work as a whole and in part, and adjacent property and improvements from accidents, injuries or damage.
2. Properly protect the work:
  - a. With lights approved by the Owner, guard rails, temporary covers, and barricades.

- b. Enclose excavations with proper barricades.
  - c. Brace and secure all parts of the work against storm and accident.
  - d. Provide such additional forms of protection which may be necessary under existing circumstances.
3. Provide and maintain in good condition all protective measures required to adequately protect the public from hazards resulting from the work and to exclude unauthorized persons from the work area. When regulated by Building Code, OSHA or other authority, such legal requirements for protection shall be considered as minimum requirements; be responsible for the protection in excess of such minimum requirements as required

#### C. WORK IN THE AIR OPERATIONS AREA

1. If the Contractor is required to perform work within the AIR OPERATIONS AREA (AOA), the Contractor shall be required to follow the requirements outlined herein and in accordance with Section X. entitled Security Badging Requirements. These requirements include, but are not limited to, the following:
- a. Badging and identifying Contractor personnel;
  - b. Securing access point to the AOA.

#### D. CONTROL OF SITE

1. The Contractor shall ensure that no alcohol, firearm, weapon or controlled substance enters or is used at the Project site. The Contractor shall immediately remove from the site and terminate the employment of any employee found in violation of this provision.
2. Install approved temporary enclosure of partially completed construction areas to prevent unauthorized entrance, vandalism and theft.
3. Secure temporary storage areas as required to prevent theft.
4. To the extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high-speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment excessive weathering, unprotected storage, improper shipping and handling, theft and vandalism.
5. The airfield is a completely secured and controlled access site. The primary means for controlling access to the site is the surrounding fence and gates. For any given work area, the access for vehicles, equipment, materials, and manpower shall be restricted to the routes depicted in the plans and in the Construction Safety and Phasing Plan (CSPP).
6. Controlled access points to the work area that impact the AOA shall be manned by an approved and trained gate guard. The Owner will provide gate guards to control access to the work areas through gates that are identified as contractor access points. Any and all vehicles entering the airfield are subject to search by gate guards or Owner personnel.
7. Failure to provide sufficient security and safety can result in serious penalties and fines of up to \$10,000 per incident. If for any reason, the Owner is fined for actions or inactions of the Contractor, the Contractor shall be liable for any and all fines incurred.

### X. SECURITY BADGING REQUIREMENTS

#### A. AIRPORT SECURITY IDENTIFICATION DISPLAY AREA (SIDA) BADGES:

Full-time competent and responsible employees of the Contractor, such as superintendents and foremen, shall obtain an Airport SIDA badge. The SIDA badge requires fingerprint screening, a criminal history check, and successful completion of security training upon receiving approval to undergo the training. The badge application process may take up to fourteen (14) days, the Contractor shall plan accordingly.

---

The Contractor shall have a minimum of 1/2 (50%) of on-site workers submit to the badging process, unless

otherwise approved by MHT Operations Management. Badged individuals must display their Airport issued badges on their outermost garment at all times while on the airfield.

At all times while on the airfield, non-badged workers must be escorted by a badged worker and comply with the following:

1. Within 100 ft of a badged worker
2. Within visual contact of a badged worker
3. Able to respond to the requests of a badged worker
4. Able to command the attention of a badged worker

Any non-badged workers will not be allowed on the airfield without valid picture identification acceptable to the TSA (current and valid driver's license, passport, etc.), and shall remain with a badged worker or Airport escort at all times. All non-badged workers under escort of a badged worker and will be required to have a temporary construction badge approved by the Owner.

Refer to the Construction Safety and Phasing Plan (CSPP) documents for more information associated with obtaining badges and vehicle permit stickers or inspections. The Contractor will need to appoint a badge coordinator that will coordinate with the Airport Security Badging Office. The cost for a New Badge application process and training is \$45 per applicant and will be billed directly to the Contractor.

The Contractor is responsible for the cost of security badges, including replacements thereof at no cost to the Owner. The Contractor's personnel and its Subcontractor's personnel losing badges will be charged for replacement and/or lost badges at the current rate at no cost to the Owner. All badging costs (including the complete application process and training) shall be considered incidental to the cost of the contract and shall not be measured or paid for separately.

#### **B. IDENTIFICATION OF EMPLOYEES**

The Contractor shall provide the Owner with a list of all employees on the job site and their badge number. The list shall include subcontractors and temporary badged employees. The list shall be updated and submitted weekly.

**END OF SECTION**



**CONSTRUCTION SAFETY AND PHASING PLAN**  
**SCHEDULE A – TAXIWAYS ‘A1’ & ‘A2’ HOLD LINE RECONFIGURATION**  
**(DRAFT PRIOR TO FAA DETERMINATION)**

THIS PAGE INTENTIONALLY LEFT BLANK

## **SUPPLEMENTAL PROVISIONS**

### **CONSTRUCTION SAFETY AND PHASING PLAN**

#### **A. GENERAL**

Construction Safety and Phasing Plan as submitted to FAA is attached as part of the Project Documents in Supplemental Provisions.

The Contractor shall be responsible for controlling access to the work area and that airport security is maintained at all times. The FAA can impose fines of \$10,000 or more for security violations and incursions into active aircraft operation areas. The Contractor shall pay all fines assessed against the Airport due to violations caused by the Contractor and his/her personnel, subcontractors and vendors.

PAGE LEFT BLANK INTENTIONALLY

# **CONSTRUCTION SAFETY AND PHASING PLAN**

## **RUNWAY INCURSION MITIGATION PROJECT TAXIWAYS A1 AND A2 HOLD LINE RECONFIGURATION**

**AT**



**MANCHESTER-BOSTON REGIONAL AIRPORT  
MANCHESTER, NEW HAMPSHIRE**

**AIRPORT IMPROVEMENT PROGRAM NO. 3-33-0011-XXX-2021**

Prepared by



53 Regional Drive  
Concord, NH 03301

**December 2020 - DRAFT**

## Table of Contents

1.	COORDINATION.....	1
2.	PHASING .....	2
3.	AREAS AND OPERATIONS AFFECTED BY CONSTRUCTION: .....	4
4.	NAVIGATIONAL AID (NAVAID) PROTECTION: .....	7
5.	CONTRACTOR ACCESS: .....	7
6.	WILDLIFE MANAGEMENT .....	9
7.	FOD MANAGEMENT:.....	9
8.	HAZMAT MANAGEMENT:.....	10
9.	NOTIFICATION OF CONSTRUCTION ACTIVITIES: .....	10
10.	INSPECTION REQUIREMENTS:.....	11
11.	UNDERGROUND UTILITIES .....	12
12.	PENALTIES: .....	12
13.	SPECIAL CONDITIONS: .....	13
14.	RUNWAY AND TAXIWAY VISUAL AIDS: .....	13
15.	MARKINGS AND SIGNS FOR ACCESS ROUTES: .....	14
16.	HAZARD MARKING AND LIGHTING .....	14
17.	PROTECTION OF AREAS, ZONES, & SURFACES:.....	14
18.	OTHER LIMITS ON CONSTRUCTION:.....	15
19.	AIRPORT WATCH PROGRAM. ....	15

## CSPP Appendix List

CSPP Appendix A .....	Key Personnel Contact List
CSPP Appendix B.....	Airside Phasing Plan
CSPP Appendix C.....	Safety and Phasing Plan Checklist
CSPP Appendix D.....	Daily Safety Inspection Checklist
CSPP Appendix E.....	Safety Plan Compliance Document

## AIRPORT DESCRIPTION / AIRCRAFT OPERATIONS

Manchester Boston Regional Airport (MHT) located in Manchester and Londonderry, New Hampshire is a Part 139 commercial service airport with regularly scheduled passenger service, terminal building and air traffic control tower manned 24 hours per day.

MHT has a normal airport reference code (ARC) of D-IV. The airport has two paved runways: 17/35 and 6/24.

Runway 17/35 dimensions are 9250' x 150'. Runway 6/24 dimensions are 7650' x 150'. Navigational aids for the runways are as follows:

**Runway 17:**

4-light PAPI - Right  
MALSR Approach lights  
ILS/DME

**Runway 35:**

4-light PAPI - Left  
ALSF2 Approach Lights  
ILS/ DME

**Runway 6:**

4-light PAPI - Left  
REILs  
ILS

**Runway 24:**

4-light PAPI - Left  
REILs

The airport also has a VOR located towards the south of the airfield. This project is not within any portion of the VOR critical area.

## PROJECT DESCRIPTION

This project reconfigures the existing markings, lighting, and signage on Taxiways A1 and A2 to have a single hold line on each taxiway at the current Runway Approach Surface hold line location. This will be accomplished by eliminating the existing Runway Safety Area (RSA) hold lines on Taxiways A1 and A2 and using the existing Runway Approach (RA) Surface hold lines in their current locations to have a single hold line for each taxiway at the Runway 35 Approach End at Manchester-Boston Regional Airport (MHT). The work shall include, but is not limited to: milling of existing pavement, removal and relocation of existing elevated runway guard lights, removal of existing in-pavement runway guard lights at the RSA hold line, removal of existing RSA hold line runway guidance sign, removal of existing enhanced centerline marking between the RA and RSA hold lines, removal of the existing RSA hold line and surface painted hold sign markings, installation of new pavement to replace milled sections, installation of the relocated existing elevated runway guard lights on new cans at the RA hold line location along with required conduit and wiring, relocation and installation of the of existing RSA runway guidance sign panels to the existing RA guidance sign, installation of in-pavement guard lights at the RA hold line location, marking of new centerline marking, edge markings, and surface painted hold position signs, and turf restoration for disturbed areas.

### 1. COORDINATION

Date	Attendees	Description
October 2020	Design Engineer & MHT Staff	Design Scoping Meeting
October/November 2020	Design Engineer & MHT Staff	Design Coordination

**Preconstruction Conference:**

- Construction Safety and Phasing Plan (CSPP) & Safety Plan Compliance Document (SPCD) to be

reviewed and discussed.

- Key Attendees: Airport Management representatives  
MHT Operations & Maintenance representatives  
Resident Project Representative  
Design Engineer Representative  
Contractor Superintendent  
Subcontractor representative(s)  
FAA MHT Service Sector Center (SSC) (Tech Ops) Representative(s)  
FAA MHT ATCT Representative(s)  
FAA Airports Project Manager

### **During Construction:**

Daily Coordination Meeting will be held prior to starting work each day

- Standing Discussion Item will be the day's activities and safety of the project site
- Key Attendees: MHT Operations and Maintenance Shift Manager  
Resident Project Representative  
Contractor Superintendent  
Subcontractor representative(s), as applicable

Prior to the start of construction activities, the Contractor shall be required to provide a complete schedule for the project. Should the overall schedule change during the course of construction, the overall schedule will be updated and distributed to stakeholders.

## **2. PHASING**

### **Phase 1 - Taxiway A2 Reconfiguration**

Work Area 1: Limits of Taxiway A2 and between the Taxiway A Object Free Area (TOFA) and the edge of the Runway 17-35 Runway Safety Area. Taxiway A2 will be closed during this phase and Runway 35 landings will be subject to a 15-minute recall for pull back during work hours due to work occurring in the Runway 35 landing Runway Protection Zone (RPZ).

Duration: Fifteen (15) consecutive calendar days from the Notice to Proceed date.

Closures: Taxiway A2  
Runway 17-35 Landings – Subject to 15-Minute Recall for Pull-Back

Work Hours: 7 AM – 5 PM

#### **Primary work to be performed in this Work Area 1:**

- Milling of existing pavement
- Removal of existing elevated runway guard lights for relocation
- Removal of existing in-pavement runway guard lights, base cans, conduit and cabling
- Removal of existing Runway Safety Area guidance sign, sign foundation, and cabling
- Removal of existing enhanced centerline marking and surface painted hold position signs
- Installation of new pavement in milled areas
- Installation of existing elevated runway guard lights on new cans at the Runway Approach Surface hold location, along with required conduit and cabling
- Relocation and installation of existing RSA hold line guidance sign panels to the existing RA hold line guidance sign



- Installation of in-pavement guard lights at the RA hold location with required conduit and cabling
- Marking of centerline marking, taxiway edge lines, and surface painted hold position signs

Work Area 1A: Work Area 1A consists of work within the limits of Taxiway A2 located within the Runway 17-35 RSA (approximately 20 feet from the edge of the RSA).

Duration: Three (3) calendar days (non-consecutive) within Phase 1 duration

Closures: Taxiway A2  
Runway 17-35 – Prior Permission Required (PPR) with 30-Minute Recall for Pull-Back

Work Hours: 7 AM – 5 PM

Primary work to be performed in Work Area 1A:

- Milling of existing pavement
- Installation of new pavement for milled area
- Marking of a portion of the Taxiway A2 centerline and a portion of the Taxiway A2 edge markings

## **Phase 2 – Taxiway A1 Reconfiguration**

Work Area 2: Limits of Taxiway A1 and between the Taxiway A TOFA and the edge of the Runway 17-35 RSA. Taxiway A1 will be closed during this phase and Runway 35 landings will be subject to a 15-minute recall for pull back during work hours due to work occurring in the RPZ.

Duration: Fifteen (15) consecutive calendar days from the completion of Phase 1 work.

Closures: Taxiway A1  
Runway 17-35 Landings – Subject to 15-Minute Recall for Pull-Back

Work Hours: 7 AM – 5 PM

Primary work to be performed in Work Area 2:

- Milling of existing pavement
- Removal of existing elevated runway guard lights for relocation
- Removal of existing in-pavement runway guard lights, base cans, conduit and cabling
- Removal of existing RSA guidance sign, sign foundation, and cabling
- Removal of existing enhanced centerline marking and surface painted hold position signs
- Installation of new pavement in milled areas
- Installation of existing elevated runway guard lights on new cans at the RA hold location, along with required conduit and cabling
- Relocation and installation of existing RSA hold line guidance sign panels to the existing RA hold line guidance sign
- Installation of in-pavement guard lights at the RA hold location with the required conduit and cabling
- Marking of centerline marking, taxiway edge, and surface painted hold position signs at RA hold line

Work Area 2A: Work Area 2A consists of work within the limits of Taxiway A1 within the Runway 17-35 RSA.

Duration: Three (3) calendar days (non-consecutive) within Phase 2 duration

Closures: Taxiway A1  
Runway 17-35 – Prior Permission Required (PPR) with 30-Minute Recall for Pull-Back

Work Hours: 7 AM – 5 PM

Primary work to be performed in Work Area 2A:

- Milling of existing pavement
- Installation of new pavement for milled area
- Marking of a portion of the Taxiway A1 centerline and a portion of Taxiway A1 edge markings

**Sequence of Work**

Estimated Start Date: Early Spring 2021  
Estimated Completion Date: Spring 2021  
Total Duration: Thirty (30) Calendar Days

**3. AREAS AND OPERATIONS AFFECTED BY CONSTRUCTION:**

The affected areas and aircraft operations for this project are shown on the Safety and Phasing Plans located in Appendix B of this CSPP. All of the work will be performed “Airside” within the Airport Operations Area (AOA). All work locations within the AOA Movement Area will require coordination and advanced notification in accordance with Section 1 - *Coordination*. As noted above in Section 2 – *Phasing*, the work in both phases will have runway closures for landings on Runway 35 with a 15-minute recall during work hours for pullback, while Taxiways A1 and A2 will be closed for the duration of their respective phases. As noted, the work in Work Areas 1A and 2A will occur on a thirty (30) minute prior permission required recall on a pullback basis in an effort to maintain open runway operations during construction.

Refer to Section 11 - *Underground Utilities* for underground utilities impacted by the construction.

The two (2) phases of this project are outlined above in Section 2 – *Phasing*. All of the work in Phase 1 must be completed prior to the start of work in Phase 2.

Contained within the table below are anticipated operational impacts to Airport Operations during the course of the project. Contractor is required to coordinate with Airport Operations prior to impacting operations on the Airport.

<b>PROJECT</b>	Taxiway A1 and A2 Hold Line Shift	
<b>PHASE</b>	Phase 1: Taxiway A2 Hold Line Reconfiguration	
<b>SCOPE OF WORK</b>	<p>Work Associated with the reconfiguration of hold marking and signage on Taxiway A2, including Work Area 1A</p> <p>Fifteen (15) consecutive calendar days for Phase 1.</p> <p>Work Area 1A: Three (3) non-consecutive calendar days during Phase 1.</p>	
<b>OPERATIONAL REQUIREMENTS</b>	<b>Normal (Existing)</b>	<b>Phase 1 (Anticipated)</b>
<b>RW 17-35 ARC</b>	D-IV	D-IV
<b>RW 17 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
<b>RW 17 Approach Procedures</b>	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
<b>RW 17 NAVAIDs</b>	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
<b>RW 35 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
<b>RW 35 Approach Procedures</b>	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	RW 35 LANDINGS with 15-Minute Recall DURING WORK HOURS for Phase 1 AND RW 35 30-Minute PPR Recall DURING WORK HOURS for Phase 1A ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR
<b>RW 35 NAVAIDs</b>	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIIE
<b>RW 6-24 ARC</b>	D-IV	D-IV
<b>RW 6 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
<b>RW 6 Approach Procedures</b>	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
<b>RW 6 NAVAIDs</b>	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
<b>RW 24 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
<b>RW 24 Approach Procedures</b>	RNAV(GPS)	RNAV(GPS)
<b>RW 24 NAVAIDs</b>	REIL, PAPI(P4L)	REIL, PAPI(P4L)
<b>Taxiway A1 ADG</b>	IV	IV
<b>Taxiway A2 ADG</b>	IV	CLOSED FOR DURATION OF PHASE
<b>Taxiway C ADG</b>	IV	IV
<b>Taxiway B ADG</b>	IV	IV
<b>Taxiway D ADG</b>	IV	IV
<b>Taxiway H ADG</b>	IV	IV
<b>ACTC (hours open)</b>	24 Hours	24 Hours
<b>ARFF Index</b>	C	C
<b>Special Conditions</b>	RW 17-35 & RW 6-24 OPEN	<p>RW 6-24 OPEN</p> <p>RW 17-35 OPEN</p> <p>except during WORK HOURS</p> <p>Phase 1: RW 35 Landings to have 15-Minute Recall to allow for Pullback</p> <p>Phase 1A: RW 35 to have 30-Minute PPR Recall to allow for Pullback</p>

<b>PROJECT</b>	Taxiway A1 and A2 Hold Line Shift	
<b>PHASE</b>	Phase 2: Taxiway A1 Hold Line Reconfiguration	
<b>SCOPE OF WORK</b>	<p>Work Associated with the reconfiguration of hold marking and signage on Taxiway A1, including Work Area 2A</p> <p>Fifteen (15) consecutive calendar days for Phase 2.</p> <p>Work Area 2A: Three (3) non-consecutive calendar days during Phase 2</p>	
<b>OPERATIONAL REQUIREMENTS</b>	<b>Normal (Existing)</b>	<b>Phase 2 (Anticipated)</b>
<b>RW 17-35 ARC</b>	D-IV	D-IV
<b>RW 17 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
<b>RW 17 Approach Procedures</b>	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
<b>RW 17 NAVAIDs</b>	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
<b>RW 35 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
<b>RW 35 Approach Procedures</b>	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	RW 35 LANDINGS with 15-minute Recall DURING WORK HOURS for Phase 1 AND RW 35 30-Minute PPR Recall DURING WORK HOURS for Phase 1A ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR
<b>RW 35 NAVAIDs</b>	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE
<b>RW 6-24 ARC</b>	D-IV	D-IV
<b>RW 6 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
<b>RW 6 Approach Procedures</b>	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
<b>RW 6 NAVAIDs</b>	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
<b>RW 24 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
<b>RW 24 Approach Procedures</b>	RNAV(GPS)	RNAV(GPS)
<b>RW 24 NAVAIDs</b>	REIL, PAPI(P4L)	REIL, PAPI(P4L)
<b>Taxiway A1 ADG</b>	IV	CLOSED FOR DURATION OF PHASE
<b>Taxiway A2 ADG</b>	IV	IV
<b>Taxiway C ADG</b>	IV	IV
<b>Taxiway B ADG</b>	IV	IV
<b>Taxiway D ADG</b>	IV	IV
<b>Taxiway H ADG</b>	IV	IV
<b>ACTC (hours open)</b>	24 Hours	24 Hours
<b>ARFF Index</b>	C	C
<b>Special Conditions</b>	RW 17-35 & RW 6-24 OPEN	<p>RW 6-24 OPEN</p> <p>RW 17-35 OPEN except during WORK HOURS</p> <p>Phase 2: RW 35 Landings to have 15-Minute Recall to allow for Pullback AND</p> <p>Phase 2A: RW 35 to have 30-Minute PPR Recall to allow for Pullback</p>

#### 4. NAVIGATIONAL AID (NAVAID) PROTECTION:

- a. Prior to commencing any construction activities or operating equipment near a NAVAID, the Contractor shall coordinate through the Resident Project Representative, with the FAA Technical Operations, to evaluate the effect of construction activity and the required distance and direction from the NAVAID. There shall be no construction activities, equipment operation, materials storage, or vehicle parking near any NAVAIDs.
- b. The Contractor is solely responsible for locating all existing NAVAID electrical feeds and other utilities within the project limits. Prior to initiation of any construction in the field, the Contractor shall provide a written notice (return receipt requested) to each of the impacted utility companies, as applicable. The Contractor shall provide the MHT Operations and Maintenance or Resident Project Representative and each of the utility companies with a copy of the receipt of said written notification. This requirement is in addition to any other state laws regarding public notification prior to excavation.
- c. All of the FAA-owned NAVAIDs for Runway 35 approaches WILL NOT need to be shut down or inactive during the work hours of Phases 1 and 2 as noted above in Section 3 – *Areas and Operations Affected by Construction* since the Runway will not be closed and will be operating on recall basis. These NAVAIDs include:
  - Runway 35 ILS
  - Runway 17 Localizer
  - Runway 35 RNAV

#### 5. CONTRACTOR ACCESS:

##### Stockpile Locations:

- a. The Contractor shall stockpile all material in the Contractor Stockpile Area as shown on the phasing plan located in Appendix B.
- b. The Contractor shall inspect all construction storage areas as often as necessary to be aware of conditions and promptly take all steps needed to prevent/remedy any unsafe or potentially unsafe conditions/activities discovered.
- c. Stockpiled material at the construction site shall be prominently marked with orange flags and lighted by light units during hours of restricted visibility and/or darkness. Orange flags shall be no less than twenty (20) inches square for day marking. The Contractor shall use wire stiffener to hold the flag in an extended position. The lights used shall be steady burning red lights at least ten (10) candelas or flashing yellow lights of at least four (4) candelas. Flags and lights shall be mounted so they are not a hazard and sufficiently close together to clearly delineate the area.
- d. Stockpiled material shall be constrained in a manner to prevent movement resulting from wind conditions.

##### Site Access:

- a. Refer to the phasing plan in Appendix B for site access points and haul routes.

##### Ingress and Egress Procedures:

- a. The MHT Operations and Maintenance will unlock and lock airport gates needed for access at the beginning and end of all shifts.
- b. The Contractor shall control all construction access through the airport perimeter gates. The gates shall be locked at all times unless continuously manned by security personnel employed by the Contractor. Haul routes and staging areas, including employee parking for this project are to be as shown on the phasing plan.
- c. Contractor's vehicles will not be allowed access to portions of the Airport other than the work and staging areas. All construction employee vehicles will be parked in the designated staging

- area. Privately-owned vehicles will not be allowed on the airfield. The Contractor will be permitted to store equipment needed for the immediate work on hand within the work area as approved by the MHT Operations and Maintenance or Resident Project Representative. All equipment will be parked in the staging area at the close of work each day and whenever it is not in use. All equipment booms shall be lowered at the close of each day's work or when stored.
- d. Each Contractor's motorized vehicle operating on airport property shall be equipped with an operating amber flashing beacon displayed in full view above the vehicle. The contractor's construction equipment shall have a checkered flag. The 3' x 3' flag shall be made of 1'x 1' international orange and white squares. The flag should be placed at the highest point on the vehicle to allow for an unobstructed view of the flag. Any vehicles not meeting these criteria will be denied access to the work zones until the problem is rectified. Any vehicle operating on the movement areas during hours of darkness or reduced visibility must be equipped with a flashing beacon, the color of which is in accordance with local or state codes.
  - e. In addition, all Contractors vehicles shall have the company identification plainly visible on both sides of the vehicle in order to identify the vehicle. They may be applied either by using tape or a water-soluble paint to facilitate removal. Magnetic signs are also acceptable. Any vehicles transporting fuel or other potentially harmful substances shall be equipped with a spill control plan and required decontamination equipment as required by Federal, State and local regulations.

**Radio Communications:**

- a. The Air Traffic Control Tower (ATCT) will communicate with and update pilots as required.
- b. Radio escorts will be provided by MHT Operations and Maintenance and will communicate with ATCT when necessary. MHT Operations and Maintenance will also act as the Resident Project Representative (RPR) for the project. The Contractor will not communicate with ATCT at any time.
- c. The RPR and Contractor superintendent will monitor air traffic ground control frequency of 121.9 MHz at all times to maintain situational awareness. See Section 13 – *Special Conditions*.

**Granite Frequency:**

- i. Granite Channel (1): General airport operations, building maintenance and emergency frequency.
- ii. Granite Channel (2): Backup frequency.
- iii. Granite Channel (3): Airport law enforcement unit communications.
- iv. Granite Channel (4): Airport operations and maintenance, construction coordination, and security communications.

**Granite Frequency - Call Signs:**

- i. Airport Communications Center: Granite 100
- ii. Airport Emergency contact: Granite 100
- iii. Security gate guard: Company, followed by gate number
- iv. Contractor site superintendent: Company, followed by predetermined call sign/number.
- v. Airport operations representative(s): Coordinate daily on site.

The ATCT will have direct communication with the MHT Operations and Maintenance personnel providing the contractor escorts and having operational safety over sight. This communication will take place on the MHT ground frequency.

**Airport Security**

All personnel with regular job duties and responsibilities within the Airport Operations Area (AOA),

including contractors, subcontractors, general workers and/or security personnel will obtain an MHT Security Identification Badge. In addition, all applicants will attend an airport security briefing prior to being granted access to any secure area. Superintendents shall also be required to have driver training.

All authorized visitors and short-term workers will be issued a white temporary escorted badge. Issuance of escorted badges will be noted in the daily security access log. The log and badges will be returned to airport operations at the close of each work day. The Contractor's MHT badged supervisor(s) are required to coordinate AOA escort assignments with MHT Operations and Maintenance. An escorted worker will be informed (by the contractor) as to their MHT badged escort and will at all times remain within line of sight and within control of the escort.

All personnel and vehicles that are granted access to the AOA will submit to random security inspections conducted by airport law enforcement, security, operations, and Transportation Security Administration personnel. Random inspections may occur at any time and may take place at the perimeter gates, on the AOA, and/or within other secure areas of the airport. Mirrors will be used to ensure a thorough inspection of the undercarriage of vehicles.

Security Gate 11 will be manned by MHT Operations and Maintenance for contractor access to the site. The following procedures will be followed for contractor access:

- a. MHT Operations and Maintenance will have an approved means of communication (i.e. "granite" radio contact) with his/her supervisors, the Contractor, other MHT Operations and Maintenance personnel, and Airport Communications in the event of an emergency.
- b. Vehicle inspections will take place on the public side of the security fence prior to the gate being opened.
- c. All personnel entering an AOA access gate will sign the daily security/AOA access log (once per day for all personnel except when leaving the secured area or hauling material off site). The daily log will be maintained by MHT Operations and Maintenance.
- d. Gates will be secured by MHT Operations and Maintenance after the Contractor accesses the site.

## **6. WILDLIFE MANAGEMENT**

The Airport will mitigate wildlife hazards during construction as follows:

### **Trash:**

- a. The Contractor shall keep the construction site free of paper, boxes, litter, and other debris which could be blown onto the runways and taxiways and aircraft operating areas. All trash must be disposed of in an appropriate manner off site.

### **Wildlife Sightings:**

- a. The RPR and/or Superintendent will immediately notify MHT Operations and Maintenance Management by phone of wildlife sighted on the airfield.
- b. See Section 9 – *Notification of Construction Activities*, for notification procedures.

## **7. FOD MANAGEMENT:**

The Airport will manage foreign object debris (FOD) control during construction as follows:

### **Housekeeping:**

- a. All construction personnel will secure any items that may be carried by wind onto the Air

Operations Area (AOA). See Section 5 – *Contractor Access*, regarding stockpile locations.

**Airfield:**

- a. All construction vehicle drivers will enter AOA paved areas from local streets only; construction vehicles will not transverse from non-paved surfaces to AOA paved surfaces. See Section 5 – *Contractor Access* and Appendix B for access routes.
- b. The Contractor will immediately sweep or otherwise remove any FOD located on an AOA paved surface. See Section 10 – *Inspection Requirements*.
- c. The Contractor shall furnish and retain, at the construction site, equipment for the application of water to control dust within the construction site and on haul roads. The equipment shall be equipped with a shut-off control valve that can be operated from the cab by the operator. The Contractor shall apply water for dust control as necessary to prevent dust from the construction site and/or haul roads from being a hazard to aircraft and from being a nuisance to the public and as directed by the RPR.

**8. HAZMAT MANAGEMENT:**

The Airport will manage hazard material transported during construction as follows:

**Fuel or Hydraulic Fluid Spills:**

- a. All Contractors' vehicles shall have hazmat placards plainly visible on both sides of the vehicle. Any vehicles transporting potentially harmful substances shall be equipped with a spill control plan and required decontamination equipment as required by Federal, State and local regulations.
- b. The Contractor will immediately notify the Airport Communications Center by phone of all spills. See Section 9 – *Notification of Construction Activities*, for notification procedures.

**Fueling:**

- a. All construction vehicles will be fueled in the staging area.

**Other HAZMAT:**

- a. No other hazardous material is expected to be transported on-site during construction.

**9. NOTIFICATION OF CONSTRUCTION ACTIVITIES:**

**Contact List and Emergency Notification:**

The Contact List of Airport and Consultant personnel and emergency contacts is located in Appendix A. Contractor contacts will be included in the SPCD.

The Contractor shall be required to submit a tentative schedule as described in Section 1 – *Coordination*. The schedule shall be given to the Airport prior to 72 hours in advance of the commencement of work. A 72-hour lead time is required by the Airport and FAA to issue a proper Notice to Airmen (NOTAM) of the pending construction activities.

To facilitate the specific requirements and intent of this section, the Contractor shall prepare a schedule of operations for the project. The schedule shall be subject to the approval of the MHT Operations and Maintenance or RPR and shall include as a minimum, the following:

Major work items to be accomplished.

- a. Subcontractors to be on site.



- b. Number of personnel to be on site.
- c. Type and quantity of equipment to be on site.
- d. Areas of the site where construction is scheduled.
- e. Any anticipated closing of facilities that will be required.
- f. Any anticipated power outages and/or system to be inoperable including anticipated length of downtime in hours.
- g. Other information requested by MHT Operations and Maintenance, Airport Management or the RPR.

The primary contact for construction activities will be MHT Operations and Maintenance since they are acting as the RPR. The contacts for the Airport will be as assigned by Airport Management.

All emergencies shall be directed to 911 or the Airport Communications Center at (603) 628-6222.

**FAA Notification:**

- The Airport Representatives will submit a 7460 case for construction equipment.
- The Airport will notify MHT SSC officials (see *Contact List*, Appendix A) as required by Section 4 – *Navigational Aid (NAVAID) Protection*, and Section 11 – *Underground Utilities*.

**Airport User Notification:**

- MHT Operations and Maintenance or Airport Management has been in contact with affected parties throughout the project.
- Airport Operations will notify the airport users of the proposed construction activities via telephone, flyer, or email.

**NOTAMs:**

- MHT Operations Management will issue all NOTAMs through the eNOTAM system, except as noted below.
- The FAA will issue all FAA facility related and Flight Procedure related NOTAMs.

**Morning Safety Meetings**

- As noted in Section 1 – *Coordination*, safety and coordination meetings will be held every morning prior to beginning construction operations for the day. The meeting will be located on the construction site and attended by MHT Operations and Maintenance, the RPR and the Construction Superintendent. The primary purpose is to discuss construction operations for the day and any safety issues that need resolution.

**10. INSPECTION REQUIREMENTS:**

**Airport Requirements:**

- a. MHT Operations and Maintenance will inspect all closed paved surfaces prior to opening to air traffic operations.
- b. The entire work area should be inspected for foreign object debris (FOD) periodically throughout the workday and at the end of each day's work. Refer to Section 7 – *Foreign Object Debris (FOD) Management*, for corrective measures.
- c. If emergency maintenance is required after work hours, refer to Section 9 – *Notification of Construction Activities* and Appendix A for primary contact procedures and information.
- d. As soon as the work is completed, the area shall be cleaned and made available for inspection.
- e. The MHT Operations and Maintenance shall inspect all work areas prior to reopening the Taxiway and associated areas to aircraft operations.
- f. The MHT Operations and Maintenance and Airport Management will conduct a final

inspection.

**Resident Project Representative (RPR) Requirements:**

- a. The RPR will conduct routine inspections of the worksite(s) at the end of all daily work shifts and at the request of MHT Operations and Maintenance Management.
- b. The MHT Operations and Maintenance Management, RPR and the Engineer of Record will attend the final inspection.

**Contractor Requirements:**

- a. The Contractor Superintendent will conduct routine inspections of the worksite(s) to ensure compliance with the CSPP and SPCD.
- b. The Contractor Superintendent will attend the RPR's daily inspections and the final inspection.

**11. UNDERGROUND UTILITIES**

**FAA and Airport Utilities**

- a. Locations of utilities and underground cables shown are based on record documents and field survey. The accuracy of the utility locations is not guaranteed. Prior to commencement of any excavation, the Contractor shall verify the utility locations. The Contractor will coordinate all work on and in the vicinity of the underground utilities and cables with the RPR and MHT Operations and Maintenance.

**Utility Damage**

- a. Should the Contractor encounter any damaged utilities, the Contractor is to contact the RPR immediately who will in turn notify MHT Operations and Maintenance.
- b. Should the Contractor damage any underground utilities, the Contractor will suspend all construction activity and notify the RPR. The Contractor shall then repair or replace the underground utility immediately.
- c. See Section 9 – *Notification of Construction Activities*, for notification requirements.

**Municipal Utilities:**

- a. As applicable, the Contractor Superintendent will contact Dig Safe to delineate all municipal utilities a minimum of seven (7) days prior to any excavation work.

**12. PENALTIES:**

**Construction Suspension:**

- a. MHT Operations and Maintenance Management will immediately suspend all construction if and when:
  - v. A Contractor or subcontractor employee enters the Air Operations Area (AOA) outside of the designated work area.
  - vi. Any unescorted construction vehicle operates on any active AOA surface.
- b. The MHT Operations and Maintenance Management will allow construction work to resume only when the discrepancy is corrected to his/her satisfaction.
- c. The penalty for non-compliance with the Airport rules, regulations and/or safety plans shall be suspension of driving privileges and or suspension of airport access.
- d. The Contractor shall be responsible for controlling access to the work area and ensuring that airport security is maintained at all times. The FAA can impose fines of \$10,000 or more for security violations and incursions into active aircraft operation areas. The Contractor shall pay all fines assessed against the airport due to violations caused by the Contractor and his/her personnel, subcontractors and vendors.

- e. Any construction related runway incursion, as described in Section 1 – *Special Conditions* will require immediate suspension of all construction activity on the airport until a thorough investigation on cause is completed.

**Expulsion of Non-compliant Employees:**

- a. The MHT Operations and Maintenance Management may permanently prohibit any consultant, or contract employee, acting in violation with Airport rules and regulations from entering or working on Airport property.

**13. SPECIAL CONDITIONS:**

**Aircraft in Distress:**

- a. MHT Operations and Maintenance, the RPR, and/or the Contractor Superintendent will immediately clear all construction personnel of all runways and approach areas upon monitoring a distress call on the airport ground frequency. See Section 5 – *Contractor Access*, for ground frequency monitoring requirements.

**Aircraft Accident:**

- a. The Contractor will notify MHT Operations and Maintenance of any suspicious persons or behavior on Airport property. No unauthorized vehicles shall enter through the construction access gates.
- b. There are four categories of runway incursions:
  - Category A is a serious incident in which a collision was narrowly avoided.
  - Category B is an incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.
  - Category C is an incident characterized by ample time and/or distance to avoid a collision.
  - Category D is an incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.
- c. Incursions will be prevented by thorough training of ground vehicle operators; radio communication; coordination among all parties; and clearly marking the boundaries of construction operations established in this safety plan. Construction related runway incursion will be subject to penalties as described in Section 12 – *Penalties*.
- d. All construction personnel will immediately vacate Airport property and remain off until cleared by the MHT Operations and Maintenance Management.

**Vehicle / Pedestrian Deviation (V/PD)**

- a. MHT Operations and Maintenance Management may temporarily suspend construction on the Air Operations Area (AOA) in the event of a non-construction related V/PD. See Section 12 – *Penalties*, for construction related construction suspension V/PD procedures.

**14. RUNWAY AND TAXIWAY VISUAL AIDS:**

**Temporary Runway Closures:**

- a. Runway 35 will be on scheduled operations, or 15-minute recall basis, for landings daily during work hours for both phases. Runway 35 will be open for landing during non-work hours. Refer to Section 3 *Areas and Operations Affected by Construction* and Appendix B for details.

**Temporary Taxiway Closures:**

- a. Taxiway A1 will be closed for the duration of Work Area 1 and Taxiway A2 will be closed for the duration of Work Area 2 as outlined in the phasing plan located in Appendix B.
- b. Closures will use barricades and/or channelizer cones as outlined in Section 16, *Hazard Marking and Lighting*, and as shown on the phasing plan located in Appendix B.

**Runway Safety Areas:**

- a. The Contractor will delineate work areas that abut the Runway Safety Area or other aircraft protection areas with traffic cone/stake delineation or barricades, as indicated on the phasing plan, or other measures acceptable to the MHT Operations and Maintenance Management.

**Taxiway Visual Aids:**

- a. Guidance signs on taxiways closed for the entire phase duration shall be covered or have temporary blank panels installed. Whereas, guidance signs for taxiways and/or runways guidance signs for phases having a daily closure will not be required to be covered.

**Temporary Pavement Markings:**

- a. No temporary pavement markings are required.

**15. MARKINGS AND SIGNS FOR ACCESS ROUTES:**

**Haul Route Markings:**

- a. There are no markings or signs proposed for the Contractor haul routes since the Contractor will be under escort, except there will be barricades/cones adjacent to active aircraft areas.

**16. HAZARD MARKING AND LIGHTING**

**All Phases**

- a. Construction low-profile barricades and/or channelizer cones will be used to delineate all closed construction airfield movement areas from the active aircraft.
- b. Barricades and cones shall be provided as shown on the phasing plans in Appendix B. These devices will delineate closed taxi routes that are not available to air traffic and will ensure that the Contractor's vehicles will not interfere with airport operations.
- c. Barricades and cones shall be weighted to protect against inadvertent movement from wind currents or prop/jet wash. These materials will be securely fastened to prevent FOD.
- d. Cones will be at 4' maximum intervals and low-profile barricades will be interlocking.
- e. For night-time closures, barricades and cones will be equipped with a flashing or steady-burn light (red in color) meeting the luminescence requirements of NHDOT and have a maximum spacing of 10'.
- f. Supplemental signs (i.e. "No Entry") and barricades will be used, as required, to limit vehicle movement.
- g. The Contractor shall maintain all barricades and cones as required and will have an "On-Call" person available for 24 hours/day, for emergency maintenance.

**17. PROTECTION OF AREAS, ZONES, & SURFACES:**

- a. The Airport will remain open during the project.
- b. Construction equipment is not anticipated to penetrate the Runway 35 approach surface, but will be within the Runway Approach Protection Zone. See Section 9 – *Notification of Construction Activities*, for 7460 case file information.
- c. All Safety Areas (SAs), Object Free Areas (OFAs) and Obstacle Free Zones (OFZs) will

- be protected from construction activity using the temporary barricades described in Section 16 – *Hazard Marking & Lighting*, and as depicted on the phasing plans.
- d. The Contractor will be responsible to instruct all workers and subcontractors on where travel is permitted on the Airport property. The Contractor will also instruct all subcontractors on the vehicle identification requirements as described in Section 5 – *Contractor Access*.
  - e. Open trenches or excavations are not permitted within the safety area adjacent to active Runways or Taxiways, unless temporarily allowed by the Resident Project Representative with special precautions (i.e. plates over a small width trench).
  - f. Open trenches or excavations must be prominently marked.

## **18. OTHER LIMITS ON CONSTRUCTION:**

### **Prohibitions:**

- a. Cranes and other tall equipment (i.e. concrete pumpers, etc.) will not be deployed without a 7460 approval determination letter.
- b. Open flame welding, torches, and flare pots will not be used at any time.
- c. No blasting (with electronic blasting caps) will be permitted for this project.
- d. Smoking is not allowed on the AOA.

### **Restrictions:**

- a. Calendar days for phases are consecutive, except as noted in Section 2 *Phasing* or in the phasing plans in Appendix B. Once work has begun in an area the area must be worked daily during work hours until the work area is complete, unless otherwise allowed by the phasing plans in Appendix B.
- b. Refer to Section 2 – *Phasing* for restrictions on calendar days or limits on the number of hours for each phase of the project.
- c. The Contractor's work hours will be limited to 7:00 AM to 5:00 PM, Monday through Friday, unless otherwise authorized by the MHT Operations and Maintenance Management. No work shall be permitted on Sundays or legal holidays, except in cases of emergency. No work will be permitted at night unless approved by the MHT Operations and Maintenance Management and sufficient lighting is provided to ensure a comparable degree of accuracy, workmanship, and conditions regarding safety as would be obtained in daylight.

## **19. AIRPORT WATCH PROGRAM.**

The "Airport Watch Program" was established to visually remind all Airport employees, users, and tenants of their role in maintaining a safe and secure Airport. If you see something suspicious, report it to your supervisor and to the Airport Communications Center immediately. With the willing assistance of many watchful eyes and alert ears, the Airport will remain a safe and secure environment for travelers, employees, contractors, and the general public.

THIS PAGE INTENTIONALLY LEFT BLANK

CSPP Appendix A  
**KEY PERSONNEL CONTACT LIST**

THIS PAGE INTENTIONALLY LEFT BLANK



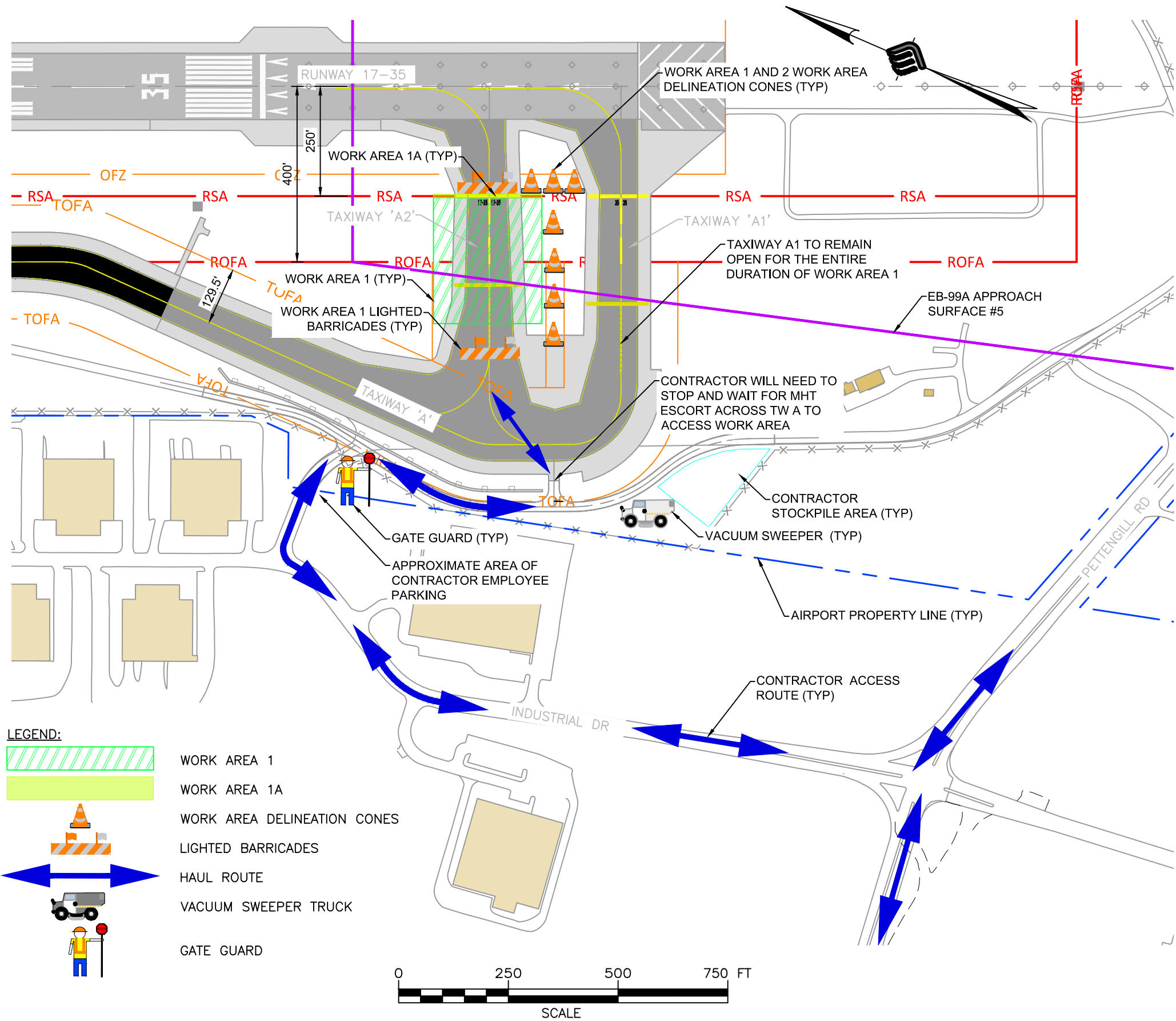
**CSPP Appendix A – Key Personnel Contact List**

<b>KEY PERSONNEL &amp; CONTACT LIST</b>		
<b>Communications Office (24 hour line)</b>	<b>Emergency:</b>	(603) 628-6222
	<b>Non-Emergency:</b>	(603) 624-6439
<b>Carlton Braley</b>	<b>Airport Operations &amp; Facilities, Asst. Dir.</b>	Manchester Boston Regional Airport
Office:	(603) 624-6539	1 Airport Road, Suite 300
Cell:	(603) 396-0707	Manchester, NH 03103
E-Mail:	cbraley@flymanchester.com	
<b>Andrew Fournier</b>	<b>Airport Operations, Superintendent</b>	Manchester Boston Regional Airport
Office:	(603) 624-6592	Operations and Maintenance
Cell:	(603) 344-3127	402 Kelly Avenue
E-Mail:	afournier@flymanchester.com	Manchester, NH 03103
<b>Dennis Duhaime</b>	<b>Airport Maintenance, Superintendent</b>	Manchester Boston Regional Airport
Office:	(603) 624-6592	Operations and Maintenance
Cell:	(603) 340-7459	402 Kelly Avenue
E-Mail:	dhduhaime@flymanchester.com	Manchester, NH 03103
<b>Mark Blad</b>	<b>MHT ATC Air Traffic Manager</b>	8 Ammon Drive
Office:	(603) 621-1701	Manchester, NH 03103
ATCT Gen. Phone:	(603) 621-1700	
Cell:	(603) 779-4301	
Email:	Mark.Blad@faa.gov	
<b>Jen Levie</b>	<b>MHT FAA Technical Operations</b>	FAA Granite State SSC
Office:	(603)	25 Robert Milligan Pkwy
Cell:	(603) 759-4883	Merrimack, NH 03054
<b>Craig Pankey</b>	<b>BCT MHT SSC A Manager, Acting</b>	FAA Granite State SSC
Office:	(603) 594-5405	25 Robert Milligan Pkwy
Cell:		Merrimack, NH 03054
<b>Kevin Belanger</b>	<b>Manchester SSC B Manager</b>	FAA Granite State SSC
Office:	(603) 594-5404	25 Robert Milligan Pkwy
Cell:	(603) 493-8242	Merrimack, NH 03054
Email:	kevin.belanger@faa.gov	
<b>John Kirkendall</b>	<b>FAA Airports Div., Project Manager</b>	FAA Airports Division ANE-600
Office:	781-238-7626 New England Division	1200 District Avenue
Cell:	(603) 738-2920	Burlington, MA 01803
E-mail:	john.m.kirkendall@faa.gov	
<b>Radio: Manchester Ground (ATCT):</b>	<b>121.9 MHz</b>	
<b>UNICOM Frequency:</b>	<b>122.95 MHz</b>	
<b>Police (Manchester Airport):</b>	Non Emergency: (603)-624-6349	
	<b>Emergencies: CALL 911 or Comm Center (603) 628-6222</b>	
<b>Fire (Manchester Airport):</b>	Non Emergency: (603)-624-1614	
	<b>Emergencies: CALL 911 or Comm Center (603) 628-6222</b>	

<b>KEY PERSONNEL &amp; CONTACT LIST – CONT.</b>		
<b>Scott Shillieto</b> Office: Cell: Fax: E-Mail:	<b>Deputy Project Manager</b> (603) 225-2978 (in Concord) (413) 427-2650 (603) 225-0095 (in Concord) sshillieto@mjinc.com	McFarland Johnson 53 Regional Drive Concord, NH 03301
<b>Brian Bennett</b> Office: Cell: Fax: E-Mail:	<b>Project Manager</b> (603) 225-2978 (in Concord) (603) 340-0437 (603) 225-0095 (in Concord) bbennett@mjinc.com	McFarland Johnson 53 Regional Drive Concord, NH 03301
<b>CONTRACTOR</b> Office: Cell: Fax: E-Mail:	<b>Site Superintendent</b> TBD TBD TBD TBD	<b>TBD</b>
<b>CONTRACTOR</b> Office: Cell: Fax: E-Mail:	<b>Project Manager</b> TBD TBD TBD TBD	<b>TBD</b>

CSPP Appendix B  
**PHASING PLAN**

PAGE LEFT BLANK INTENTIONALLY



**WORK AREA 1:** WORK AREA 1 CONSISTS OF WORK WITHIN THE LIMITS OF TAXIWAY A2 BETWEEN THE TAXIWAY A TOFA AND THE RUNWAY 17-35 RSA

**DURATION:** 15 CONSECUTIVE CALENDAR DAYS FROM THE NOTICE TO PROCEED

**CLOSURES:** TAXIWAY A2  
RUNWAY 35 LANDINGS - 15-MINUTE RECALL FOR PULL-BACK

- PRIMARY WORK TO BE PERFORMED IN WORK AREA 1:**
- MILL EXISTING PAVEMENT FOR WIDTH OF TAXIWAY FOR SURFACE PAINTED HOLD SIGN AREA
  - REMOVE EXISTING ELEVATED RUNWAY GUARD LIGHTS
  - REMOVE EXISTING IN-PAVEMENT RUNWAY GUARD LIGHT SYSTEMS AND INSTALL NEW BASE MATERIAL
  - REMOVE EXISTING RUNWAY SAFETY AREA GUIDANCE SIGN AND CABLING
  - REMOVE EXISTING ENHANCED CENTERLINE MARKING
  - INSTALL NEW PAVEMENT FOR WIDTH OF TAXIWAY FOR SURFACE PAINTED HOLD SIGN AND IN-PAVEMENT RUNWAY GUARD LIGHTS
  - INSTALL EXISTING ELEVATED GUARD LIGHTS ON NEW CANS AT THE RUNWAY APPROACH HOLD LOCATION, ALONG WITH REQUIRED CONDUIT AND WIRING
  - REPLACE EXISTING RUNWAY SAFETY AREA GUIDANCE SIGN PANELS TO THE EXISTING RUNWAY APPROACH GUIDANCE SIGN
  - INSTALL IN-PAVEMENT GUARD LIGHTS AT THE RUNWAY APPROACH HOLD LOCATION
  - MARK REPLACEMENT SECTION OF CENTERLINE FROM RUNWAY SAFETY AREA EDGE TO RUNWAY APPROACH HOLD LINE, SURFACE PAINTED HOLD SIGNS AT THE RUNWAY APPROACH HOLD LINE, AND REPLACEMENT SECTION OF TAXIWAY EDGE MARKINGS

**WORK AREA 1A:** WORK AREA 1A CONSISTS OF WORK IN THE LIMITS OF TAXIWAY A2 WITHIN THE RUNWAY 17-35 RSA (APPROXIMATELY 20 FEET)

**DURATION:** 3 CALENDAR DAYS (NON-CONSECUTIVE) WITHIN WORK AREA 1 TIME DURATION

**CLOSURES:** TAXIWAY A2  
RUNWAY 17-35 PPR WITH 30-MINUTE RECALL FOR PULL-BACK

- PRIMARY WORK TO BE PERFORMED IN WORK AREA 1A:**
- MILL EXISTING PAVEMENT
  - INSTALL NEW PAVEMENT
  - MARK REPLACEMENT SECTION OF TAXIWAY A2 CENTERLINE AND TAXIWAY EDGE MARKINGS

**NOTE:** TAXIWAY A1 WILL BE OPEN DURING PHASE 1 WORK.

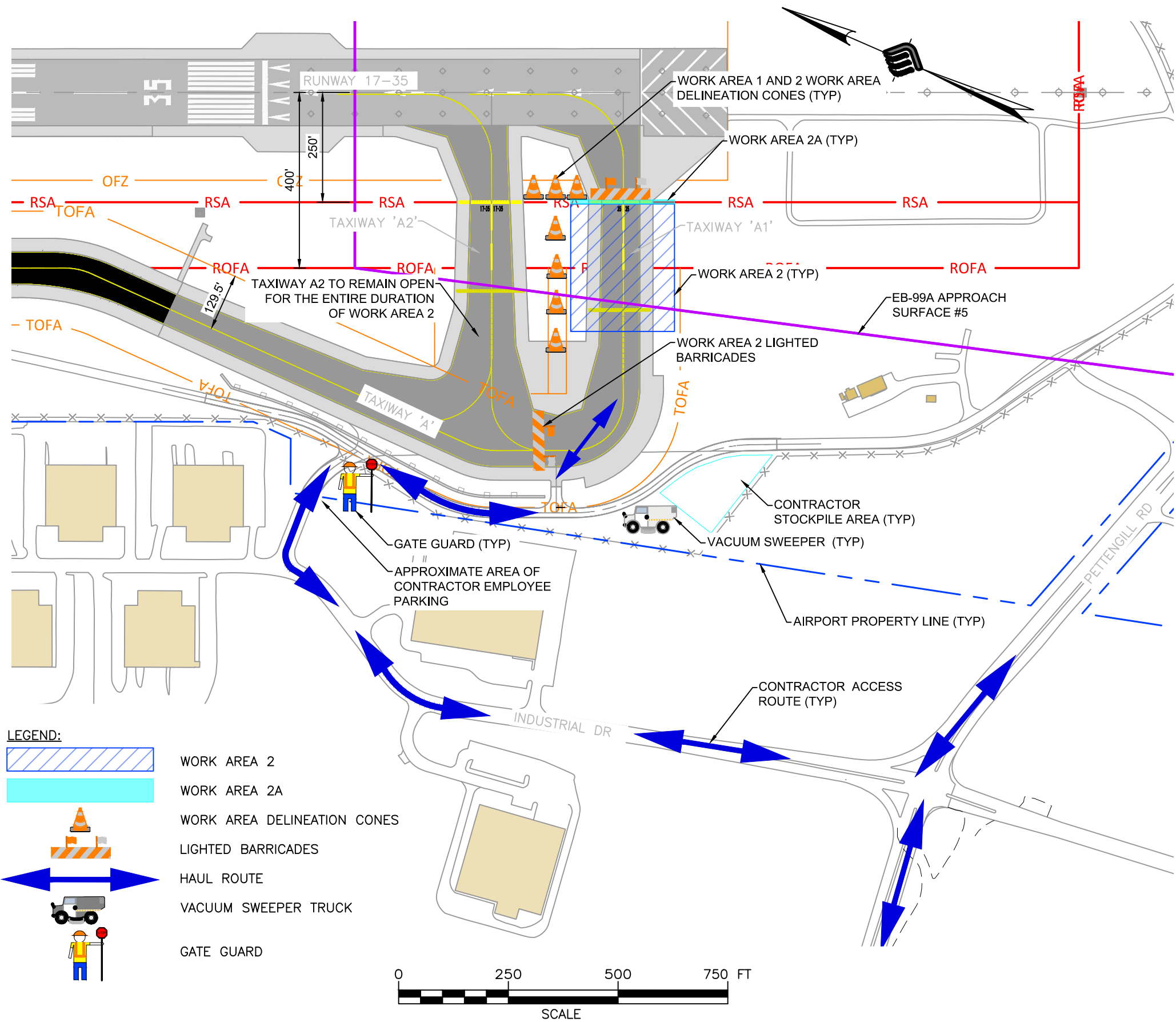
**DRAFT - 11/16/20**



IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECT DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

**MANCHESTER-BOSTON REGIONAL AIRPORT**  
**MANCHESTER, NEW HAMPSHIRE**  
**(RIM) PROJECT - TAXIWAYS A1 AND A2 HOLD LINE RECONFIGURATION**  
**CONSTRUCTION SAFETY AND PHASING PLAN - PHASE 1**

SCALE:	1"=250'
DRAWN:	RHL
CHECKED:	BMB
DESIGN:	SSS
PROJECT:	18700.03
DATE:	NOVEMBER 2020



**WORK AREA 2:** WORK AREA 2 CONSISTS OF WORK WITHIN THE LIMITS OF TAXIWAY A1 BETWEEN TAXIWAY A TOFA AND THE RUNWAY 17-35 RSA

**DURATION:** 15 CONSECUTIVE CALENDAR DAYS FROM THE COMPLETION OF WORK AREA 1 WORK

**CLOSURES:** TAXIWAY A1  
RUNWAY 35 LANDINGS - 15-MINUTE RECALL FOR PULL-BACK

- PRIMARY WORK TO BE PERFORMED IN WORK AREA 2:**
- MILL EXISTING PAVEMENT FOR WIDTH OF TAXIWAY FOR SURFACE PAINTED HOLD SIGN AREA
  - REMOVE EXISTING ELEVATED RUNWAY GUARD LIGHTS
  - REMOVE EXISTING IN-PAVEMENT RUNWAY GUARD LIGHT SYSTEMS AND INSTALL NEW BASE MATERIAL
  - REMOVE EXISTING RUNWAY SAFETY AREA GUIDANCE SIGN AND CABLING
  - REMOVE EXISTING ENHANCED CENTERLINE MARKING
  - INSTALL NEW PAVEMENT FOR WIDTH OF TAXIWAY FOR SURFACE PAINTED HOLD SIGN AND IN-PAVEMENT RUNWAY GUARD LIGHTS
  - INSTALL EXISTING ELEVATED GUARD LIGHTS ON NEW CANS AT THE RUNWAY APPROACH HOLD LOCATION, ALONG WITH REQUIRED CONDUIT AND WIRING
  - REPLACE EXISTING RUNWAY SAFETY AREA GUIDANCE SIGN PANELS TO THE EXISTING RUNWAY APPROACH GUIDANCE SIGN
  - INSTALL IN-PAVEMENT GUARD LIGHTS AT THE RUNWAY APPROACH HOLD LOCATION
  - MARK REPLACEMENT SECTION OF CENTERLINE FROM RUNWAY SAFETY AREA EDGE TO RUNWAY APPROACH HOLD LINE, SURFACE PAINTED HOLD SIGNS AT THE RUNWAY APPROACH HOLD LINE, AND REPLACEMENT SECTION OF THE TAXIWAY EDGE MARKINGS

**WORK AREA 2A:** WORK AREA 2A CONSISTS OF WORK IN THE LIMITS OF TAXIWAY A1 WITHIN THE RUNWAY 17-35 RSA (APPROXIMATELY 20 FEET)

**DURATION:** 3 CALENDAR DAYS (NON-CONSECUTIVE) WITHIN WORK AREA 2 DURATION

**CLOSURES:** TAXIWAY A1  
RUNWAY 17-35 PPR WITH 30-MINUTE RECALL FOR PULL-BACK

- PRIMARY WORK TO BE PERFORMED IN WORK AREA 2A:**
- MILL EXISTING PAVEMENT
  - INSTALL NEW PAVEMENT
  - MARK REPLACEMENT SECTION OF TAXIWAY A1 CENTERLINE AND TAXIWAY EDGE MARKINGS

**NOTE:** TAXIWAY A2 WILL BE OPEN DURING PHASE 2 WORK.

DRAFT - 11/16/20



IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECT DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

**MANCHESTER-BOSTON REGIONAL AIRPORT**  
**MANCHESTER, NEW HAMPSHIRE**  
**(RIM) PROJECT - TAXIWAYS A1 AND A2 HOLD LINE RECONFIGURATION**  
**CONSTRUCTION SAFETY AND PHASING PLAN - PHASE 2**

SCALE:	1"=250'
DRAWN:	RHL
CHECKED:	BMB
DESIGN:	SSS
PROJECT:	18700.03
DATE:	NOVEMBER 2020

CSPP Appendix C  
**SAFETY AND PHASING PLAN CHECKLIST**

PAGE LEFT BLANK INTENTIONALLY



**APPENDIX C. SAFETY AND PHASING PLAN CHECKLIST**

This appendix is keyed to Chapter 2. In the electronic version of this AC, clicking on the paragraph designation in the Reference column will access the applicable paragraph. There may be instances where the CSPP requires provisions that are not covered by the list in this appendix.

This checklist is intended as an aid, not a required submittal.

**Table C-1. CSPP Checklist**

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
General Considerations					
Requirements for predesign, prebid, and preconstruction conferences to introduce the subject of airport operational safety during construction are specified.	<u>2.5</u>	X			
Operational safety is a standing agenda item for construction progress meetings.	<u>2.5</u>	X			
Scheduling of the construction phases is properly addressed.	<u>2.6</u>	X			
Any formal agreements are established.	<u>2.5.3</u>	X			
Areas and Operations Affected by Construction Activity					
Drawings showing affected areas are included.	<u>2.7.1</u>	X			
Closed or partially closed runways, taxiways, and aprons are depicted on drawings.	<u>2.7.1.1</u>	X			
Access routes used by ARFF vehicles affected by the project are addressed.	<u>2.7.1.2</u>	X			
Access routes used by airport and airline support vehicles affected by the project are addressed.	<u>2.7.1.3</u>	X			
Underground utilities, including water supplies for firefighting and drainage.	<u>2.7.1.4</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Approach/departure surfaces affected by heights of temporary objects are addressed.	<u>2.7.1.5</u>	X			
Construction areas, storage areas, and access routes near runways, taxiways, aprons, or helipads are properly depicted on drawings.	<u>2.7.1</u>	X			
Temporary changes to taxi operations are addressed.	<u>2.7.2.1</u>	X			
Detours for ARFF and other airport vehicles are identified.	<u>2.7.2.2</u>	X			
Maintenance of essential utilities and underground infrastructure is addressed.	<u>2.7.2.3</u>	X			
Temporary changes to air traffic control procedures are addressed.	<u>2.7.2.4</u>	X			
<b>NAVAIDs</b>					
Critical areas for NAVAIDs are depicted on drawings.	<u>2.8</u>	X			
Effects of construction activity on the performance of NAVAIDS, including unanticipated power outages, are addressed.	<u>2.8</u>	X			
Protection of NAVAID facilities is addressed.	<u>2.8</u>	X			
The required distance and direction from each NAVAID to any construction activity is depicted on drawings.	<u>2.8</u>	X			
Procedures for coordination with FAA ATO/Technical Operations, including identification of points of contact, are included.	<u>2.8, 2.13.1, 2.13.5.3.1, 2.18.1</u>	X			
<b>Contractor Access</b>					
The CSPP addresses areas to which contractor will have access and how	<u>2.9</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
the areas will be accessed.					
The application of 49 CFR Part 1542 Airport Security, where appropriate, is addressed.	<u>2.9</u>	X			
The location of stockpiled construction materials is depicted on drawings.	<u>2.9.1</u>	X			
The requirement for stockpiles in the ROFA to be approved by FAA is included.	<u>2.9.1</u>	X			
Requirements for proper stockpiling of materials are included.	<u>2.9.1</u>	X			
Construction site parking is addressed.	<u>2.9.2.1</u>	X			
Construction equipment parking is addressed.	<u>2.9.2.2</u>	X			
Access and haul roads are addressed.	<u>2.9.2.3</u>	X			
A requirement for marking and lighting of vehicles to comply with <u>AC 150/5210-5, Painting, Marking and Lighting of Vehicles Used on an Airport</u> , is included.	<u>2.9.2.4</u>	X			
Proper vehicle operations, including requirements for escorts, are described.	<u>2.9.2.5, 2.9.2.6</u>	X			
Training requirements for vehicle drivers are addressed.	<u>2.9.2.7</u>	X			
Two-way radio communications procedures are described.	<u>2.9.2.9</u>	X			
Maintenance of the secured area of the airport is addressed.	<u>2.9.2.10</u>	X			
<b>Wildlife Management</b>					
The airport operator's wildlife management procedures are addressed.	<u>2.10</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Foreign Object Debris Management					
The airport operator’s FOD management procedures are addressed.	<u>2.11</u>	X			
Hazardous Materials Management					
The airport operator’s hazardous materials management procedures are addressed.	<u>2.12</u>	X			
Notification of Construction Activities					
Procedures for the immediate notification of airport user and local FAA of any conditions adversely affecting the operational safety of the airport are detailed.	<u>2.13</u>	X			
Maintenance of a list by the airport operator of the responsible representatives/points of contact for all involved parties and procedures for contacting them 24 hours a day, seven days a week is specified.	<u>2.13.1</u>	X			
A list of local ATO/Technical Operations personnel is included.	<u>2.13.1</u>	X			
A list of ATCT managers on duty is included.	<u>2.13.1</u>	X			
A list of authorized representatives to the OCC is included.	<u>2.13.2</u>	X			
Procedures for coordinating, issuing, maintaining and cancelling by the airport operator of NOTAMS about airport conditions resulting from construction are included.	<u>2.8, 2.13.2, 2.18.3.3.9</u>	X			
Provision of information on closed or hazardous conditions on airport movement areas by the airport operator to the OCC is specified.	<u>2.13.2</u>	X			
Emergency notification procedures for medical, fire fighting, and police	<u>2.13.3</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
response are addressed.					
Coordination with ARFF personnel for non-emergency issues is addressed.	<u>2.13.4</u>	X			
Notification to the FAA under 14 CFR parts 77 and 157 is addressed.	<u>2.13.5</u>	X			
Reimbursable agreements for flight checks and/or design and construction for FAA owned NAVAIDs are addressed.	<u>2.13.5.3.2</u>	X			
<b>Inspection Requirements</b>					
Daily and interim inspections by both the airport operator and contractor are specified.	<u>2.14.1, 2.14.2</u>	X			
Final inspections at certificated airports are specified when required.	<u>2.14.3</u>	X			
<b>Underground Utilities</b>					
Procedures for protecting existing underground facilities in excavation areas are described.	<u>2.15</u>	X			
<b>Penalties</b>					
Penalty provisions for noncompliance with airport rules and regulations and the safety plans are detailed.	<u>2.16</u>	X			
<b>Special Conditions</b>					
Any special conditions that affect the operation of the airport or require the activation of any special procedures are addressed.	<u>2.17</u>	X			
<b>Runway and Taxiway Visual Aids - Marking, Lighting, Signs, and Visual NAVAIDs</b>					
The proper securing of temporary airport markings, lighting, signs, and visual NAVAIDs is addressed.	<u>2.18.1</u>	X			
Frangibility of airport markings, lighting, signs, and visual NAVAIDs is specified.	<u>2.18.1, 2.18.3, 2.18.4.2, 2.20.2.4</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
The requirement for markings to be in compliance with <u>AC 150/5340-1</u> , <i>Standards for Airport Markings</i> , is specified.	<u>2.18.2</u>	X			
Detailed specifications for materials and methods for temporary markings are provided.	<u>2.18.2</u>	X			
The requirement for lighting to conform to <u>AC 150/5340-30</u> , <i>Design and Installation Details for Airport Visual Aids</i> ; <u>AC 150/5345-50</u> , <i>Specification for Portable Runway and Taxiway Lights</i> ; and <u>AC 150/5345-53</u> , <i>Airport Lighting Certification Program</i> , is specified.	<u>2.18.3</u>	X			
The use of a lighted X is specified where appropriate.	<u>2.18.2.1.2</u> , <u>2.18.3.2</u>	X			
The requirement for signs to conform to <u>AC 150/5345-44</u> , <i>Specification for Runway and Taxiway Signs</i> ; <u>AC 150/5340-18</u> , <i>Standards for Airport Sign Systems</i> ; and <u>AC 150/5345-53</u> , <i>Airport Lighting Certification Program</i> , is specified.	<u>2.18.4</u>	X			
<b>Marking and Signs For Access Routes</b>					
The CSPP specifies that pavement markings and signs intended for construction personnel should conform to <u>AC 150/5340-18</u> and, to the extent practicable, with the MUTCD and/or State highway specifications.	<u>2.18.4.2</u>	X			
<b>Hazard Marking and Lighting</b>					
Prominent, comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles are specified.	<u>2.20.1</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Hazard marking and lighting are specified to identify open manholes, small areas under repair, stockpiled material, and waste areas.	<u>2.20.1</u>	X			
The CSPP considers less obvious construction-related hazards.	<u>2.20.1</u>	X			
Equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash and jet blast is specified.	<u>2.20.2.1</u>	X			
The spacing of barricades is specified such that a breach is physically prevented barring a deliberate act.	<u>2.20.2.1</u>	X			
Red lights meeting the luminance requirements of the State Highway Department are specified.	<u>2.20.2.2</u>	X			
Barricades, temporary markers, and other objects placed and left in areas adjacent to any open runway, taxiway, taxi lane, or apron are specified to be as low as possible to the ground, and no more than 18 inch high.	<u>2.20.2.3</u>	X			
Barricades are specified to indicate construction locations in which no part of an aircraft may enter.	<u>2.20.2.3</u>	X			
Highly reflective barriers with lights are specified to barricade taxiways leading to closed runways.	<u>2.20.2.5</u>	X			
Markings for temporary closures are specified.	<u>2.20.2.5</u>	X			
The provision of a contractor's representative on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades is specified.	<u>2.20.2.7</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Work Zone Lighting for Nighttime Construction					
If work is to be conducted at night, the CSPP identifies construction lighting units and their general locations and aiming in relationship to the ATCT and active runways and taxiways.	<u>2.21</u>	X			
Protection of Runway and Taxiway Safety Areas					
The CSPP clearly states that no construction may occur within a safety area while the associated runway or taxiway is open for aircraft operations.	<u>2.22.1.1,</u> <u>2.22.3.1</u>	X			
The CSPP specifies that the airport operator coordinates the adjustment of RSA or TSA dimensions with the ATCT and the appropriate FAA Airports Regional or District Office and issues a local NOTAM.	<u>2.22.1.2,</u> <u>2.22.3.2</u>	X			
Procedures for ensuring adequate distance for protection from blasting operations, if required by operational considerations, are detailed.	<u>2.22.3.3</u>	X			
The CSPP specifies that open trenches or excavations are not permitted within a safety area while the associated runway or taxiway is open, subject to approved exceptions.	<u>2.22.1.4</u>	X			
Appropriate covering of excavations in the RSA or TSA that cannot be backfilled before the associated runway or taxiway is open is detailed.	<u>2.22.1.4</u>	X			
The CSPP includes provisions for prominent marking of open trenches and excavations at the construction site.	<u>2.22.1.4</u>	X			
Grading and soil erosion control to maintain RSA/TSA standards are	<u>2.22.3.5</u>	X			



Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
addressed.					
The CSPP specifies that equipment is to be removed from the ROFA when not in use.	<u>2.22.2</u>	X			
The CSPP clearly states that no construction may occur within a taxiway safety area while the taxiway is open for aircraft operations.	<u>2.22.3</u>	X			
Appropriate details are specified for any construction work to be accomplished in a taxiway object free area.	<u>2.22.4</u>	X			
Measures to ensure that personnel, material, and/or equipment do not penetrate the OFZ or threshold siting surfaces while the runway is open for aircraft operations are included.	<u>2.22.4.3.6</u>	X			
Provisions for protection of runway approach/departure areas and clearways are included.	<u>2.22.6</u>	X			
<b>Other Limitations on Construction</b>					
The CSPP prohibits the use of open flame welding or torches unless adequate fire safety precautions are provided and the airport operator has approved their use.	<u>2.23.1.2</u>	X			
The CSPP prohibits the use of electrical blasting caps on or within 1,000 ft (300 m) of the airport property.	<u>2.23.1.3</u>	X			

PAGE INTENTIONALLY LEFT BLANK

CSPP Appendix D  
**DAILY SAFETY INSPECTION CHECKLIST**

PAGE LEFT BLANK INTENTIONALLY

CSPP Appendix E  
**SAFETY PLAN COMPLIANCE DOCUMENT**

PAGE LEFT BLANK INTENTIONALLY

## APPENDIX E

### SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)

This document **MUST** be submitted and approved prior to the Notice to Proceed being issued.

**Name of Contractor:** \_\_\_\_\_

**Project Name:**    **RIM Project - Taxiways A1 and A2 Hold Line Reconfiguration**  
                             **Manchester-Boston Regional Airport, Manchester, New Hampshire**

Please check appropriate box for each of sections. If the Construction Phasing and Safety Plan will be followed without exception for any given topic, the "No Supplemental Information" box may be checked. If not, provide supplemental information components and comment as applicable (add attachments as needed). Any comments below will be discussed and require approval of the Airport prior to issuance of a Notice to Proceed.

- (1)    **Coordination.** Discuss details of proposed safety meetings with the airport operator and with contractor and subcontractor employees.

☐ **No Supplemental Information**                      ☐ **Supplemental Information as follows:**

---

---

---

- (2)    **Phasing.** Discuss proposed construction schedule elements:

☐ **No Supplemental Information**                      ☐ **Supplemental Information as follows:**

- (a) Planned duration of each phase:

Provide anticipated duration for each work phase via attachment.

- (b) Daily start and finish of construction, including "night only" construction:

Provide anticipated daily start/finish for each phase via attachment.

- (c) Duration of construction activities during:

(i) Normal runway operations \_\_\_\_\_

(ii) Closed runway operations \_\_\_\_\_

(iii) Modified runway "Aircraft Reference Code" usage \_\_\_\_\_

- (3)    **Areas and operations affected by the construction activity.** Areas and operations are identified in the CSPP.

☐ **No Supplemental Information**                      ☐ **Supplemental Information as follows:**

---

---

---

---

---

- (4) **Protection of NAVAIDs.** Discuss specific methods proposed to protect operating NAVAIDs.

☐ No Supplemental Information

☐ Supplemental Information as follows:

---

---

---

- (5) **Contractor access.** Provide the following:

☐ No Supplemental Information

☐ Supplemental Information as follows:

- (a) Details on how the contractor will maintain the integrity of the airport security fence (gate guards, daily log of construction personnel, and other):

---

---

---

- (b) Listing of individuals requiring driver training (for certificated airports and as requested). \_\_\_\_\_

---

---

- (c) Radio communications.

(i) Types of radios and backup capabilities. \_\_\_\_\_

(ii) Who will be monitoring radios. \_\_\_\_\_

(iii) Whom to contact if the ATCT cannot reach the contractor's designated person by radio. \_\_\_\_\_

- (d) Details on how the contractor will escort material delivery vehicles. \_\_\_\_\_

---

---

- (6) **Wildlife management.** Discuss the following:

☐ No Supplemental Information

☐ Supplemental Information as follows:

- (a) Methods and procedures to prevent wildlife attraction \_\_\_\_\_

---

- (b) Wildlife reporting procedures \_\_\_\_\_

---

- (7) **Foreign Object Debris (FOD) management.** Discuss equipment and methods for control of FOD, including construction debris and dust.

☐ No Supplemental Information

☐ Supplemental Information as follows:

Provide anticipated equipment and methods via attachment.



- (8) **Hazardous material (HAZMAT) management.** Discuss equipment and methods for responding to hazardous spills.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

- (9) **Notification of construction activities.** Provide the following:

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

(a) Contractor points of contact \_\_\_\_\_

(b) Contractor emergency contact \_\_\_\_\_

(c) Listing of tall or other requested equipment proposed for use on the airport and the timeframe for submitting 7460-1 forms not previously submitted by the airport operator \_\_\_\_\_

---

- (10) **Inspection requirements.** Discuss daily (or more frequent) inspections and special inspection procedures.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

- (11) **Underground utilities.** Discuss proposed methods of identifying and protecting underground utilities.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

- (12) **Penalties.** Penalties are identified in the CSPP.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

- (13) **Special conditions.** Discuss proposed actions for each special condition identified in the CSPP as required.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

**(14) Runway and taxiway visual aids.** Including marking, lighting, signs, and visual NAVAIDs. Discuss proposed visual aids including the following:

(a) Equipment and methods for covering signage and airfield lights \_\_\_\_\_

\_\_\_\_\_

(b) Equipment and methods for temporary closure markings (paint, fabric, other) \_\_\_\_\_

\_\_\_\_\_

(c) Types of temporary Visual Guidance Slope Indicators (VGSI) \_\_\_\_\_

\_\_\_\_\_

**(15) Marking and signs for access routes.** Discuss proposed methods of demarcating access routes for vehicle drivers.

☐ No Supplemental Information

☐ Supplemental Information as follows:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**(16) Hazard marking and lighting.** Discuss proposed equipment and methods for identifying excavation areas.

☐ No Supplemental Information

☐ Supplemental Information as follows:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**(17) Protection of runway and taxiway safety areas.** Including object free areas, obstacle free zones, and approach/departure surfaces. Discuss proposed methods of identifying, demarcating, and protecting airport surfaces including:

☐ No Supplemental Information

☐ Supplemental Information as follows:

(a) Equipment and methods for maintaining Taxiway Safety Area standards \_\_\_\_\_

\_\_\_\_\_

(b) Equipment and methods for separation of construction operations from aircraft operations, including details of barricades \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(18) Other limitations on construction** These are identified in the CSPP.

☐ No Supplemental Information

**Supplemental Information as follows:**

---

---

---

**LIST OF ATTACHMENTS PROVIDED AS PART OF THE SAFETY PLAN COMPLIANCE DOCUMENT:**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

**Contractor's Certification and Acknowledgement**

I have read the Project Construction Safety and Phasing Plan (CSPP) for the above referenced project, which has been approved by FAA on \_\_\_\_\_, 20\_\_\_\_, and certify the Contractor and its subcontractors will abide by it as written, unless any additions and changes are approved by the Manchester-Boston Regional Airport in writing. This Safety Plan Compliance Document (SPCD) will conform to the CSPP and will provide additional safety information for the Project.

---

CONTRACTOR

---

Signature

---

Printed Name and Title

---

Date

**CONSTRUCTION SAFETY AND PHASING PLAN**  
**SCHEDULE B & C – TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**  
**(DRAFT PRIOR TO FAA DETERMINATION)**

THIS PAGE INTENTIONALLY LEFT BLANK

## **SUPPLEMENTAL PROVISIONS**

### **CONSTRUCTION SAFETY AND PHASING PLAN**

#### **A. GENERAL**

Construction Safety and Phasing Plan as submitted to FAA is attached as part of the Project Documents in Supplemental General Provisions as Section II.

The Contractor shall be responsible for controlling access to the work area and that airport security is maintained at all times. The FAA can impose fines of \$10,000 or more for security violations and incursions into active aircraft operation areas. The Contractor shall pay all fines assessed against the Airport due to violations caused by the Contractor and his/her personnel, subcontractors and vendors.

PAGE LEFT BLANK INTENTIONALLY



# **CONSTRUCTION SAFETY AND PHASING PLAN**

## **RUNWAY INCURSION MITIGATION PROJECT TAXIWAY H RECONFIGURATION TO TAXIWAY K**

**AT**



**MANCHESTER-BOSTON REGIONAL AIRPORT  
MANCHESTER, NEW HAMPSHIRE**

**AIRPORT IMPROVEMENT PROGRAM NO. 3-33-0011-XXX-2021**

Prepared by



53 Regional Drive  
Concord, NH 03301

**MARCH 2021 –DRAFT FOR BIDDING**

## Table of Contents

1.	COORDINATION.....	1
2.	PHASING .....	2
3.	AREAS AND OPERATIONS AFFECTED BY CONSTRUCTION: .....	5
4.	NAVIGATIONAL AID (NAVAID) PROTECTION: .....	13
5.	CONTRACTOR ACCESS: .....	14
6.	WILDLIFE MANAGEMENT .....	16
7.	FOD MANAGEMENT:.....	17
8.	HAZMAT MANAGEMENT:.....	17
9.	NOTIFICATION OF CONSTRUCTION ACTIVITIES: .....	17
10.	INSPECTION REQUIREMENTS:.....	18
11.	UNDERGROUND UTILITIES .....	19
12.	PENALTIES: .....	19
13.	SPECIAL CONDITIONS: .....	20
14.	RUNWAY AND TAXIWAY VISUAL AIDS: .....	21
15.	MARKINGS AND SIGNS FOR ACCESS ROUTES: .....	21
16.	HAZARD MARKING AND LIGHTING .....	21
17.	PROTECTION OF AREAS, ZONES, & SURFACES:.....	22
18.	OTHER LIMITS ON CONSTRUCTION:.....	22
19.	AIRPORT WATCH PROGRAM. ....	23

### CSPP Appendix List

CSPP Appendix A .....	Key Personnel Contact List
CSPP Appendix B.....	Airside Phasing Plan
CSPP Appendix C.....	Safety and Phasing Plan Checklist
CSPP Appendix D.....	Daily Safety Inspection Checklist
CSPP Appendix E.....	Safety Plan Compliance Document

## AIRPORT DESCRIPTION / AIRCRAFT OPERATIONS

Manchester Boston Regional Airport (MHT) located in Manchester and Londonderry, New Hampshire is a Part 139 commercial service airport with regularly scheduled passenger service, terminal building and air traffic control tower manned 24 hours per day.

MHT has a normal airport reference code (ARC) of D-IV. The airport has two paved runways: 17/35 and 6/24.

Runway 17/35 dimensions are 9250' x 150'. Runway 6/24 dimensions are 7650' x 150'. Navigational aids for the runways are as follows:

### **Runway 17:**

4-light PAPI - Right  
MALSR Approach lights  
ILS/DME

### **Runway 35:**

4-light PAPI - Left  
ALSF2 Approach Lights  
ILS/ DME

### **Runway 6:**

4-light PAPI - Left  
REILs  
ILS

### **Runway 24:**

4-light PAPI - Left  
REILs

The airport also has a VOR located towards the south of the airfield. This project is not within any portion of the VOR critical area.

## PROJECT DESCRIPTION

The Manchester-Boston Regional Airport (MHT) is proposing a taxiway reconfiguration project on the airfield adjacent to the Runway 17 End of Runway 17-35. The proposed project involves the reconfiguration of the northern portion of Taxiway H and Taxiway L pavements to mitigate the existing Federal Aviation Administration's (FAA) identified Hot Spot location (Hot Spot 1). Hot Spot 1 has nonstandard geometry and a wider than normal expanse of pavement that causes many safety issues and heightened risk of runway incursions. These issues will be mitigated by reconfiguring the existing taxiway layouts which will include reconfiguring a new pavement geometric layout and removals of existing pavements. The project will also involve Airfield Lighting Control and Monitoring System updates with graphic changes for the proposed layout modifications, new airfield lighting and signage systems for the new configuration, and drainage improvements. Scope of work items will include, but not be limited to: milling and removal of existing pavement, installation of new pavement to replace milled sections, new pavement sections for widening and new pavement areas, removal of existing elevated and in-pavement runway guard lights, installation of new elevated and in-pavement runway guard lights, removal of existing taxiway edge lights, installation of new taxiway edge lights, installation of new taxiway centerline lights, removal of existing guidance signs, installation of new runway guidance signs and foundations, replacement of existing guidance sign panels for existing guidance sign for new taxiway designation, new pavement markings, and turf restoration for disturbed areas.

## 1. COORDINATION

<b>Date</b>	<b>Attendees</b>	<b>Description</b>
June 2020	Design Engineer, MHT Staff, & FAA	Design Scoping Meeting
October 2020 to February 2021	Design Engineer, MHT Staff, & FAA	Design Coordination
January 2021	Design Engineer, MHT Staff & Tenants	Design Coordination
January to March 2021	Design Engineer, MHT Staff, & FAA	NAVAID Impact Coord.

**Preconstruction Conference:**

- Construction Safety and Phasing Plan (CSPP) & Safety Plan Compliance Document (SPCD) to be reviewed and discussed.
- Key Attendees:
  - Airport Management representatives
  - MHT Operations & Maintenance representatives
  - Design Engineer Representative
  - Contractor Superintendent
  - Subcontractor representative(s)
  - FAA MHT Service Sector Center (SSC) (Tech Ops) Representative(s)
  - FAA MHT ATCT Representative(s)
  - FAA Airports Project Manager

**During Construction:**

Daily Coordination Meeting will be held prior to starting work each day

- Standing Discussion Item will be the day's activities and safety of the project site
- Key Attendees:
  - MHT Operations and Maintenance Shift Manager
  - Resident Project Representative
  - Contractor Superintendent
  - Subcontractor representative(s), as applicable

Prior to the start of construction activities, the Contractor shall be required to provide a complete schedule for the project. Should the overall schedule change during the course of construction, the overall schedule will be updated and distributed to stakeholders.

**2. PHASING****PHASE 1 - Temporary Site and Taxiway L Access Modifications**

Work Area 1 Limits: Work Area 1 consists of the south edge of the existing Taxiway L and Northeast Apron and the adjacent shoulder area having a closure of a portion of Taxiway H (North) from Runway 6-24 to approximately the midpoint of Taxiway L extended westerly across Taxiway H (North). Work area limits also to include the new project construction access from Perimeter Road onto the Vehicle Service Road with a new temporary access road with a temporary security gate and fence.

Duration: Three (3) calendar day from the Notice to Proceed date.

Work Hours: 6 AM – 6 PM, Monday to Friday, unless otherwise approved by Owner & Resident Project Representative (RPR)

**Primary work to be performed in this Work Area 1:**

- Remove existing Taxiway L edge light fixtures and plate the base cans.
- Removed the existing Taxiway L taxiway edge markings.
- Install new temporary Taxiway L taxiway centerline for access to Northeast Ramp
- Install Runway Safety Area markers for all phases
- Install temporary gate and perimeter TSA fence for temporary construction access point
- Install temporary access haul road from Perimeter Road to Vehicle Service Road

**PHASE 2 - North End of Taxiway H (North) Reconfiguration to TW K, K1 & K2**

**Work Area 2 Limits:** Work Area 2 consists of the portion of existing Taxiway H (North) between the edge of the Runway 17-35 Runway Safety Area at the Runway 17 End to the north edge of the temporary Taxiway L access Taxiway Object Free Area (TOFA) and extended across existing Taxiway H (North) for the installation of the reconfigured Taxiways K, L, K1 and K2.

**Duration:** Fifty-two (52) consecutive calendar days from the completion of Phase 1 work.

**Work Hours:** 6 AM – 6 PM, Monday to Friday, unless otherwise approved by Owner & Resident Project Representative (RPR)

**Primary work to be performed in this Work Area 2:**

- Maintenance and protection of all temporary airfield traffic control devices and safety items, including all FAA facilities
- Removal and disposal of existing elevated and in-pavement runway guard lights, conduit and cabling
- Removal and disposal of existing elevated taxiway edge lights, conduit and cabling
- Removal and disposal of existing guidance sign, sign foundation and cabling within Work Area
- Installation of new elevated and in-pavement runway guard lights with required conduit and cabling
- Installation of new in-pavement centerline lights with required conduit and cabling
- Installation of new elevated taxiway edge lights with required conduit and cabling
- Installation of new guidance signs with required conduit and cabling
- Installation of new duct banks
- Replacement of FAA communication cables
- Installation of electrical vault equipment
- Excavation and installation of subbase, aggregate base course and pavement for new pavement sections
- Marking of centerline and enhanced centerline markings, taxiway edge lines, and surface painted hold position signs
- Grading and drainage improvements with proper installation and maintenance of all sedimentation and erosion control best management practice devices
- Restoration of growth for all disturbed turf areas

**Work Area 2A Limits:** Work Area 2A consists of the portion of existing Taxiway H (North) and grassed infield area within Runway 17-35 Runway Safety Area near the Runway 17 End for the installation of the reconfigured Taxiways K1 and K2.

**Duration:** Fifteen (15) consecutive calendar days within Phase 2 duration

**Work Hours:** 24 Hours per Day for Work Area 2A duration

**Primary work to be performed in Work Area 2A:**

- Maintenance and protection of all temporary airfield traffic control devices and safety items, including all FAA facilities
- Removal and disposal of existing elevated taxiway edge lights, conduit and cabling
- Removal and disposal of existing guidance sign, sign foundation and cabling within Work Area
- Installation of new in-pavement centerline lights with required conduit and cabling
- Installation of new elevated taxiway edge lights with required conduit and cabling
- Installation of new guidance signs with required conduit and cabling
- Excavation and installation of subbase, aggregate base course and pavement for new pavement

sections

- Marking of centerline markings, taxiway edge lines, and surface painted hold position signs
- Grading and drainage improvements with proper installation and maintenance of all sedimentation and erosion control best management practice devices
- Restoration of growth for all disturbed turf areas

### **PHASE 3 - South End of Taxiway H (North) Reconfiguration to TW K**

**Work Area 3 Limits:** Work Area 3 consists of the portion of the existing Taxiway H (North) between the edge of the Runway 6-24 Runway Safety Area and the south edge of the temporary Taxiway L Taxiway Object Free Area (TOFA) for the installation of the reconfigured Taxiways K and L.

**Duration:** Thirty-five (35) consecutive calendar days from the completion of Phase 2 work.

**Work Hours:** 6 AM – 6 PM, Monday to Friday, unless otherwise approved by Owner & Resident Project Representative (RPR)

#### **Primary work to be performed in this Work Area 3:**

- Maintenance and protection of all temporary airfield traffic control devices and safety items, including all FAA facilities
- Removal and disposal of existing elevated taxiway edge lights, conduit and cabling
- Removal and disposal of existing guidance sign, sign foundation and cabling within Work Area
- Installation of new in-pavement centerline lights with required conduit and cabling
- Installation of new elevated taxiway edge lights with required conduit and cabling
- Installation of new guidance signs with required conduit and cabling
- Installation of electrical vault equipment
- Installation of Airport Lighting Control and Management System (ALCMS) modifications
- Excavation and installation of subbase, aggregate base course and pavement for new pavement sections
- Marking of centerline and enhanced centerline markings, taxiway edge lines, and surface painted hold position signs
- Grading and drainage improvements with proper installation and maintenance of all sedimentation and erosion control best management practice devices
- Restoration of growth for all disturbed turf areas

**Work Area 3A Limits:** Work Area 3A consists of work within the limits of the proposed Taxiway K located within the Runway 6-24 RSA (approximately 250 feet from the Runway 6-24 centerline).

**Duration:** Fifteen (15) consecutive calendar days within Phase 3 duration

**Work Hours:** 24 Hours per Day within Phase 3 duration

#### **Primary work to be performed in Work Area 3A:**

- Maintenance and protection of all temporary airfield traffic control devices and safety items, including all FAA facilities
- Removal and disposal of existing elevated taxiway edge lights, conduit and cabling
- Removal and disposal of existing guidance sign, sign foundation and cabling within Work Area
- Installation of new in-pavement centerline lights with required conduit and cabling
- Installation of new elevated taxiway edge lights with required conduit and cabling
- Installation of new guidance signs with required conduit and cabling
- Replacement of panels on existing guidance signs for new Taxiway K designation on Taxiway H

- Milling of existing pavement and installation of new pavement in milled areas
- Excavation and installation of subbase, aggregate base course and pavement for new pavement sections
- Marking of centerline markings, taxiway edge lines, and surface painted hold position signs
- Grading and drainage improvements with proper installation and maintenance of all sedimentation and erosion control best management practice devices
- Restoration of growth for all disturbed turf areas
- Runway 6-24 Pavement Repairs with milling, tack coat, pavement and saw & seal joints

#### **PHASE 4 – “Home Run” Electric Cable Installation**

**Work Area 4 Limits:** Limits of the “home run” cabling is the existing electrical duct bank from the primary work areas to the electrical vault. The electrical duct bank is typically located outside the edge of the Runway Safety Areas (RSAs) for Runway 6-24 and Runway 17-35, except for the crossing locations of Runway 6-24 and crosses Taxiway H near the electrical vault. All work will be subject to a 15-minute recall for pull back during work hours for work occurring in the RSA or the Taxiway Object Free Area (TOFA).

**Duration:** Five (5) calendar days (non-consecutive) anytime within the overall Project time duration and as scheduled with the Owner and Resident Project Representative (RPR) to minimize impacts to airport traffic.

**Work Hours:** 6 AM – 6 PM, Monday to Friday, unless otherwise approved by Owner & RPR

**Primary work to be performed in Work Area 4:**

- Removal of existing electrical cabling and installing new replacement cabling from primary project limits to the electrical vault for existing circuit to be reused
- Installation of new electrical cabling from primary project limits to the electrical vault for new circuits

#### **Sequence of Work**

Estimated Start Date: Late Summer 2021/Spring 2022, but subject to revision based on grant issuance

Estimated Completion Date: Summer 2022

The Construction Schedule will allot the following amount time for each phase and subphase:

- **Phase 1: Three (3) Consecutive Calendar Days**
- **Phase 2: Fifty-two (52) Consecutive Calendar Days** after completion of Phase 1
  - Phase 2A: Fifteen (15) Consecutive Calendar Days within Phase 2
- **Phase 3: Thirty-five (35) Consecutive Calendar Days** after completion of Phase 2
  - Phase 3A: Fifteen (15) Consecutive Calendar Days within Phase 3
- **Phase 4: Five (5) Calendar Days**, schedule within Applicable Phase and Total Project Duration

**Total Duration: Ninety-five (95) Calendar Days (Phases 1 - 4)**

### **3. AREAS AND OPERATIONS AFFECTED BY CONSTRUCTION:**

The affected areas and aircraft operations for this project are shown on the Safety and Phasing Plans located in Appendix B of this CSPP. All of the work will be performed “Airside” within the Airport Operations Area (AOA). All work locations within the AOA Movement Area will require coordination and advanced

notification in accordance with Section 1 - *Coordination*. As noted above in Section 2 – *Phasing*, the work in both phases will have runway closures for Runways 17-35 and 6-24 for Work Areas 2A and 3A respectively, as well as Phase 4 work areas for “Home Run” cabling installations having a 15-minute recall during work hours. Phase 4 will also have a restriction that all “parked” equipment and vehicles are to remain outside of any Runway Safety Area or Taxiway Object Free Areas. As shown in the phasing in Section 2 – *Phasing*, access for the Northeast Ramp aircraft operations will occur at all times during construction.

Refer to Section 11 - *Underground Utilities* for underground utilities impacted by the construction.

The four (4) phases of this project are outlined above in Section 2 – *Phasing*. As noted above, all of the work in Phase 1 must be completed prior to the start of work in Phase 2 and all of the work for Phase 2 must also be completed prior to the start of work in Phase 3.

Contained within the tables below are anticipated operational impacts to Airport Operations during the course of the project. Contractor is required to coordinate with Airport Operations prior to impacting operations on the Airport.



<b>PROJECT</b>	Taxiway H Runway Incursion Mitigation	
<b>PHASE</b>	Phase 1: Temporary Site and Taxiway L Access Modifications	
<b>SCOPE OF WORK</b>	<u>Work Associated with the modifications to provide:</u> 1. Temporary access for the Site for a Haul Route from Landside 2. Temporary access for TW L to RW 17-35 during Phase 2 Three (3) consecutive calendar day for Phase 1 Duration.	
<b>OPERATIONAL REQUIREMENTS</b>	<b>Normal (Existing)</b>	<b>Phase 1 (Anticipated)</b>
<b>RW 17-35 ARC</b>	D-IV	D-IV
<b>RW 17 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
<b>RW 17 Approach Procedures</b>	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
<b>RW 17 NAVAIDs</b>	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
<b>RW 35 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
<b>RW 35 Approach Procedures</b>	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR
<b>RW 35 NAVAIDs</b>	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE
<b>RW 6-24 ARC</b>	D-IV	D-IV
<b>RW 6 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
<b>RW 6 Approach Procedures</b>	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
<b>RW 6 NAVAIDs</b>	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
<b>RW 24 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
<b>RW 24 Approach Procedures</b>	RNAV(GPS)	RNAV(GPS)
<b>RW 24 NAVAIDs</b>	REIL, PAPI(P4L)	REIL, PAPI(P4L)
<b>Taxiway J ADG</b>	IV	IV
<b>Taxiway H ADG</b>	IV	IV
<b>Taxiway H (North) ADG</b>	IV	Restricted to ADG II Aircraft from Northeast Apron to RW 17 End Only
<b>ACTC (hours open)</b>	24 Hours	24 Hours
<b>ARFF Index</b>	C	C
<b>Special Conditions</b>	RW 17-35 & RW 6-24 OPEN No Restrictions	RW 17-35 & RW 6-24 OPEN No Restrictions
	Northeast Apron Access No Restrictions	Northeast Apron Access TW H (North) to RW 17 End Only

<b>PROJECT</b>	Taxiway H Runway Incursion Mitigation	
<b>PHASE</b>	Phase 2 – Work Area 2: Taxiway (North) Reconfiguration Northern Portion Outside RSA	
<b>SCOPE OF WORK</b>	<p>Work Associated with the Taxiway H (North) reconfiguration for:</p> <p>1. Northern Section of TW H (North) Reconfiguration for new TW K, K1, and K2 and TW L Reconfiguration into Northeast Apron outside of RW 17-35 Runway Safety Area</p> <p>Fifty-two (52) consecutive calendar days for Phase 2 Duration.</p>	
<b>OPERATIONAL REQUIREMENTS</b>	<b>Normal (Existing)</b>	<b>Phase 2 (Anticipated)</b>
<b>RW 17-35 ARC</b>	D-IV	D-IV
<b>RW 17 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
<b>RW 17 Approach Procedures</b>	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	LOC/DME, RNAV(GPS), RNAV(RNP)
<b>RW 17 NAVAIDs</b>	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) /
<b>RW 35 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
<b>RW 35 Approach Procedures</b>	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	ILS or LOC RNAV(GPS), RNAV(RNP), VOR
<b>RW 35 NAVAIDs</b>	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE
<b>RW 6-24 ARC</b>	D-IV	D-IV
<b>RW 6 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
<b>RW 6 Approach Procedures</b>	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
<b>RW 6 NAVAIDs</b>	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
<b>RW 24 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
<b>RW 24 Approach Procedures</b>	RNAV(GPS)	RNAV(GPS)
<b>RW 24 NAVAIDs</b>	REIL, PAPI(P4L)	REIL, PAPI(P4L)
<b>Taxiway J ADG</b>	IV	IV
<b>Taxiway H ADG</b>	IV	IV
<b>Taxiway H (North) ADG</b>	IV	Restricted to ADG II Aircraft from Northeast Apron to RW 6-24 Only
<b>ACTC (hours open)</b>	24 Hours	24 Hours
<b>ARFF Index</b>	C	C
<b>Special Conditions</b>	RW 6-24 OPEN No Restrictions	RW 6-24 OPEN No Restrictions
	RW 17 OPEN No Restrictions	RW 17 OPEN Restricted Arrivals - No ILS Glide Slope Back Taxi req'd for Full Length Takeoff
	RW 35 OPEN	RW 35 – No Cat II or III Anticipated
	Northeast Apron Access No Restrictions	Northeast Apron Access TW H (North) to RW 6-24 Only

<b>PROJECT</b>	Taxiway H Runway Incursion Mitigation	
<b>PHASE</b>	Phase 2 – Work Area 2A: Taxiway (North) Reconfiguration Northern Portion within RSA	
<b>SCOPE OF WORK</b>	<u>Work Associated with the Taxiway H (North) reconfiguration for:</u> 1. Northern Section of TW H (North) Reconfiguration for new TW K, K1, and K2 within the Runway 17-35 Safety Area Fifteen (15) consecutive calendar days within Phase 2 Duration.	
<b>OPERATIONAL REQUIREMENTS</b>	<b>Normal (Existing)</b>	<b>Phase 2A (Anticipated)</b>
<b>RW 17-35 ARC</b>	D-IV	D-IV
<b>RW 17 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	Take-Off Restrictions for Only Intersection Departures No Arrivals
<b>RW 17 Approach Procedures</b>	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	CLOSED FOR ARRIVALS
<b>RW 17 NAVAIDs</b>	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	CLOSED FOR ARRIVALS
<b>RW 35 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
<b>RW 35 Approach Procedures</b>	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	RNAV(GPS), RNAV(RNP), VOR
<b>RW 35 NAVAIDs</b>	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL)
<b>RW 6-24 ARC</b>	D-IV	D-IV
<b>RW 6 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
<b>RW 6 Approach Procedures</b>	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
<b>RW 6 NAVAIDs</b>	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
<b>RW 24 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
<b>RW 24 Approach Procedures</b>	RNAV(GPS)	RNAV(GPS)
<b>RW 24 NAVAIDs</b>	REIL, PAPI(P4L)	REIL, PAPI(P4L)
<b>Taxiway J ADG</b>	IV	IV
<b>Taxiway H ADG</b>	IV	IV
<b>Taxiway H (North) ADG</b>	IV	Restricted to ADG II Aircraft From Northeast Apron to RW 6-24 Only
<b>ACTC (hours open)</b>	24 Hours	24 Hours
<b>ARFF Index</b>	C	C
<b>Special Conditions</b>	RW 6-24 OPEN No Restrictions	RW 6-24 OPEN No Restrictions
	RW 17 OPEN No Restrictions	RW 17 CLOSED for ARRIVALS Intersection Takeoffs Available
	RW 35 OPEN No Restrictions	RW 35 OPEN Restricted Arrival Procedures No ILS LOC Available
	Northeast Apron Access No Restrictions	Northeast Apron Access TW H (North) to RW 6-24 Only

<b>PROJECT</b>	Taxiway H Runway Incursion Mitigation	
<b>PHASE</b>	Phase 3 – Work Area 3: Taxiway (North) Reconfiguration Southern Portion Outside RSA	
<b>SCOPE OF WORK</b>	<p>Work Associated with the Taxiway H (North) reconfiguration for:</p> <p>1. Southern Section of TW H (North) Reconfiguration for new TW K and TW L Reconfiguration into Northeast Apron</p> <p>Thirty-five (35) consecutive calendar days for Phase 3 Duration.</p>	
<b>OPERATIONAL REQUIREMENTS</b>	<b>Normal (Existing)</b>	<b>Phase 3 (Anticipated)</b>
<b>RW 17-35 ARC</b>	D-IV	D-IV
<b>RW 17 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
<b>RW 17 Approach Procedures</b>	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	LOC/DME, RNAV(GPS), RNAV(RNP)
<b>RW 17 NAVAIDs</b>	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) /
<b>RW 35 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
<b>RW 35 Approach Procedures</b>	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	ILS or LOC, RNAV(GPS), RNAV(RNP), VOR
<b>RW 35 NAVAIDs</b>	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL)
<b>RW 6-24 ARC</b>	D-IV	D-IV
<b>RW 6 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
<b>RW 6 Approach Procedures</b>	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
<b>RW 6 NAVAIDs</b>	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
<b>RW 24 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
<b>RW 24 Approach Procedures</b>	RNAV(GPS)	RNAV(GPS)
<b>RW 24 NAVAIDs</b>	REIL, PAPI(P4L)	REIL, PAPI(P4L)
<b>Taxiway J ADG</b>	IV	IV
<b>Taxiway H ADG</b>	IV	IV
<b>Taxiway H (North) ADG</b>	IV	Restricted to ADG II Aircraft From Northeast Apron to RW 17 End Only
<b>ACTC (hours open)</b>	24 Hours	24 Hours
<b>ARFF Index</b>	C	C
<b>Special Conditions</b>	RW 6-24 OPEN No Restrictions	RW 6-24 OPEN No Restrictions
	RW 17 OPEN No Restrictions	RW 17 OPEN Arrival Restrictions – No ILS Glide Slope Unless having an approved Flight Check Back Taxi req'd for Full Length Takeoff
	RW 35 OPEN No Restrictions	RW 35 OPEN Restricted Arrival Procedures Flight Check for RW 35 LOC Req'd before putting RW 35 into service
	Northeast Apron Access No Restrictions	Northeast Apron Access New TW K/K1 to RW 17 End Only

<b>PROJECT</b>	Taxiway H Runway Incursion Mitigation	
<b>PHASE</b>	Phase 3 – Work Area 3A: Taxiway (North) Reconfiguration Southern Portion Within RW 6-24 RSA	
<b>SCOPE OF WORK</b>	<p>Work Associated with the Taxiway H (North) reconfiguration for:</p> <p>1. Southern Section of TW H (North) Reconfiguration for new TW K within Runway 6-24 Runway Safety Area</p> <p>Fifteen (15) consecutive calendar days within Phase 3 Duration.</p>	
<b>OPERATIONAL REQUIREMENTS</b>	<b>Normal (Existing)</b>	<b>Phase 3A (Anticipated)</b>
<b>RW 17-35 ARC</b>	D-IV	D-IV
<b>RW 17 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
<b>RW 17 Approach Procedures</b>	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	LOC/DME, RNAV(GPS), RNAV(RNP)
<b>RW 17 NAVAIDs</b>	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR)
<b>RW 35 Declared Distances</b>	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
<b>RW 35 Approach Procedures</b>	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR
<b>RW 35 NAVAIDs</b>	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE
<b>RW 6-24 ARC</b>	D-IV	CLOSED
<b>RW 6 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	CLOSED
<b>RW 6 Approach Procedures</b>	ILS or LOC, RNAV(GPS)	CLOSED
<b>RW 6 NAVAIDs</b>	REIL, PAPI(P4L), ILS – Class IT	CLOSED
<b>RW 24 Declared Distances</b>	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	CLOSED
<b>RW 24 Approach Procedures</b>	RNAV(GPS)	CLOSED
<b>RW 24 NAVAIDs</b>	REIL, PAPI(P4L)	CLOSED
<b>Taxiway J ADG</b>	IV	IV
<b>Taxiway H ADG</b>	IV	IV
<b>Taxiway H (North) ADG</b>	IV	Restricted to ADG II Aircraft from Northeast Apron to RW 17 End Only
<b>ACTC (hours open)</b>	24 Hours	24 Hours
<b>ARFF Index</b>	C	C
<b>Special Conditions</b>	RW 6-24 OPEN No Restrictions	RW 6-24 CLOSED
	RW 17 OPEN No Restrictions	RW 17 OPEN Arrival Restrictions – No ILS Glide Slope Unless having an approved Flight Check Back Taxi req'd for Full Length Takeoff
	RW 35 OPEN No Restrictions	RW 35 OPEN Restricted Arrival Procedures Flight Check for RW 35 LOC may be req'd before putting RW 35 back into service
	Northeast Apron Access No Restrictions	Northeast Apron Access New TW K/K1 to RW 17 End Only

PROJECT	Taxiway H Runway Incursion Mitigation	
PHASE	Phase 4 – Work Area 4: Home Run Electrical Cable Installation	
SCOPE OF WORK	<u>Work Associated with the modifications to provide:</u> 1. Removal and replacement of existing circuit home run cabling 2. Installation of new lighting home run cabling Five (5) calendar days for Phase 4 – Schedule during Applicable Phase during Overall Project Duration	
OPERATIONAL REQUIREMENTS	Normal (Existing)	Phase 4 (Anticipated)
RW 17-35 ARC	D-IV	D-IV
RW 17 Declared Distances	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914	Refer to Phase when work is performed within
RW 17 Approach Procedures	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	Refer to Phase when work is performed within
RW 17 NAVAIDs	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	Refer to Phase when work is performed within
RW 35 Declared Distances	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	Refer to Phase when work is performed within
RW 35 Approach Procedures	ILS or LOC, ILS (SA Cat I), ILS (Cat II or III), RNAV(GPS), RNAV(RNP), VOR	Refer to Phase when work is performed within
RW 35 NAVAIDs	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	Refer to Phase when work is performed within
RW 6-24 ARC	D-IV	D-IV
RW 6 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	Refer to Phase when work is performed within
RW 6 Approach Procedures	ILS or LOC, RNAV(GPS)	Refer to Phase when work is performed within
RW 6 NAVAIDs	REIL, PAPI(P4L), ILS – Class IT	Refer to Phase when work is performed within
RW 24 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	Refer to Phase when work is performed within
RW 24 Approach Procedures	RNAV(GPS)	Refer to Phase when work is performed within
RW 24 NAVAIDs	REIL, PAPI(P4L)	Refer to Phase when work is performed within
Taxiway J ADG	IV	IV
Taxiway H ADG	IV	IV
Taxiway H (North) ADG	IV	ADG II Aircraft and Access dependent based on Phase when Work is concurrently performed within
ACTC (hours open)	24 Hours	24 Hours
ARFF Index	C	C
Special Conditions	RW 17-35 & RW 6-24 OPEN No Restrictions	RW 17-35 & RW 6-24 Restrictions based on Phase when Work is Concurrently Performed within
	Northeast Apron Access No Restrictions	Northeast Apron Access Restrictions based on Phase when Work is Concurrently Performed within

#### 4. NAVIGATIONAL AID (NAVAID) PROTECTION:

- a. Prior to commencing any construction activities or operating equipment near a NAVAID, the Contractor shall coordinate through the Resident Project Representative, with the FAA Technical Operations, to evaluate the effect of construction activity for the project duration and the required distance and direction from the NAVAID.
- b. The Contractor is solely responsible for locating all existing NAVAID electrical feeds and other utilities within the project limits. Prior to initiation of any construction in the field, the Contractor shall provide a written notice (return receipt requested) to each of the impacted utility companies (including the FAA) and MHT Operations, as applicable. The Contractor shall provide the MHT Operations and Maintenance, the Resident Project Representative, and each of the utility companies (including the FAA) with a copy of the receipt of said written notification. This requirement is in addition to any other state laws regarding public notification prior to excavation.
- c. There shall be no construction activities, equipment operation, materials/equipment storage, or vehicle parking near any NAVAIDs, unless otherwise allowed by the Contract Documents. All construction activities and materials/equipment stored near a NAVAID must not obstruct access to the equipment and instruments for maintenance by Airport Staff/FAA personnel. NAVAIDs require special consideration since construction activities may interfere with signals essential to air navigation. There will be construction activities within the Runway 17 Instrument Landing System (ILS) Glide Slope Antennae Critical Area and the Runway 35 ILS Localizer Critical Area.
- d. The Contractor will not be permitted within the critical areas of active NAVAIDs, unless allowed by the Contract Documents. The stockpiling of construction material, as well as the movement and parking of construction equipment, shall not be permitted in areas where materials or equipment may interfere with line of sight from the FAA ATCT or with electronic emissions devices. Interference from construction equipment and activities may require NAVAID shutdown or adjustment of instrument approach minimums for low visibility operations. If these conditions are required, a NOTAM will be needed per Section 9 – *Notification of Construction Activities*.
- e. **Facility Outage Coordination:** Strategic Event Coordination (SEC) is required if construction operations require FAA equipment to be removed from service, such as NAVAID/VISID (i.e., ILS, VOR, MALSR, etc.) for 24 hours or greater in duration, or interruptions that may generate Traffic Management Initiatives. If the proponent of the NAVAID is the Sponsor (MHT), and FAA will not be directly involved, then the proponent shall plan accordingly to ensure adequate advance notice, in addition to the 30 days, is provided to the FAA Planning & Requirements Section in order for SEC process to be initiated.
- f. **FAA Flight Check:** It is anticipated that the RW 17 ILS Glide Slope Antennae will require a FAA Flight Check prior to being able to be put back into service. An FAA Flight Check may also be required due to the disturbance in the RW 35 ILS Localizer Critical Area and will be based on a determination by FAA Nav aids. The timing of any flight check will be scheduled based on the progression of the work and will be coordinated directly with FAA.

Anticipated potential SEC notifications required are as outlined below:

1. **Runway 35 Approach Impacts:** The FAA-owned NAVAIDs for Runway 35 approaches WILL need to be shut down or inactive during the work hours of Phase 2A as noted above in Section 3 – *Areas and Operations Affected by Construction*. The FAA RW 35 ILS Localizer effectiveness will be impacted due to its location in proximity to the construction and effecting the operational procedures and will restrict instrument landings for the Runway 35 Approach. A SEC notification will be required. Additionally, NOTAMSs will need to be issued as outlined above in paragraph d. An FAA Flight Check will be required before putting the FAA RW 35 ILS localizer back into service.
2. **Runway 17 Approach Impacts:** The FAA-owned NAVAIDs for Runway 17 approaches

**WILL** need to be shut down or inactive during Phase 2 and possibly during Phase 3 as noted above in Section 3 – *Areas and Operations Affected by Construction*. The primary FAA NAVAID effected by the construction will be the RW 17 ILS Glide Slope Antennae operations and restricting instrument landings for the Runway 17 Approach. Due to the proposed taxiway reconfigurations and grading, the RW 17 ILS Glide Slope Antennae Critical Area grading will be modified and will be unavailable during that construction work. These modifications will require an FAA Flight Check and recalibration of the RW 17 ILS Glide Slope Antennae after the completion of the construction activities for Phase 2. SEC notification anticipated as part of the design.

These NAVAIDS include:

- RWY 17 MALSR
- RWY 17 ILS (Glideslope)
- RWY 17 ILS (Localizer) (Not in Work Zone)
- RW 17 PAPI (Not in Work Zone)
- RW 17 RVR (Not in Work Zone)

3. **Runway 6-24 Impacts:** The FAA-owned NAVAIDS for Runways 6 and 24 approaches **WILL** need to be shut down or inactive during Phase 3A as noted above in Section 3 – *Areas and Operations Affected by Construction*. All of the MHT-owned NAVAIDS and FAA-owned NAVAIDS for Runway 6 -24 will be shutdown or inactive during the construction of Phase 3A. SEC notification anticipated as part of the design.

These NAVAIDS include

- RW 6 REIL (Not in Work Zone)
- RW 6 PAPI (Not in Work Zone)
- RWY 6 ILS (Glideslope & Localizer) (Not in Work Zone)
- RW 24 PAPI (Not in Work Zone)
- RW 24 REIL (Not in Work Zone)
- RW 24 RVR (Not in Work Zone)

## 5. CONTRACTOR ACCESS:

### **Stockpile Locations:**

- a. The Contractor shall stockpile all material in the Contractor Stockpile Area as shown on the phasing plan located in Appendix B.
- b. The Contractor shall inspect all construction storage areas as often as necessary to be aware of conditions and promptly take all steps needed to prevent/remedy any unsafe or potentially unsafe conditions/activities discovered.
- c. Stockpiled material at the construction site shall be prominently marked with orange flags and lighted by light units during hours of restricted visibility and/or darkness. Orange flags shall be no less than twenty (20) inches square for day marking. The Contractor shall use wire stiffener to hold the flag in an extended position. The lights used shall be steady burning red lights at least ten (10) candelas or flashing yellow lights of at least four (4) candelas. Flags and lights shall be mounted so they are not a hazard and sufficiently close together to clearly delineate the area.
- d. Stockpiled material shall be constrained in a manner to prevent movement resulting from wind conditions.

### **Site Access:**

- a. Refer to the phasing plan in Appendix B for site access points and haul routes.

### **Ingress and Egress Procedures:**

- a. The MHT Operations and Maintenance will unlock and lock airport gates needed for access at



- the beginning and end of all shifts.
- b. The Contractor shall control all construction access through the airport perimeter gates. The gates shall be locked at all times unless continuously manned by security personnel employed by the Contractor. Haul routes and staging areas, including employee parking for this project are to be as shown on the phasing plan.
  - c. Contractor's vehicles will not be allowed access to portions of the Airport other than the work and staging areas. All construction employee vehicles will be parked in the designated staging area. Privately-owned vehicles will not be allowed on the airfield. The Contractor will be permitted to store equipment needed for the immediate work on hand within the work area as approved by the MHT Operations and Maintenance or Resident Project Representative. All equipment will be parked in the staging area at the close of work each day and whenever it is not in use. All equipment booms shall be lowered at the close of each day's work or when stored.
  - d. Each Contractor's motorized vehicle operating on airport property shall be equipped with an operating amber flashing beacon displayed in full view above the vehicle. The contractor's construction equipment shall have a checkered flag. The 3' x 3' flag shall be made of 1'x 1' international orange and white squares. The flag should be placed at the highest point on the vehicle to allow for an unobstructed view of the flag. Any vehicles not meeting these criteria will be denied access to the work zones until the problem is rectified. Any vehicle operating on the movement areas during hours of darkness or reduced visibility must be equipped with a flashing beacon, the color of which is in accordance with local or state codes.
  - e. In addition, all Contractors vehicles shall have the company identification plainly visible on both sides of the vehicle in order to identify the vehicle. They may be applied either by using tape or a water-soluble paint to facilitate removal. Magnetic signs are also acceptable. Any vehicles transporting fuel or other potentially harmful substances shall be equipped with a spill control plan and required decontamination equipment as required by Federal, State and local regulations.

#### **Radio Communications:**

- a. The Air Traffic Control Tower (ATCT) will communicate with and update pilots as required.
- b. Radio escorts will be provided by MHT Operations and Maintenance and will communicate with ATCT when necessary. A representative for the Engineer of Record will also act as the Resident Project Representative (RPR) for the project. The RPR and the Contractor will not communicate with ATCT at any time.
- c. The RPR and Contractor superintendent will monitor air traffic ground control frequency of 121.9 MHz at all times to maintain situational awareness. See Section 13 – *Special Conditions*.

#### **Granite Frequency:**

- i. Granite Channel (1): General airport operations, building maintenance and emergency frequency.
- ii. Granite Channel (2): Backup frequency.
- iii. Granite Channel (3): Airport law enforcement unit communications.
- iv. Granite Channel (4): Airport operations and maintenance, construction coordination, and security communications.

#### **Granite Frequency - Call Signs:**

- i. Airport Communications Center: Granite 100
- ii. Airport Emergency contact: Granite 100
- iii. Security gate guard: Company, followed by gate number
- iv. Contractor site superintendent: Company, followed by predetermined call sign/number.
- v. Airport operations representative(s): Coordinate daily on site.

The ATCT will have direct communication with the MHT Operations and Maintenance personnel providing the contractor escorts and having operational safety oversight. This communication will take place on the MHT ground frequency.

### **Airport Security**

All personnel with regular job duties and responsibilities within the Airport Operations Area (AOA), including contractors, subcontractors, general workers and/or security personnel will obtain an MHT Security Identification Badge. In addition, all applicants will attend an airport security briefing prior to being granted access to any secure area. Superintendents shall also be required to have driver training.

All authorized visitors and short-term workers will be issued a white temporary escorted badge. Issuance of escorted badges will be noted in the daily security access log. The log and badges will be returned to airport operations at the close of each work day. The Contractor's MHT badged supervisor(s) are required to coordinate AOA escort assignments with MHT Operations and Maintenance. An escorted worker will be informed (by the contractor) as to their MHT badged escort and will at all times remain within line of sight and within control of the escort.

All personnel and vehicles that are granted access to the AOA will submit to random security inspections conducted by airport law enforcement, security, operations, and Transportation Security Administration personnel. Random inspections may occur at any time and may take place at the perimeter gates, on the AOA, and/or within other secure areas of the airport. Mirrors will be used to ensure a thorough inspection of the undercarriage of vehicles.

The Temporary Secure Access Gate on Perimeter Road as shown in the Contract Documents will be manned by an MHT Airport-approved Security Guard for contractor access to the site. The following procedures will be followed for contractor access:

- a. MHT Airport-approved Security Guard will have an approved means of communication (i.e. "granite" radio contact) with his/her supervisors, the Contractor, MHT Operations and Maintenance personnel, and Airport Communications in the event of an emergency.
- b. Vehicle inspections will take place on the public side of the security fence prior to the gate being opened.
- c. All personnel entering an AOA access gate will sign the daily security/AOA access log (once per day for all personnel except when leaving the secured area or hauling material off site). The daily log will be maintained by MHT Airport-approved Security Guard and turned over to MHT Operations and Maintenance at the close of each work day.
- d. During periods of minimal activity, the Secure Access Gate shall be secured or have the MHT Airport-approved Security Guard's vehicle parked across the gate opening such that a vehicle cannot pass through the gate opening. Gates will be secured by MHT Operations and Maintenance at the beginning and ending of each work day.

## **6. WILDLIFE MANAGEMENT**

The Airport will mitigate wildlife hazards during construction as follows:

### **Trash:**

- a. The Contractor shall keep the construction site free of paper, boxes, litter, and other debris which could be blown onto the runways and taxiways and aircraft operating areas. All trash must be disposed of in an appropriate manner off site.

**Wildlife Sightings:**

- a. The RPR and/or Superintendent will immediately notify MHT Operations and Maintenance Management by phone of wildlife sited on the airfield.
- b. See Section 9 – *Notification of Construction Activities*, for notification procedures.

**7. FOD MANAGEMENT:**

The Airport will manage foreign object debris (FOD) control during construction as follows:

**Housekeeping:**

- a. All construction personnel will secure any items that may be carried by wind onto the Air Operations Area (AOA). See Section 5 – *Contractor Access*, regarding stockpile locations.

**Airfield:**

- a. All construction vehicle drivers will enter AOA paved areas from local streets only; construction vehicles will not transverse from non-paved surfaces to AOA paved surfaces. See Section 5 – *Contractor Access* and Appendix B for access routes.
- b. The Contractor will immediately sweep or otherwise remove any FOD located on an AOA paved surface. See Section 10 – *Inspection Requirements*.
- c. The Contractor shall furnish and retain, at the construction site, equipment for the application of water to control dust within the construction site and on haul roads. The equipment shall be equipped with a shut-off control valve that can be operated from the cab by the operator. The Contractor shall apply water for dust control as necessary to prevent dust from the construction site and/or haul roads from being a hazard to aircraft and from being a nuisance to the public and as directed by the RPR.

**8. HAZMAT MANAGEMENT:**

The Airport will manage hazard material transported during construction as follows:

**Fuel or Hydraulic Fluid Spills:**

- a. All Contractors' vehicles shall have hazmat placards plainly visible on both sides of the vehicle. Any vehicles transporting potentially harmful substances shall be equipped with a spill control plan and required decontamination equipment as required by Federal, State and local regulations.
- b. The Contractor will immediately notify the Airport Communications Center by phone of all spills. See Section 9 – *Notification of Construction Activities*, for notification procedures.

**Fueling:**

- a. All construction vehicles will be fueled in the staging area.

**Other HAZMAT:**

- a. No other hazardous material is expected to be transported on-site during construction.

**9. NOTIFICATION OF CONSTRUCTION ACTIVITIES:****Contact List and Emergency Notification:**

The Contact List of Airport and Consultant personnel and emergency contacts is located in Appendix A. Contractor contacts will be included in the SPCD.

The Contractor shall be required to submit a tentative schedule as described in Section 1 – Manchester-Boston Regional Airport

*Coordination.* The schedule shall be given to the Airport prior to 72 hours in advance of the commencement of work. A 72-hour lead time is required by the Airport and FAA to issue a proper Notice to Airmen (NOTAM) of the pending construction activities.

To facilitate the specific requirements and intent of this section, the Contractor shall prepare a schedule of operations for the project. The schedule shall be subject to the approval of the MHT Operations and Maintenance or RPR and shall include as a minimum, the following:

Major work items to be accomplished.

- a. Subcontractors to be on site.
- b. Number of personnel to be on site.
- c. Type and quantity of equipment to be on site.
- d. Areas of the site where construction is scheduled.
- e. Any anticipated closing of facilities that will be required.
- f. Any anticipated power outages and/or system to be inoperable including anticipated length of downtime in hours.
- g. Other information requested by MHT Operations and Maintenance, Airport Management or the RPR.

The primary contact for construction activities will be MHT Operations and Maintenance since they are acting as the RPR. The contacts for the Airport will be as assigned by Airport Management.

All emergencies shall be directed to 911 or the Airport Communications Center at (603) 628-6222.

**FAA Notification:**

- The Airport Representatives will submit a 7460 case for construction equipment.
- The Airport will notify MHT SSC officials (see *Contact List*, Appendix A) as required by Section 4 – *Navigational Aid (NAVAID) Protection*, and Section 11 – *Underground Utilities*.

**Airport User Notification:**

- MHT Operations and Maintenance or Airport Management has been in contact with affected parties throughout the project.
- Airport Operations will notify the airport users of the proposed construction activities via telephone, flyer, or email.

**NOTAMs:**

- MHT Operations Management will issue all NOTAMs through the eNOTAM system, except as noted below.
- The FAA will issue all FAA facility related and Flight Procedure related NOTAMs.

**Morning Safety Meetings**

- As noted in Section 1 – *Coordination*, safety and coordination meetings will be held every morning prior to beginning construction operations for the day. The meeting will be located on the construction site and attended by MHT Operations and Maintenance, the RPR and the Construction Superintendent. The primary purpose is to discuss construction operations for the day and any safety issues that need resolution.

**10. INSPECTION REQUIREMENTS:**

**Airport Requirements:**

- a. MHT Operations and Maintenance will inspect all closed paved surfaces prior to opening to air traffic operations.
- b. The entire work area should be inspected for foreign object debris (FOD) periodically throughout the workday and at the end of each day's work. Refer to Section 7 – *Foreign Object Debris (FOD) Management*, for corrective measures.
- c. If emergency maintenance is required after work hours, refer to Section 9 – *Notification of Construction Activities* and Appendix A for primary contact procedures and information.
- d. As soon as the work is completed, the area shall be cleaned and made available for inspection.
- e. The MHT Operations and Maintenance shall inspect all work areas prior to reopening the Taxiway and associated areas to aircraft operations.
- f. The MHT Operations and Maintenance and Airport Management will conduct a final inspection.

**Resident Project Representative (RPR) Requirements:**

- a. The RPR will be the field point of contact for all concerns during construction. The RPR will notify all appropriate parties relating to the concern.
- b. The RPR will conduct routine inspections of the worksite(s) at the end of all daily work shifts and at the request of MHT Operations and Maintenance Management.
- c. The RPR and the Engineer of Record will attend the final inspection.

**Contractor Requirements:**

- a. The Contractor Superintendent will conduct routine inspections of the worksite(s) to ensure compliance with the CSPP and SPCD.
- b. The Contractor Superintendent will attend the RPR's daily inspections and the final inspection.

**11. UNDERGROUND UTILITIES****FAA and Airport Utilities**

- a. Locations of utilities and underground cables shown are based on record documents and field survey. The accuracy of the utility locations is not guaranteed. Prior to commencement of any excavation, the Contractor shall verify the utility locations. The Contractor will coordinate all work on and in the vicinity of the underground utilities and cables with the RPR and MHT Operations and Maintenance.

**Municipal Utilities:**

- a. As applicable, the Contractor Superintendent will contact Dig Safe to delineate all municipal utilities a minimum of seven (7) days prior to any excavation work. The Contractor's DIG SAFE # for the Project shall be recorded as part of the Safety Plan Compliance Document (SPCD).

**Utility Damage**

- a. Should the Contractor encounter any damaged utilities, the Contractor is to contact the RPR immediately who will in turn notify MHT Operations and Maintenance.
- b. Should the Contractor damage any underground utilities, the Contractor will suspend all construction activity and notify the RPR. The Contractor shall then repair or replace the underground utility immediately.
- c. See Section 9 – *Notification of Construction Activities*, for notification requirements.

**12. PENALTIES:****Construction Suspension:**

- a. MHT Operations and Maintenance Management will immediately suspend all construction if and when:
  - i. A Contractor or subcontractor employee enters the Air Operations Area (AOA) outside of the designated work area.
  - ii. Any unescorted construction vehicle operates on any active AOA surface.
- b. The MHT Operations and Maintenance Management will allow construction work to resume only when the discrepancy is corrected to his/her satisfaction.
- c. The penalty for non-compliance with the Airport rules, regulations and/or safety plans shall be suspension of driving privileges and or suspension of airport access.
- d. The Contractor shall be responsible for controlling access to the work area and ensuring that airport security is maintained at all times. The FAA can impose fines of \$10,000 or more for security violations and incursions into active aircraft operation areas. The Contractor shall pay all fines assessed against the airport due to violations caused by the Contractor and his/her personnel, subcontractors and vendors.
- e. Any construction related runway incursion, as described in Section 1 – *Special Conditions* will require immediate suspension of all construction activity on the airport until a thorough investigation on cause is completed.

**Expulsion of Non-compliant Employees:**

- a. The MHT Operations and Maintenance Management may permanently prohibit any consultant, or contractor employee, acting in violation with Airport rules and regulations from entering or working on Airport property.

**13. SPECIAL CONDITIONS:**

**Aircraft in Distress:**

- a. MHT Operations and Maintenance, the RPR, and/or the Contractor Superintendent will immediately clear all construction personnel of all runways and approach areas upon monitoring a distress call on the airport ground frequency. See Section 5 – *Contractor Access*, for ground frequency monitoring requirements.

**Aircraft Accident:**

- a. The Contractor will notify MHT Operations and Maintenance of any suspicious persons or behavior on Airport property. No unauthorized vehicles shall enter through the construction access gates.
- b. There are four categories of runway incursions:
  - Category A is a serious incident in which a collision was narrowly avoided.
  - Category B is an incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.
  - Category C is an incident characterized by ample time and/or distance to avoid a collision.
  - Category D is an incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.
- c. Incursions will be prevented by thorough training of ground vehicle operators; radio communication; coordination among all parties; and clearly marking the boundaries of construction operations established in this safety plan. Construction related runway incursion will be subject to penalties as described in Section 12 – *Penalties*.
- d. All construction personnel will immediately vacate Airport property and remain off until cleared by the MHT Operations and Maintenance Management.

**Vehicle / Pedestrian Deviation (V/PD)**

- a. MHT Operations and Maintenance Management may temporarily suspend construction on the Air Operations Area (AOA) in the event of a non-construction related V/PD. See Section 12 – *Penalties*, for construction related construction suspension V/PD procedures.

**14. RUNWAY AND TAXIWAY VISUAL AIDS:****Temporary Runway Closures:**

- a. Runway 17 Landings will be closed during PHASE 2A, in accordance with the Airside phasing plans in Appendix B. Closures will use temporary Runway Closure Markers. Refer to Appendix B for details.
- b. Runway 6 - 24 will be closed during PHASE 3A, in accordance with the Airside phasing plans in Appendix B. Closures will use temporary Runway Closure Markers. Refer to Appendix B for details

**Temporary Taxiway Closures:**

- a. A portion of Taxiway H (North) – Northern Section will be closed temporarily during PHASE 2 on a phase duration as outlined in the Airside phasing plans in Appendix B.
- b. A portion of Taxiway H (North) – Southern Section will be closed temporarily during PHASES 1 and 3 on a phase duration as outlined in the Airside phasing plans in Appendix B.
- c. Closures will use barricades and/or channelizer cones as outlined in Section 16, *Hazard Marking and Lighting*.

**Runway Safety Areas:**

- a. The Contractor will delineate work areas that abut the Runway Safety Area or other aircraft protection areas with traffic cone/stake delineation or barricades, as indicated on the phasing plan, or other measures acceptable to the MHT Operations and Maintenance Management.

**Taxiway Visual Aids:**

- a. The Contractor will be required to provide temporary “jumpers” to keep portions of a taxiway edge light system operational in order to bypass closed portions of a taxiway.
- b. Guidance signs on taxiways closed for the entire phase duration shall have the circuit “locked out-tagged out” or be adequately covered with plastic securely fastened or temporary blank panels installed. Whereas, guidance signs for taxiways and/or runways guidance signs for phases having a daily closure will not be required to be covered.

**Temporary Pavement Markings:**

- a. Temporary pavement markings may be necessary as outlined in the Airside phasing plans in Appendix B. Any temporary pavement markings shall be installed per the requirements of the Pavement Marking specifications in the Contract Documents.

**15. MARKINGS AND SIGNS FOR ACCESS ROUTES:****Haul Route Markings:**

- a. There are no markings or signs proposed for the Contractor haul routes since the Contractor will be under escort, except there will be barricades/cones adjacent to active aircraft areas.

**16. HAZARD MARKING AND LIGHTING****All Phases**

- a. Construction low-profile barricades and/or channelizer cones will be used to delineate all closed construction airfield movement areas from the active aircraft.
- b. Barricades and cones shall be provided as shown on the phasing plans in Appendix B. These devices will delineate closed taxi routes that are not available to air traffic and will ensure that the Contractor's vehicles will not interfere with airport operations.
- c. Barricades and cones shall be weighted to protect against inadvertent movement from wind currents or prop/jet wash. These materials will be securely fastened to prevent FOD.
- d. Cones will be at 4' maximum intervals and low-profile barricades will be interlocking.
- e. For night-time closures, barricades and cones will be equipped with a flashing or steady-burn light (red in color) meeting the luminescence requirements of NHDOT and have a maximum spacing of 10'.
- f. Supplemental signs (i.e. "No Entry") and barricades will be used, as required, to limit vehicle movement.
- g. The Contractor shall maintain all barricades and cones as required and will have an "On-Call" person available for 24 hours/day, for emergency maintenance.

## **17. PROTECTION OF AREAS, ZONES, & SURFACES:**

- a. The Airport will remain open during the project.
- b. Construction equipment is not anticipated to penetrate the Runway 17 or any other approach surface when available for use, as well as any departure surface. See Section 9 – *Notification of Construction Activities*, for 7460 case file information.
- c. All Safety Areas (SAs), Object Free Areas (OFAs) and Obstacle Free Zones (OFZs) will be protected from construction activity using the temporary barricades described in Section 16 – *Hazard Marking & Lighting*, and as depicted on the phasing plans.
- d. The Contractor will be responsible to instruct all workers and subcontractors on where travel is permitted on the Airport property. The Contractor will also instruct all subcontractors on the vehicle identification requirements as described in Section 5 – *Contractor Access*.
- e. Open trenches or excavations are not permitted within the safety area adjacent to active Runways or Taxiways, unless temporarily allowed by the Engineer with special precautions (i.e. plates over a small width trench).
- f. Open trenches or excavations must be prominently marked.

## **18. OTHER LIMITS ON CONSTRUCTION:**

### **Prohibitions:**

- a. Cranes and other tall equipment (i.e. concrete pumpers, etc.) will not be deployed without a 7460 approval determination letter.
- b. Open flame welding, torches, and flare pots will not be used at any time.
- c. No blasting (with electronic blasting caps) will be permitted for this project.
- d. Smoking is not allowed on the AOA.

### **Restrictions:**

- a. Calendar days for phases are consecutive, except as noted in Section 2 *Phasing* or in the phasing plans in Appendix B. Once work has begun in an area the area must be worked daily during work hours until the work area is complete, unless otherwise allowed by the phasing plans in Appendix B.
- b. Refer to Section 2 – *Phasing* for restrictions on calendar days or limits on the number of hours for each phase of the project.
- c. The Contractor's work hours will be limited to 7:00 AM to 5:00 PM, Monday through Friday, unless otherwise authorized by the MHT Operations and Maintenance Management. No work shall be permitted on Sundays or legal holidays, except in cases of emergency. No work



will be permitted at night, unless a Night Work Lighting Plans is approved by the RPR and MHT Operations and Maintenance Management which outlines how sufficient lighting is provided to ensure a comparable degree of accuracy, workmanship, and conditions regarding safety as would be obtained in daylight.

## **19. AIRPORT WATCH PROGRAM.**

The “Airport Watch Program” was established to visually remind all Airport employees, users, and tenants of their role in maintaining a safe and secure Airport. If you see something suspicious, report it to your supervisor and to the Airport Communications Center immediately. With the willing assistance of many watchful eyes and alert ears, the Airport will remain a safe and secure environment for travelers, employees, contractors, and the general public.

THIS PAGE INTENTIONALLY LEFT BLANK

CSPP Appendix A  
**KEY PERSONNEL CONTACT LIST**

THIS PAGE INTENTIONALLY LEFT BLANK

## CSPP Appendix A – Key Personnel Contact List

<b>KEY PERSONNEL &amp; CONTACT LIST</b>		
<b>Communications Office (24 hour line)</b>	<b>Emergency:</b>	(603) 628-6222
	<b>Non-Emergency:</b>	(603) 624-6439
<b>Carlton Braley</b>	<b>Airport Operations &amp; Facilities, Asst. Dir.</b>	Manchester Boston Regional Airport
Office:	(603) 624-6539	1 Airport Road, Suite 300
Cell:	(603) 396-0707	Manchester, NH 03103
E-Mail:	cbraley@flymanchester.com	
<b>Andrew Fournier</b>	<b>Airport Operations, Superintendent</b>	Manchester Boston Regional Airport
Office:	(603) 624-6592	Operations and Maintenance
Cell:	(603) 344-3127	402 Kelly Avenue
E-Mail:	afournier@flymanchester.com	Manchester, NH 03103
<b>Dennis Duhaime</b>	<b>Airport Maintenance, Superintendent</b>	Manchester Boston Regional Airport
Office:	(603) 624-6592	Operations and Maintenance
Cell:	(603) 396-4851	402 Kelly Avenue
E-Mail:	dhduhaime@flymanchester.com	Manchester, NH 03103
<b>Mark Blad</b>	<b>MHT ATC Air Traffic Manager</b>	8 Ammon Drive
Office:	(603) 621-1701	Manchester, NH 03103
ATCT Gen. Phone:	(603) 621-1700	
Cell:	(603) 779-4301	
E-Mail:	Mark.Blad@faa.gov	
<b>Jen Levie</b>	<b>MHT FAA Technical Operations</b>	FAA Granite State SSC
Office:	(603)	25 Robert Milligan Pkwy
Cell:	(603) 759-4883	Merrimack, NH 03054
E-Mail:	Mark.Blad@faa.gov	
<b>Craig Pankey</b>	<b>BCT MHT SSC A Manager, Acting</b>	FAA Granite State SSC
Office:	(603) 594-5405	25 Robert Milligan Pkwy
Cell:	Jennifer.f.Levie@faa.gov	Merrimack, NH 03054
<b>Kevin Belanger</b>	<b>Manchester SSC B Manager</b>	FAA Granite State SSC
Office:	(603) 594-5404	25 Robert Milligan Pkwy
Cell:	(603) 493-8242	Merrimack, NH 03054
Email:	kevin.belanger@faa.gov	
<b>John Kirkendall</b>	<b>FAA Airports Div., Project Manager</b>	FAA Airports Division ANE-600
Office:	781-238-7626 New England Division	1200 District Avenue
Cell:	(603) 738-2920	Burlington, MA 01803
E-mail:	john.m.kirkendall@faa.gov	
<b>Radio: Manchester Ground (ATCT):</b>	<b>121.9 MHz</b>	
<b>UNICOM Frequency:</b>	<b>122.95 MHz</b>	
<b>MHT Communications Center</b>	Non Emergency: (603)-624-6349 - <b>Emergency (603) 628-6222</b>	
<b>Police (Manchester Airport):</b>	Non Emergency: (603)-624-6349 <b>Emergencies: CALL 911 or Comm Cntr (603) 628-6222</b>	
<b>Fire (Manchester Airport):</b>	Non Emergency: (603)-624-1614 <b>Emergencies: CALL 911 or Comm Cntr (603) 628-6222</b>	

<b>KEY PERSONNEL &amp; CONTACT LIST – CONT.</b>		
<b>Scott Shillieto</b>	<b>Deputy Project Manager</b>	McFarland Johnson
Office:	(603) 225-2978 (in Concord)	53 Regional Drive
Cell:	(413) 427-2650	Concord, NH 03301
Fax:	(603) 225-0095 (in Concord)	
E-Mail:	sshillieto@mjinc.com	
<b>Brian Bennett</b>	<b>Project Manager</b>	McFarland Johnson
Office:	(603) 225-2978 (in Concord)	53 Regional Drive
Cell:	(603) 340-0437	Concord, NH 03301
Fax:	(603) 225-0095 (in Concord)	
E-Mail:	bbennett@mjinc.com	
<b>CONTRACTOR</b>	<b>Site Superintendent</b>	<b>TBD</b>
Office:	TBD	
Cell:	TBD	
Fax:	TBD	
E-Mail:	TBD	
<b>CONTRACTOR</b>	<b>Project Manager</b>	<b>TBD</b>
Office:	TBD	
Cell:	TBD	
Fax:	TBD	
E-Mail:	TBD	

CSPP Appendix B  
**PHASING PLAN**

PAGE LEFT BLANK INTENTIONALLY



NGS MONUMENT DATA					
POINT #	NAME	DESCRIPTION	ELEVATION	LATITUDE	LONGITUDE
1	MHTO	SAC	21980	N42° 55' 59.617"	W71° 26' 40.231"
2	MHT C	PAC	22010	N42° 56' 14.438"	W71° 26' 19.585"
3	MHT E	SAC	22520	N42° 56' 00.144"	W71° 26' 01.084"
4	MHT F	PAC	22000	N42° 56' 15.302"	W71° 26' 19.034"
5	MHT G	SAC	22490	N42° 55' 59.645"	W71° 26' 00.045"

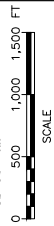
DATA: NGS 2016, NAD 83 (2011) and NAVD 88



**LEGEND:**

PHASED WORK AREA

HAZJ ROUTE



1. CONTRACTOR SHALL SUBMIT A WRITTEN SAFETY PLAN COMPLETION DOCUMENT (SPCD) TO THE ENGINEER, CITY OF MANCHESTER, DEPARTMENT OF AVIATION, AND FAA FOR REVIEW AND APPROVAL PRIOR TO MOBILIZATION AND BEFORE ANY CONSTRUCTION IS ALLOWED TO BE PERFORMED. ANY DELAY IN THE ISSUANCE OF THE SPCD SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE SPCD SHALL BE KNOWN AND KNOWLEDGEABLE NOT BE GROUNDS FOR ANY CONTRACT TIME EXTENSION. THE CONTRACTOR SHALL COME KNOWLEDGEABLE OF THE REGULATIONS AND PROCEDURES OF THE FAA ADVISORY CIRCULAR NO. 150/537-2C OR (CURRENT EDITION) "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION" AND THE APPROVED "CONSTRUCTION EDITION" OF THE FAA ADVISORY CIRCULAR NO. 150/537-2C. THE SPCD SHALL BE MODIFIED AND UPDATED AS REQUIRED OR EXCEED THE PROJECT'S CSPP REQUIREMENTS. THE SPCD SHALL BE MONITORED AND UPDATED AS REQUIRED THROUGHOUT THE PROJECT TO ADDRESS EACH PHASE AND/OR SUB PHASE AS WORK PROGRESSES. SOME, BUT NOT ALL OF THE ITEMS, TO BE ADDRESSED IN THE SPCD ARE AS FOLLOWS:
  - IDENTIFICATION AND QUALIFICATIONS OF DEDICATED SAFETY & SECURITY POINT OF CONTACT.
  - WORK SCHEDULING, COORDINATION, AND NOTIFICATION PROCEDURES OF CONSTRUCTION ACTIVITIES.
  - AIRFIELD COMMUNICATIONS AND 24-HOUR EMERGENCY NOTIFICATION PROCEDURES.
  - CONSTRUCTION OPERATIONS ADJACENT TO OR WITHIN SAFETY AREAS, OBJECT FREE.
  - AREAS, NAVAID CRITICAL AREAS, AND APPROACH SURFACES, (I.E. GRADING, HAULING MATERIALS, ETC.).
  - METHODS AND REQUIREMENTS FOR SEPARATING CONSTRUCTION AREAS FROM AIRPORT.
  - AIR OPERATIONS AREAS (AOA).
  - PREVENTING INTERFERENCE WITH FAANAVIAD (I.E. OR OTHER) CRITICAL AREAS.
  - CONTROL OF FOREIGN OBJECT DEBRIS (FOD) AND DUST.
  - CONSTRUCTION VEHICLE REQUIREMENTS, PROCEDURES AND DRIVER TRAINING FOR ESCORT DRIVERS.
  - OPERATIONS WITHIN MOVEMENT AND NON-MOVEMENT AREAS TO PREVENT RUNWAY INTRUSIONS.
  - CONTRACTOR ACCESS POINTS, VEHICLE CROSSING LOCATIONS, SECURITY FENCING AND GATES, AND EMPLOYEE SECURITY TRAINING.
  - PROCEDURES, REQUIREMENTS, AND COORDINATION OF RUNWAY AND/OR TAXIWAY CLOSURES, INCLUDING NOTICE TO AIRMEN (NOTAM) COORDINATION.
  - LIGHTED CHANNELIZER CONE PLACEMENT LOCATIONS, AND TEMPORARY CONSTRUCTION SIGN LOCATIONS.
  - PROCEDURES FOR MANAGING HAZARDOUS MATERIALS.
  - PROCEDURES FOR LOCATING & PROTECTING EXISTING UNDERGROUND UTILITIES.
2. CONTRACTOR SHALL PROVIDE A COMPETENT SAFETY PERSON (WHO ALSO COULD BE THE SUPERINTENDENT OR OTHER SUPERVISORY PERSON) FAMILIAR WITH AIRPORT SAFETY TO MONITOR CONSTRUCTION ACTIVITIES, ENSURE THAT ALL CONSTRUCTION ACTIVITIES ARE IN ACCORDANCE WITH THE SPCD, AND ENSURE THAT ALL PERSONNEL ADHERE TO THE SAFETY REQUIREMENTS ESTABLISHED BY THE CONTRACT DOCUMENTS. THE SPCD, THE REGULATIONS AND REQUIREMENTS OF THE AIRPORT, FAA, AND OTHER APPLICABLE AGENCIES, CONTRACTOR SHALL PROVIDE A POINT OF CONTACT TO THE OWNER AND RPRR WHO CAN BE CONTACTED AT ANY TIME THROUGHOUT THE COURSE OF THE CONTRACT. THIS INDIVIDUAL WILL BE CAPABLE OF ADVERSELY AFFECT THE OPERATIONAL SAFETY OF THE AIRPORT.
3. PRIOR TO RECEIPT OF APPROVAL FOR A CLOSURE AND BEFORE EQUIPMENT ENTERS THE AIRFIELD AND CONSTRUCTION COMMENCES, THE WORK AREA SHALL BE SECURED. LIGHTING EQUIPMENT, CHANNELIZER CONES AND SAFETY BARRICADES SHALL BE PLACED AND OPERATIONAL AS APPLICABLE. THE WORK AREA SHALL BE FULLY ILLUMINATED AND ALL SAFETY REQUIREMENTS SHALL BE APPROVED BY THE RPRR PRIOR TO BEGINNING ANY WORK.
5. THIS CONTRACTOR SHALL ENSURE THAT NO PAVERS, LIPS, PAVEMENT EDGES, SIGN FOUNDATIONS, STRUCTURES OR OTHER APPURTENANCES EXCEED 3 INCHES WITHIN ACTIVE AIRCRAFT OPERATIONAL AREAS.
7. DAILY COORDINATION OF CONSTRUCTION ACTIVITIES SHALL BE HELD ON-SITE WITH THE RPRR AND MHT OPERATIONS TO CLEARLY "IDENTIFY THE LIMITS OF WORK FOR THE DAY." THE CONTRACTOR SHALL NOT EXCEED THE LIMITS OF WORK WITHOUT APPROVAL FROM THE RPRR.
8. RUNWAY CLOSURES IN ACCORDANCE WITH THE CSPP SHALL BE SUBJECT TO WIND/WEATHER AVAILABILITY AND ARE SUBJECT TO A RECALL TIME TO BE DETERMINED BY MHT OPERATIONS.
9. IF WORKING UNDER A CAUTION ALLOWED BY THE CSPP, ALL ADJACENT PAVEMENTS SHALL BE AVAILABLE FOR UNLIMITED AIRCRAFT OPERATIONS. THE CONTRACTOR SHALL CONDUCT OPERATIONS IN SUCH A MANNER THAT THE CONTRACTOR SHALL NOT BE RESPONSIBLE FOR ANY DAMAGE TO THE AIRCRAFT OR THE AIRCRAFT OPERATIONS AND THE CONTRACTOR SHALL RELOCATE PERSONNEL AND EQUIPMENT A MINIMUM OF 120.9 FEET FROM THE TAXIWAY CENTERLINE, OR A MINIMUM OF 250' FROM RUNWAY CENTERLINE, TO ALLOW FOR SAFE PASSAGE OF AIRCRAFT AS REQUIRED.
10. AS NOTED PREVIOUSLY, WITHIN THESE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL BE PROVIDED WITH CONTRACTOR SHALL VEHICLES COMING INTO THE AOA AT THE GATE AND BE ESCORTED, WITH A MAXIMUM OF 3 STAGES IN CONVOY BEHIND THE ESCORT VEHICLE, TO THE WORK AREAS.
11. DURING NIGHT WORK (IF ALLOWED), ALL LIGHTING EQUIPMENT UTILIZED SHALL BE CONTROLLED TO PREVENT STRAY LIGHT. THE CONTRACTOR SHALL DIRECT ALL LIGHTING AWAY FROM ADJACENT NEIGHBORHOODS AND IN THE EVENT OF A NIGHTTIME LIGHTING VIOLATION, THE CONTRACTOR SHALL IMMEDIATELY SHUT DOWN THE LIGHTING. THE CONTRACTOR SHALL PREPARE A LIGHTING PLAN TO BE REVIEWED AND APPROVED BY THE RPRR. THE RPRR SHALL APPROVE THE LOCATION AND OPERATION OF ALL LIGHTING EQUIPMENT.

## LIGHTED RUNWAY CLOSURE MARKER

**RUNWAY CLOSURE MARKER NOTES:**

1. RUNWAY CLOSURE MARKERS TO PROVIDED BY AHT OPERATIONS
2. RUNWAY CLOSURE MARKER IS TO BE A TOWABLE UNIT WHICH CAN BE QUICKLY AND EFFICIENTLY SET UP AND REMOVED FROM THE RUNWAY. THE RUNWAY CLOSURE MARKER SHALL MEET THE REQUIREMENTS OF FAA ADVISORY CIRCULAR 100534-55A (CURRENT REVISION). SPECIFICATION FOR 1-483 LIGHT VISUAL AID TO BE USED FOR THE RUNWAY CLOSURE MARKER SHALL BE AS FOLLOWS:
  - 3. RUNWAY CLOSURE MARKER MUST BE ABLE TO WITHSTAND A MINIMUM WIND SPEED OF 40 M.P.H. WITHOUT ADVERSELY AFFECTING AIMING OR OPERATION.
  - 4. RUNWAY CLOSURE MARKER WILL CONSIST OF 21 90-watt PAR 38 CLEAR INCANDESCENT LAMPS OR LAMPS WHICH ARE CAPABLE OF TRANSMITTING AVIATION WHITE LIGHT PER SAE A582960, ARRANGED IN THE SHAPE OF A "Y". THE "Y" FRAME SHALL BE CONSTRUCTED OF 1 1/2" X 1/2" ALUMINUM ANGLE, 10 FEET LONG, 10 FEET HIGH, YELLOW, PER FED-STD-595, ON ALL SIDES TO ENHANCE VISIBILITY.
  - 5. LIGHT FIXTURES MOUNTED IN "Y" FRAME MUST INDIVIDUALLY BE CAPABLE OF PROVIDING THE FOLLOWING MINIMUM INTENSITIES:
    - a. DAYTIME: 100 CD AT AN INTENSITY OF 7000 CANDLEPOWER (cd)
    - b. AT THE BEAM CENTER, 34,000 cd AT 10 DEGREES RADIIUS,
    - c. AND 13,000 cd AT 15 DEGREES RADIIUS,
    - d. NIGHTTIME EFFECTIVE INTENSITY OF 2,000 (cd) AT THE BEAM CENTER, 970 cd AT 10 DEGREES RADIIUS, AND 370 cd AT 15 DEGREES RADIIUS.
  - 6. LIGHT FIXTURES MOUNTED IN "Y" FRAME MUST HAVE ALL LIGHT BULBS SOCKETS, WIRING AND CONNECTIONS ENCLOSED IN WEATHER RESISTANT HOUSINGS.
  - 7. LIGHT FIXTURES MOUNTED IN "Y" FRAME ARE TO BE IN A FLASHING MODE CONTROLLED BY A SOLID STATE FLASHER. FLASHER IS TO BE EQUIPPED WITH A FAI SAFE ALLOWING LIGHTS TO REMAIN ON CONTINUOUS FLASH INTERVAL TIME WILL BE: DAYTIME OPERATION: 2.5 SECONDS ON 2.5 SECONDS OFF NIGHTTIME OPERATION: 2.5 SECONDS ON 2.5 SECONDS OFF
  - 8. UNIT MUST BE EQUIPPED WITH A PHOTO CELL WHICH WILL REDUCE THE OUTPUT VOLTAGE TO 65 VOLTS DURING NIGHTTIME OPERATION.
  - 9. UNIT MUST BE EQUIPPED FOR A CONNECTION TO 400V AC POWER SOURCE TO ALLOW FOR BACKUP POWER SOURCE CAPABILITY OR ON-SITE POWER SUPPLY IF AVAILABLE. RUNWAY CLOSURE MARKER IS TO BE ENERGIZED BY A PORTABLE DIESEL ENGINE POWER SUPPLY WITH AN ADEQUATE FUEL CAPACITY TO SUPPLY POWER TO THE UNIT AT FULL LOAD FOR A MINIMUM OF 120 HOURS OF CONTINUOUS OPERATION.
  - 10. LIGHT FIXTURES ARE TO BE EQUIPPED WITH 21 LIGHTS MOUNTED ON THE BACK SIDE OF THE TOP LESSORS OF THE "Y" FRAME. LIGHTS ARE TO BE WIRED SUCH THAT THEY REMAIN CONTINUOUSLY ON DURING CLOSURE MARKER OPERATION AS AN INDICATION OF POWER BEING SUPPLIED TO THE UNIT.
  - 11. UNIT IS TO BE EQUIPPED WITH SOLAR POWERED SAFETY BEACON MOUNTED IN A LOCATION VISIBLE TO ATCT OR AIRPORT PERSONNEL. BEACON IS TO BE WIRED SUCH THAT IT WILL BE ACTIVATED IN THE EVENT OF TOTAL LOSS OF POWER TO THE UNIT.
  - 12. CONTRACTOR TO MOBILIZE, OPERATE AND MAINTAIN THE RUNWAY CLOSURE MARKERS AS PART OF THE W-2001 MAINTENANCE AND PROTECTION OF THE SAFETY LINE FENCE IN THE CONTRACT.

## RSA DELINEATION MARKER

1. THE RPPR AND MHT OPERATIONS WILL HAVE FINAL DETERMINATION WHERE EACH TYPE OF BARRICADE (LOW PROFILE, CHANNELIZER CONES, TRAFFIC CONES, ETC.) SHALL BE PLACED.
2. BARRICADES SPECIFIC TO THE PROJECT OR CHANNELIZER CONES SHOWN ON THIS SHEET OR APPROVED EQUAL EQUIVALENTS SHALL BE USED FOR THE PROJECT.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESENCE OF THE FOLLOWING:
  - "OPERATIONAL SIGN" ON AIRPORTS DURING CONSTRUCTION.
4. MHT OPERATIONS MAINTAIN A SMALL SUPPLY OF LIGHTED CONSTRUCTION BARRICADES FOR CONTRACTOR USE. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESENCE OF THE FOLLOWING:
  - CONTRACTOR SHALL BE REQUIRED TO SUPPLY ADDITIONAL BARRICADES IF THESE BARRICADES SHALL BE PROVIDED UNDER ITEM M-200.1 AND RETAINED BY THE CONTRACTOR AT COMPLETION OF THE PROJECT.
5. CONTRACTOR SHALL MAKE DAILY INSPECTIONS OF THE BARRICADES/CONES TO ENSURE LIGHTS ARE OPERATING EVERY HOUR.
6. CONTRACTOR SHALL INSTALL OWNER PROVIDED "DO NOT ENTER" SIGNS ON TAIWAYS TO BE CLOSED AT 260' FROM RUNWAY CENTERLINE AT THE REQUEST OF THE OWNER.

## WATER BALLASTED LIGHTED SAFETY BARRICADE

- 
- 3" WOODEN GRADE STAKE
- 60°
- FLUORESCENT ORANGE POLYETHYLENE CONE WITH WHITE REFLECTIVE BANDS, 4-6" IN WIDTH
1. MARKER CONES SHALL BE SPACED AT 20' ON CENTER TO PROTECT THE RUNWAY SAFETY AREA AND SHALL BE PLACED 260' FROM THE RUNWAY CENTERLINE.
2. THE MARKER CONES MUST BE SUBJECT TO INSPECTION OF THE MARKER CONES AND SHALL RELOCATE ANY CONES THAT ARE MISALIGNED.
3. TRAFFIC CONES SHALL BE ADEQUATELY SECURED TO WITHSTAND HIGH WINDS AND MUST BE PLACED AT LEAST USING GRADE STAKES AS SHOWN.
4. INSTALLATION, REMOVAL AND RELOCATION

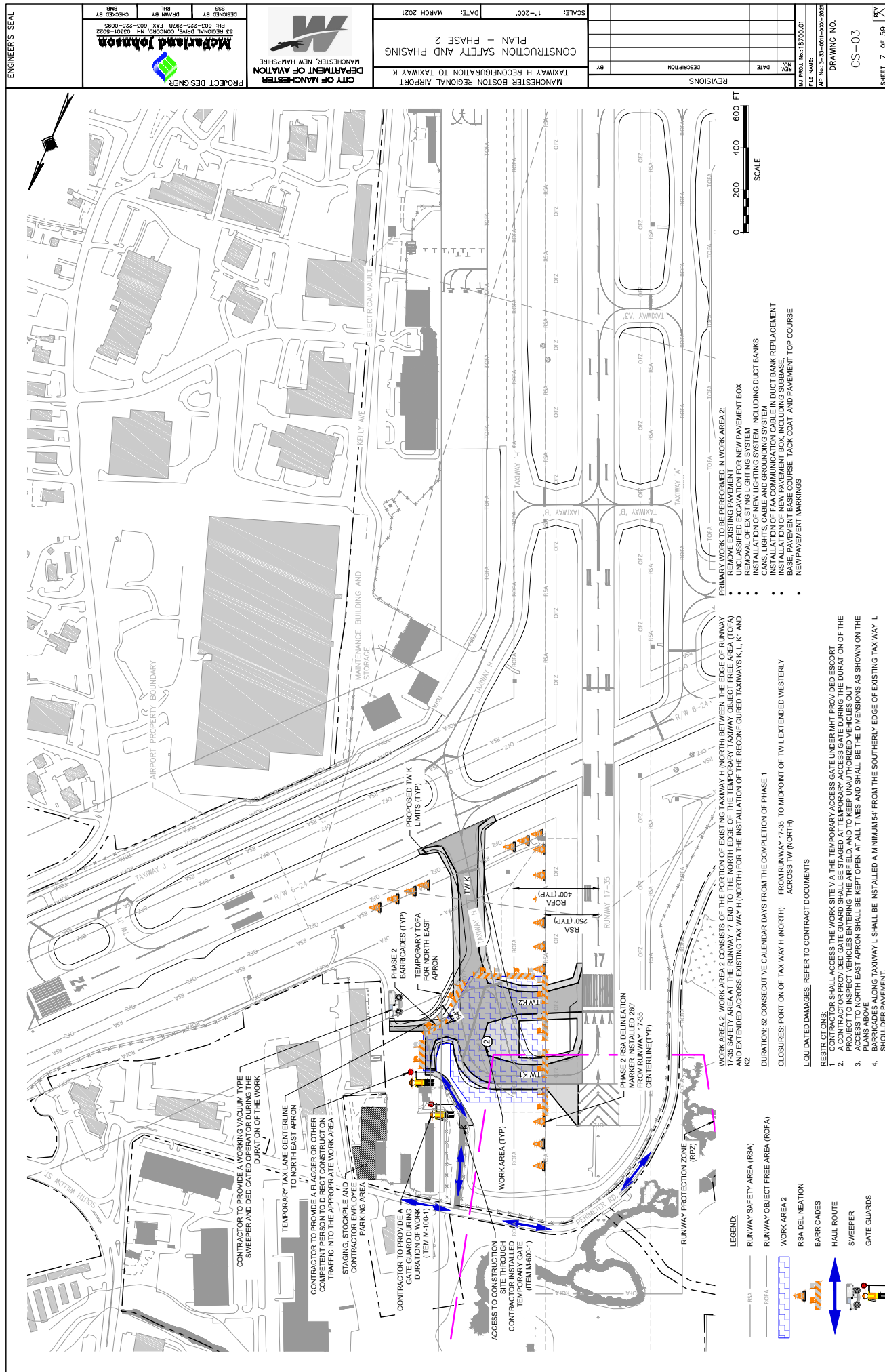
## GENERAL AVIATION BARRICADE NOTES:

1. THE RPPR AND MHT OPERATIONS WILL HAVE FINAL DETERMINATION WHERE EACH TYPE OF BARRICADE (LOW PROFILE, CHANNELIZER CONES, TRAFFIC CONES, ETC.) SHALL BE PLACED.
2. BARRICADES SPECIFIC TO THE PROJECT OR CHANNELIZER CONES SHOWN ON THIS SHEET OR APPROVED EQUAL EQUIVALENTS SHALL BE USED FOR THE PROJECT.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESENCE OF THE FOLLOWING:
  - "OPERATIONAL SIGN" ON AIRPORTS DURING CONSTRUCTION.
4. MHT OPERATIONS MAINTAIN A SMALL SUPPLY OF LIGHTED CONSTRUCTION BARRICADES FOR CONTRACTOR USE. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PRESENCE OF THE FOLLOWING:
  - CONTRACTOR SHALL BE REQUIRED TO SUPPLY ADDITIONAL BARRICADES IF THESE BARRICADES SHALL BE PROVIDED UNDER ITEM M-200.1 AND RETAINED BY THE CONTRACTOR AT COMPLETION OF THE PROJECT.
5. CONTRACTOR SHALL MAKE DAILY INSPECTIONS OF THE BARRICADES/CONES TO ENSURE LIGHTS ARE OPERATING EVERY HOUR.
6. CONTRACTOR SHALL INSTALL OWNER PROVIDED "DO NOT ENTER" SIGNS ON TAIWAYS TO BE CLOSED AT 260' FROM RUNWAY CENTERLINE AT THE REQUEST OF THE OWNER.









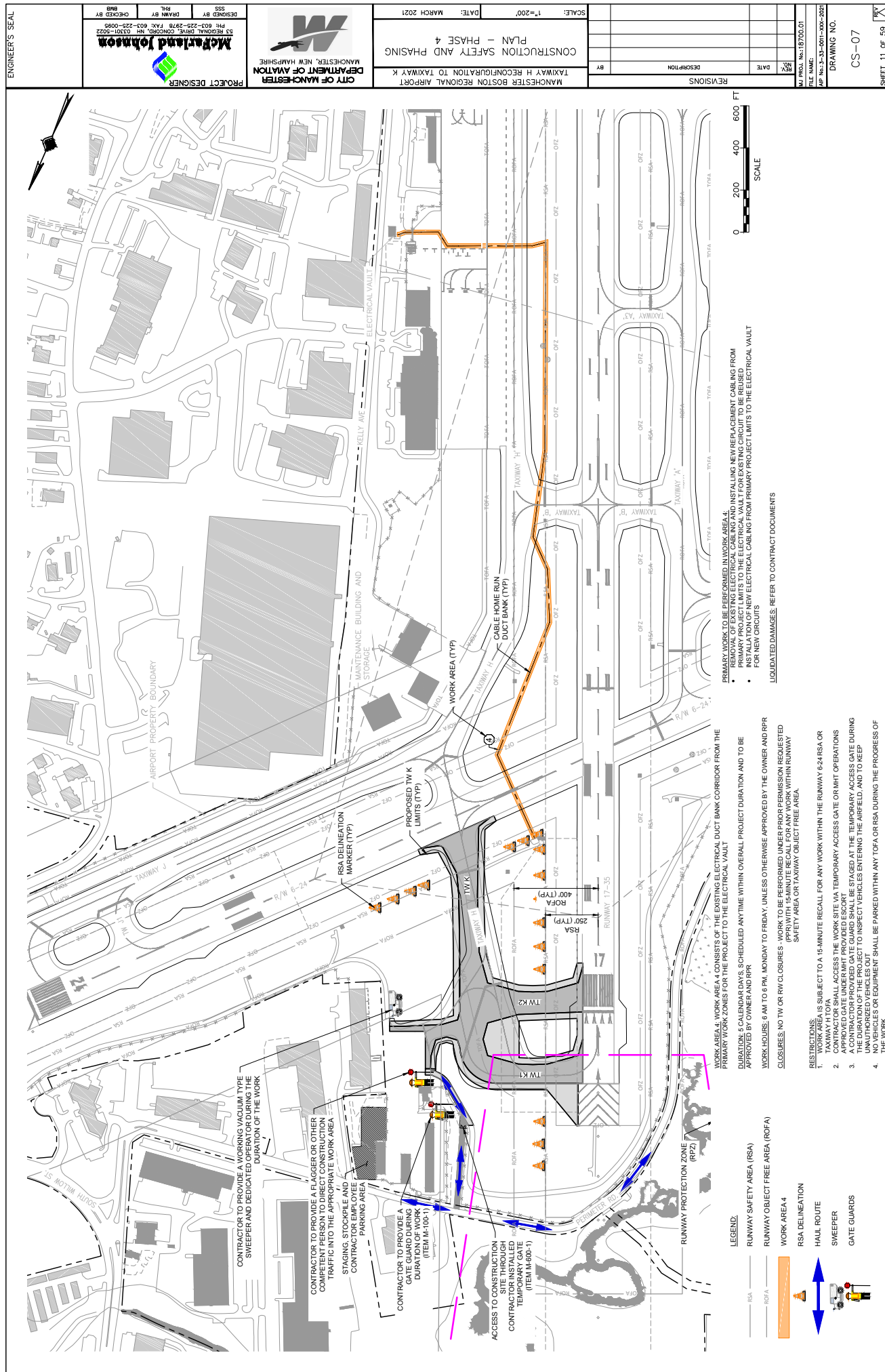












PAGE LEFT BLANK INTENTIONALLY

CSPP Appendix C  
**SAFETY AND PHASING PLAN CHECKLIST**

PAGE LEFT BLANK INTENTIONALLY

**APPENDIX C. SAFETY AND PHASING PLAN CHECKLIST**

This appendix is keyed to Chapter 2. In the electronic version of this AC, clicking on the paragraph designation in the Reference column will access the applicable paragraph. There may be instances where the CSPP requires provisions that are not covered by the list in this appendix.

This checklist is intended as an aid, not a required submittal.

**Table C-1. CSPP Checklist**

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
General Considerations					
Requirements for predesign, prebid, and preconstruction conferences to introduce the subject of airport operational safety during construction are specified.	<u>2.5</u>	X			
Operational safety is a standing agenda item for construction progress meetings.	<u>2.5</u>	X			
Scheduling of the construction phases is properly addressed.	<u>2.6</u>	X			
Any formal agreements are established.	<u>2.5.3</u>	X			
Areas and Operations Affected by Construction Activity					
Drawings showing affected areas are included.	<u>2.7.1</u>	X			
Closed or partially closed runways, taxiways, and aprons are depicted on drawings.	<u>2.7.1.1</u>	X			
Access routes used by ARFF vehicles affected by the project are addressed.	<u>2.7.1.2</u>	X			
Access routes used by airport and airline support vehicles affected by the project are addressed.	<u>2.7.1.3</u>	X			
Underground utilities, including water supplies for firefighting and drainage.	<u>2.7.1.4</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Approach/departure surfaces affected by heights of temporary objects are addressed.	<u>2.7.1.5</u>	X			
Construction areas, storage areas, and access routes near runways, taxiways, aprons, or helipads are properly depicted on drawings.	<u>2.7.1</u>	X			
Temporary changes to taxi operations are addressed.	<u>2.7.2.1</u>	X			
Detours for ARFF and other airport vehicles are identified.	<u>2.7.2.2</u>	X			
Maintenance of essential utilities and underground infrastructure is addressed.	<u>2.7.2.3</u>	X			
Temporary changes to air traffic control procedures are addressed.	<u>2.7.2.4</u>	X			
<b>NAVAIDs</b>					
Critical areas for NAVAIDs are depicted on drawings.	<u>2.8</u>	X			
Effects of construction activity on the performance of NAVAIDS, including unanticipated power outages, are addressed.	<u>2.8</u>	X			
Protection of NAVAID facilities is addressed.	<u>2.8</u>	X			
The required distance and direction from each NAVAID to any construction activity is depicted on drawings.	<u>2.8</u>	X			
Procedures for coordination with FAA ATO/Technical Operations, including identification of points of contact, are included.	<u>2.8, 2.13.1, 2.13.5.3.1, 2.18.1</u>	X			
<b>Contractor Access</b>					
The CSPP addresses areas to which contractor will have access and how	<u>2.9</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
the areas will be accessed.					
The application of 49 CFR Part 1542 Airport Security, where appropriate, is addressed.	<u>2.9</u>	X			
The location of stockpiled construction materials is depicted on drawings.	<u>2.9.1</u>	X			
The requirement for stockpiles in the ROFA to be approved by FAA is included.	<u>2.9.1</u>	X			
Requirements for proper stockpiling of materials are included.	<u>2.9.1</u>	X			
Construction site parking is addressed.	<u>2.9.2.1</u>	X			
Construction equipment parking is addressed.	<u>2.9.2.2</u>	X			
Access and haul roads are addressed.	<u>2.9.2.3</u>	X			
A requirement for marking and lighting of vehicles to comply with <u>AC 150/5210-5, Painting, Marking and Lighting of Vehicles Used on an Airport</u> , is included.	<u>2.9.2.4</u>	X			
Proper vehicle operations, including requirements for escorts, are described.	<u>2.9.2.5, 2.9.2.6</u>	X			
Training requirements for vehicle drivers are addressed.	<u>2.9.2.7</u>	X			
Two-way radio communications procedures are described.	<u>2.9.2.9</u>	X			
Maintenance of the secured area of the airport is addressed.	<u>2.9.2.10</u>	X			
<b>Wildlife Management</b>					
The airport operator's wildlife management procedures are addressed.	<u>2.10</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Foreign Object Debris Management					
The airport operator’s FOD management procedures are addressed.	<u>2.11</u>	X			
Hazardous Materials Management					
The airport operator’s hazardous materials management procedures are addressed.	<u>2.12</u>	X			
Notification of Construction Activities					
Procedures for the immediate notification of airport user and local FAA of any conditions adversely affecting the operational safety of the airport are detailed.	<u>2.13</u>	X			
Maintenance of a list by the airport operator of the responsible representatives/points of contact for all involved parties and procedures for contacting them 24 hours a day, seven days a week is specified.	<u>2.13.1</u>	X			
A list of local ATO/Technical Operations personnel is included.	<u>2.13.1</u>	X			
A list of ATCT managers on duty is included.	<u>2.13.1</u>	X			
A list of authorized representatives to the OCC is included.	<u>2.13.2</u>	X			
Procedures for coordinating, issuing, maintaining and cancelling by the airport operator of NOTAMS about airport conditions resulting from construction are included.	<u>2.8, 2.13.2, 2.18.3.3.9</u>	X			
Provision of information on closed or hazardous conditions on airport movement areas by the airport operator to the OCC is specified.	<u>2.13.2</u>	X			
Emergency notification procedures for medical, fire fighting, and police	<u>2.13.3</u>	X			



Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
response are addressed.					
Coordination with ARFF personnel for non-emergency issues is addressed.	<u>2.13.4</u>	X			
Notification to the FAA under 14 CFR parts 77 and 157 is addressed.	<u>2.13.5</u>	X			
Reimbursable agreements for flight checks and/or design and construction for FAA owned NAVAIDs are addressed.	<u>2.13.5.3.2</u>	X			
<b>Inspection Requirements</b>					
Daily and interim inspections by both the airport operator and contractor are specified.	<u>2.14.1, 2.14.2</u>	X			
Final inspections at certificated airports are specified when required.	<u>2.14.3</u>	X			
<b>Underground Utilities</b>					
Procedures for protecting existing underground facilities in excavation areas are described.	<u>2.15</u>	X			
<b>Penalties</b>					
Penalty provisions for noncompliance with airport rules and regulations and the safety plans are detailed.	<u>2.16</u>	X			
<b>Special Conditions</b>					
Any special conditions that affect the operation of the airport or require the activation of any special procedures are addressed.	<u>2.17</u>	X			
<b>Runway and Taxiway Visual Aids - Marking, Lighting, Signs, and Visual NAVAIDs</b>					
The proper securing of temporary airport markings, lighting, signs, and visual NAVAIDs is addressed.	<u>2.18.1</u>	X			
Frangibility of airport markings, lighting, signs, and visual NAVAIDs is specified.	<u>2.18.1, 2.18.3, 2.18.4.2, 2.20.2.4</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
The requirement for markings to be in compliance with <u>AC 150/5340-1</u> , <i>Standards for Airport Markings</i> , is specified.	<u>2.18.2</u>	X			
Detailed specifications for materials and methods for temporary markings are provided.	<u>2.18.2</u>	X			
The requirement for lighting to conform to <u>AC 150/5340-30</u> , <i>Design and Installation Details for Airport Visual Aids</i> ; <u>AC 150/5345-50</u> , <i>Specification for Portable Runway and Taxiway Lights</i> ; and <u>AC 150/5345-53</u> , <i>Airport Lighting Certification Program</i> , is specified.	<u>2.18.3</u>	X			
The use of a lighted X is specified where appropriate.	<u>2.18.2.1.2</u> , <u>2.18.3.2</u>	X			
The requirement for signs to conform to <u>AC 150/5345-44</u> , <i>Specification for Runway and Taxiway Signs</i> ; <u>AC 150/5340-18</u> , <i>Standards for Airport Sign Systems</i> ; and <u>AC 150/5345-53</u> , <i>Airport Lighting Certification Program</i> , is specified.	<u>2.18.4</u>	X			
<b>Marking and Signs For Access Routes</b>					
The CSPP specifies that pavement markings and signs intended for construction personnel should conform to <u>AC 150/5340-18</u> and, to the extent practicable, with the MUTCD and/or State highway specifications.	<u>2.18.4.2</u>	X			
<b>Hazard Marking and Lighting</b>					
Prominent, comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles are specified.	<u>2.20.1</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Hazard marking and lighting are specified to identify open manholes, small areas under repair, stockpiled material, and waste areas.	<u>2.20.1</u>	X			
The CSPP considers less obvious construction-related hazards.	<u>2.20.1</u>	X			
Equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash and jet blast is specified.	<u>2.20.2.1</u>	X			
The spacing of barricades is specified such that a breach is physically prevented barring a deliberate act.	<u>2.20.2.1</u>	X			
Red lights meeting the luminance requirements of the State Highway Department are specified.	<u>2.20.2.2</u>	X			
Barricades, temporary markers, and other objects placed and left in areas adjacent to any open runway, taxiway, taxi lane, or apron are specified to be as low as possible to the ground, and no more than 18 inch high.	<u>2.20.2.3</u>	X			
Barricades are specified to indicate construction locations in which no part of an aircraft may enter.	<u>2.20.2.3</u>	X			
Highly reflective barriers with lights are specified to barricade taxiways leading to closed runways.	<u>2.20.2.5</u>	X			
Markings for temporary closures are specified.	<u>2.20.2.5</u>	X			
The provision of a contractor's representative on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades is specified.	<u>2.20.2.7</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
Work Zone Lighting for Nighttime Construction					
If work is to be conducted at night, the CSPP identifies construction lighting units and their general locations and aiming in relationship to the ATCT and active runways and taxiways.	<u>2.21</u>	X			
Protection of Runway and Taxiway Safety Areas					
The CSPP clearly states that no construction may occur within a safety area while the associated runway or taxiway is open for aircraft operations.	<u>2.22.1.1</u> , <u>2.22.3.1</u>	X			
The CSPP specifies that the airport operator coordinates the adjustment of RSA or TSA dimensions with the ATCT and the appropriate FAA Airports Regional or District Office and issues a local NOTAM.	<u>2.22.1.2</u> , <u>2.22.3.2</u>	X			
Procedures for ensuring adequate distance for protection from blasting operations, if required by operational considerations, are detailed.	<u>2.22.3.3</u>	X			
The CSPP specifies that open trenches or excavations are not permitted within a safety area while the associated runway or taxiway is open, subject to approved exceptions.	<u>2.22.1.4</u>	X			
Appropriate covering of excavations in the RSA or TSA that cannot be backfilled before the associated runway or taxiway is open is detailed.	<u>2.22.1.4</u>	X			
The CSPP includes provisions for prominent marking of open trenches and excavations at the construction site.	<u>2.22.1.4</u>	X			
Grading and soil erosion control to maintain RSA/TSA standards are	<u>2.22.3.5</u>	X			

Coordination	Reference	Addressed?			Remarks
		Yes	No	NA	
addressed.					
The CSPP specifies that equipment is to be removed from the ROFA when not in use.	<u>2.22.2</u>	X			
The CSPP clearly states that no construction may occur within a taxiway safety area while the taxiway is open for aircraft operations.	<u>2.22.3</u>	X			
Appropriate details are specified for any construction work to be accomplished in a taxiway object free area.	<u>2.22.4</u>	X			
Measures to ensure that personnel, material, and/or equipment do not penetrate the OFZ or threshold siting surfaces while the runway is open for aircraft operations are included.	<u>2.22.4.3.6</u>	X			
Provisions for protection of runway approach/departure areas and clearways are included.	<u>2.22.6</u>	X			
<b>Other Limitations on Construction</b>					
The CSPP prohibits the use of open flame welding or torches unless adequate fire safety precautions are provided and the airport operator has approved their use.	<u>2.23.1.2</u>	X			
The CSPP prohibits the use of electrical blasting caps on or within 1,000 ft (300 m) of the airport property.	<u>2.23.1.3</u>	X			

PAGE INTENTIONALLY LEFT BLANK

CSPP Appendix D  
**DAILY SAFETY INSPECTION CHECKLIST**

PAGE LEFT BLANK INTENTIONALLY



**APPENDIX D. CONSTRUCTION PROJECT DAILY SAFETY INSPECTION CHECKLIST**

The situations identified below are potentially hazardous conditions that may occur during airport construction projects. Safety area encroachments, unauthorized and improper ground vehicle operations, and unmarked or uncovered holes and trenches near aircraft operating surfaces pose the most prevalent threats to airport operational safety during airport construction projects. The list below is one tool that the airport operator or contractor may use to aid in identifying and correcting potentially hazardous conditions. It should be customized as appropriate for each project including information such as the date, time and name of the person conducting the inspection.

**Table D-1. Potentially Hazardous Conditions**

<b>Item</b>	<b>Action Required (Describe)</b>	<b>No Action Required (Check)</b>
Excavation adjacent to runways, taxiways, and aprons improperly backfilled.		
Mounds of earth, construction materials, temporary structures, and other obstacles near any open runway, taxiway, or taxi lane; in the related Object Free area and aircraft approach or departure areas/zones; or obstructing any sign or marking.		
Runway resurfacing projects resulting in lips exceeding 3 inch (7.6 cm) from pavement edges and ends.		
Heavy equipment (stationary or mobile) operating or idle near AOA, in runway approaches and departures areas, or in OFZ.		
Equipment or material near NAVAIDs that may degrade or impair radiated signals and/or the monitoring of navigation and visual aids. Unauthorized or improper vehicle operations in localizer or glide slope critical areas, resulting in electronic interference and/or facility shutdown.		
Tall and especially relatively low visibility units (that is, equipment with slim profiles) — cranes, drills, and similar objects — located in critical areas, such as OFZ and		

<b>Item</b>	<b>Action Required (Describe)</b>	<b>No Action Required (Check)</b>
approach zones.		
Improperly positioned or malfunctioning lights or unlighted airport hazards, such as holes or excavations, on any apron, open taxiway, or open taxi lane or in a related safety, approach, or departure area.		
Obstacles, loose pavement, trash, and other debris on or near AOA. Construction debris (gravel, sand, mud, paving materials) on airport pavements may result in aircraft propeller, turbine engine, or tire damage. Also, loose materials may blow about, potentially causing personal injury or equipment damage.		
Inappropriate or poorly maintained fencing during construction intended to deter human and animal intrusions into the AOA. Fencing and other markings that are inadequate to separate construction areas from open AOA create aviation hazards.		
Improper or inadequate marking or lighting of runways (especially thresholds that have been displaced or runways that have been closed) and taxiways that could cause pilot confusion and provide a potential for a runway incursion. Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOA create aviation hazards.		
Wildlife attractants — such as trash (food scraps not collected from construction personnel activity), grass seeds, tall grass, or standing water — on or near airports.		
Obliterated or faded temporary markings on active operational areas.		
Misleading or malfunctioning obstruction lights. Unlighted or unmarked obstructions in the approach to any open runway pose aviation hazards.		

Item	Action Required (Describe)	No Action Required (Check)
Failure to issue, update, or cancel NOTAMs about airport or runway closures or other construction related airport conditions.		
Failure to mark and identify utilities or power cables. Damage to utilities and power cables during construction activity can result in the loss of runway / taxiway lighting; loss of navigation, visual, or approach aids; disruption of weather reporting services; and/or loss of communications.		
Restrictions on ARFF access from fire stations to the runway / taxiway system or airport buildings.		
Lack of radio communications with construction vehicles in airport movement areas.		
Objects, regardless of whether they are marked or flagged, or activities anywhere on or near an airport that could be distracting, confusing, or alarming to pilots during aircraft operations.		
Water, snow, dirt, debris, or other contaminants that temporarily obscure or derogate the visibility of runway/taxiway marking, lighting, and pavement edges. Any condition or factor that obscures or diminishes the visibility of areas under construction.		
Spillage from vehicles (gasoline, diesel fuel, oil) on active pavement areas, such as runways, taxiways, aprons, and airport roadways.		
Failure to maintain drainage system integrity during construction (for example, no temporary drainage provided when working on a drainage system).		

<b>Item</b>	<b>Action Required (Describe)</b>	<b>No Action Required (Check)</b>
Failure to provide for proper electrical lockout and tagging procedures. At larger airports with multiple maintenance shifts/workers, construction contractors should make provisions for coordinating work on circuits.		
Failure to control dust. Consider limiting the amount of area from which the contractor is allowed to strip turf.		
Exposed wiring that creates an electrocution or fire ignition hazard. Identify and secure wiring, and place it in conduit or bury it.		
Site burning, which can cause possible obscuration.		
Construction work taking place outside of designated work areas and out of phase.		

CSPP Appendix E  
**SAFETY PLAN COMPLIANCE DOCUMENT**

PAGE LEFT BLANK INTENTIONALLY

## APPENDIX E

### SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)

This document **MUST** be submitted and approved prior to the Notice to Proceed being issued.

**Name of Contractor:** \_\_\_\_\_

**Project Name:**     **Runway Incursion Mitigation Project**  
                          **Taxiway H Reconfiguration to Taxiway K**  
                          **Manchester-Boston Regional Airport, Manchester, New Hampshire**

Please check appropriate box for each of sections. If the Construction Phasing and Safety Plan will be followed without exception for any given topic, the “No Supplemental Information” box may be checked. If not, provide supplemental information components and comment as applicable (add attachments as needed). Any comments below will be discussed and require approval of the Airport prior to issuance of a Notice to Proceed.

- (1) Coordination.** Discuss details of proposed safety meetings with the airport operator and with contractor and subcontractor employees.

☐ **No Supplemental Information**                      ☐ **Supplemental Information as follows:**

---

---

---

- (2) Phasing.** Discuss proposed construction schedule elements:

☐ **No Supplemental Information**                      ☐ **Supplemental Information as follows:**

- (a) Planned duration of each phase:

Provide anticipated duration for each work phase via attachment.

- (b) Daily start and finish of construction, including “night only” construction:

Provide anticipated daily start/finish for each phase via attachment.

- (c) Duration of construction activities during:

(i) Normal runway operations \_\_\_\_\_

(ii) Closed runway operations \_\_\_\_\_

(iii) Modified runway “Aircraft Reference Code” usage \_\_\_\_\_

- (3) Areas and operations affected by the construction activity.** Areas and operations are identified in the CSPP.

☐ **No Supplemental Information**                      ☐ **Supplemental Information as follows:**

---

---

---

---

---

- (4) **Protection of NAVAIDs.** Discuss specific methods proposed to protect operating NAVAIDs.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

- (5) **Contractor access.** Provide the following:

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

- (a) Details on how the contractor will maintain the integrity of the airport security fence (gate guards, daily log of construction personnel, and other):

---

---

---

- (b) Listing of individuals requiring driver training (for certificated airports and as requested). \_\_\_\_\_

---

---

- (c) Radio communications.

(i) Types of radios and backup capabilities. \_\_\_\_\_

(ii) Who will be monitoring radios. \_\_\_\_\_

(iii) Whom to contact if the ATCT cannot reach the contractor's designated person by radio. \_\_\_\_\_

- (d) Details on how the contractor will escort material delivery vehicles. \_\_\_\_\_

---

---

- (6) **Wildlife management.** Discuss the following:

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

- (a) Methods and procedures to prevent wildlife attraction \_\_\_\_\_

---

- (b) Wildlife reporting procedures \_\_\_\_\_

---

- (7) **Foreign Object Debris (FOD) management.** Discuss equipment and methods for control of FOD, including construction debris and dust.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

Provide anticipated equipment and methods via attachment.



- (8) **Hazardous material (HAZMAT) management.** Discuss equipment and methods for responding to hazardous spills.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

- (9) **Notification of construction activities.** Provide the following:

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

(a) Contractor points of contact \_\_\_\_\_

(b) Contractor emergency contact \_\_\_\_\_

(c) Listing of tall or other requested equipment proposed for use on the airport and the timeframe for submitting 7460-1 forms not previously submitted by the airport operator \_\_\_\_\_

---

- (10) **Inspection requirements.** Discuss daily (or more frequent) inspections and special inspection procedures.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

- (11) **Underground utilities.** Discuss proposed methods of identifying and protecting underground utilities.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

- (12) **Penalties.** Penalties are identified in the CSPP.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

- (13) **Special conditions.** Discuss proposed actions for each special condition identified in the CSPP as required.

☐ **No Supplemental Information**

☐ **Supplemental Information as follows:**

---

---

---

**(14) Runway and taxiway visual aids.** Including marking, lighting, signs, and visual NAVAIDs. Discuss proposed visual aids including the following:

(a) Equipment and methods for covering signage and airfield lights \_\_\_\_\_

\_\_\_\_\_

(b) Equipment and methods for temporary closure markings (paint, fabric, other) \_\_\_\_\_

\_\_\_\_\_

(c) Types of temporary Visual Guidance Slope Indicators (VGSI) \_\_\_\_\_

\_\_\_\_\_

**(15) Marking and signs for access routes.** Discuss proposed methods of demarcating access routes for vehicle drivers.

☐ No Supplemental Information

☐ Supplemental Information as follows:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**(16) Hazard marking and lighting.** Discuss proposed equipment and methods for identifying excavation areas.

☐ No Supplemental Information

☐ Supplemental Information as follows:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**(17) Protection of runway and taxiway safety areas.** Including object free areas, obstacle free zones, and approach/departure surfaces. Discuss proposed methods of identifying, demarcating, and protecting airport surfaces including:

☐ No Supplemental Information

☐ Supplemental Information as follows:

(a) Equipment and methods for maintaining Taxiway Safety Area standards \_\_\_\_\_

\_\_\_\_\_

(b) Equipment and methods for separation of construction operations from aircraft operations, including details of barricades \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(18) Other limitations on construction** These are identified in the CSPP.

☐ No Supplemental Information

**Supplemental Information as follows:**

---

---

---

**LIST OF ATTACHMENTS PROVIDED AS PART OF THE SAFETY PLAN COMPLIANCE DOCUMENT:**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

**Contractor's Certification and Acknowledgement**

I have read the Project Construction Safety and Phasing Plan (CSPP) for the above referenced project, which has been approved by FAA on \_\_\_\_\_, 20\_\_\_\_, and certify the Contractor and its subcontractors will abide by it as written, unless any additions and changes are approved by the Manchester-Boston Regional Airport in writing. This Safety Plan Compliance Document (SPCD) will conform to the CSPP and will provide additional safety information for the Project.

---

CONTRACTOR

---

Signature

---

Printed Name and Title

---

Date

**GEOTECHNICAL REPORT**  
**SCHEDULE B & C – TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**

THIS PAGE INTENTIONALLY LEFT BLANK

## GEOTECHNICAL INVESTIGATION REPORT

### RECONFIGURE TAXIWAY H PROJECT

Manchester-Boston Regional Airport  
Manchester, New Hampshire 03103

Prepared for:

McFarland Johnson, Inc.  
53 Regional Drive  
Concord, New Hampshire 03301

Prepared by:

John Turner Consulting, Inc.  
19 Dover Street  
Dover, New Hampshire 03820

**JTC Project No. 20-04-093**

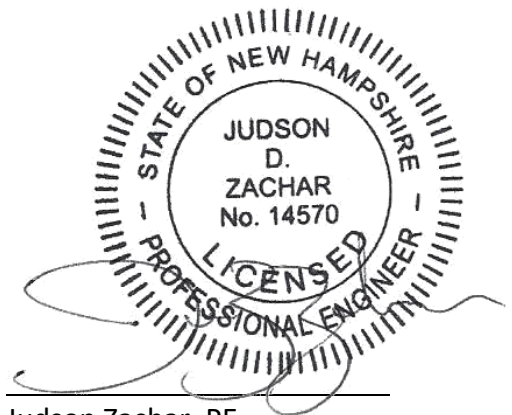
November 20, 2020

*Jonathan Benoit*

Jonathan Benoit  
Staff Geotechnical Engineer  
19 Dover Street  
Dover, NH 03820  
[jbenoit@consultjtc.com](mailto:jbenoit@consultjtc.com)  
Ph: (774) 402-0484

*Thomas A. McIntosh III*

Thomas McIntosh III, PE (MA)  
Senior Geotechnical Engineer  
19 Dover Street  
Dover, NH 03820  
[Tmcintosh@consultjtc.com](mailto:Tmcintosh@consultjtc.com)  
Ph: (508) 446-6180



Judson Zachar, PE  
Director of Geotechnical Engineering  
19 Dover Street  
Dover, NH 03820  
[Judsonz@consultjtc.com](mailto:Judsonz@consultjtc.com)  
Ph: (508) 320-4668

PAGE LEFT BLANK INTENTIONALLY





November 20, 2020  
Scott Shillieto, P.E. – Project Manager  
McFarland Johnson, Inc.  
53 Regional Drive  
Concord, New Hampshire 03301

**RE: Geotechnical Investigation Report  
Reconfigure Taxiway H Project  
Manchester-Boston Regional Airport  
Manchester, New Hampshire 03103**

Dear Mr. Shillieto:

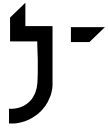
In accordance with our proposal and authorization to proceed, John Turner Consulting, Inc. (JTC) has performed a geotechnical investigation for the above captioned project. Presented herein and attached are the results of the site subsurface investigation, laboratory analysis results, and our recommendations regarding the construction of the new taxiway.

We appreciate the opportunity to assist you on this venture and we look forward to working with you on this project through its completion. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,  
**JOHN TURNER CONSULTING, INC.**

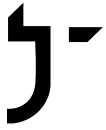
---

Jonathan Benoit  
Staff Geotechnical Engineer  
19 Dover Street  
Dover, NH 03820  
[jbenoit@consultjtc.com](mailto:jbenoit@consultjtc.com)  
Ph: (774) 402-0484



## Table of Contents

1.0	INTRODUCTION .....	3
2.0	PROJECT INFORMATION.....	3
2.1	Site Description .....	3
2.2	Regional Geologic Setting .....	3
2.3	Proposed Development .....	4
3.0	GEOTECHNICAL EXPLORATIONS .....	4
3.1	Soil Borings.....	4
3.2	Asphalt Coring .....	5
4.0	GEOTECHNICAL FIELD TESTING .....	5
4.1	Dynamic Cone Penetrometer Testing.....	5
4.2	Infiltration Testing .....	5
4.2.1	Infiltration Test Procedure .....	5
4.2.2	Infiltration Testing Results .....	6
5.0	GEOTECHNICAL LABORATORY TESTING .....	6
5.1	Particle Size Analyses.....	6
5.2	California Bearing Ratio (CBR) and Modified Proctors.....	7
6.0	SUBSURFACE CONDITIONS.....	8
6.1	Asphalt.....	8
6.2	Soil Profile .....	9
6.2.1	Topsoil .....	9
6.2.2	Pavement Base.....	9
6.2.3	Existing Fill.....	9
6.2.4	Outwash.....	9
6.2.5	Lake Bottom Deposits.....	10
6.3	Bedrock.....	10
6.4	Groundwater .....	10
7.0	GEOTECHNICAL ANALYSIS & RECOMMENDATIONS.....	10
7.1	California Bearing Ratio and Subgrade Preparation .....	10
7.2	Frost Susceptibility.....	11
7.3	Seismic Considerations .....	11
7.4	Re-Use of Site Soils .....	11
7.5	Construction Monitoring and Quality Control Testing.....	11
7.6	Additional Considerations.....	12
8.0	CLOSING .....	12
APPENDIX A: Limitations		
APPENDIX B: Exploration Location Plan		
APPENDIX C: Test Boring Logs & Key to Symbols and Descriptions		
APPENDIX D: Laboratory Particle Size Analysis Results		
APPENDIX E: Laboratory CBR and Field DCP Testing Results		
APPENDIX F: Site Photographs		



## 1.0 INTRODUCTION

John Turner Consulting, Inc. (JTC) is pleased to present this *Geotechnical Investigation Report* for the proposed reconfiguration of Taxiway ‘H’ at Manchester-Boston Regional Airport in Manchester, New Hampshire. JTC conducted geotechnical explorations, laboratory testing, and engineering evaluations in general accordance with our proposed scope of services submitted to McFarland Johnson, Inc. in *JTC Proposal #20-690*.

The purpose of the geotechnical investigation was to obtain information on the subsurface conditions at the site and to provide geotechnical engineering recommendations to support the planning, design, and construction of the proposed development. Geotechnical explorations and laboratory testing services were performed in October and November of 2020.

This report summarizes available project information, presents the geotechnical exploration and laboratory testing programs, describes the subsurface conditions encountered, and provides geotechnical engineering recommendations to support the planning, design, and construction of the proposed taxiways. The contents of this report are subject to the attached *Limitations*.

## 2.0 PROJECT INFORMATION

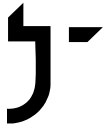
The following subsections provide general descriptions of the site, the regional geologic setting, and the proposed development.

### 2.1 Site Description

The study area is within the vicinity of the existing Taxiway ‘H’ section located north of Runway 6-24, the short, existing Taxiway ‘L’ to the east of Taxiway ‘H’, the grassed area between Taxiway ‘H’ and Runway 17-35, and the grassed areas to the north and east of Taxiway ‘H’. The existing Taxiway ‘H’ and Taxiway ‘L’ consist of paved taxiways, and the areas explored outside the taxiways consisted of grassy, currently undeveloped areas. Topography across the study area gently slope down to the north, with elevations ranging from approximately EL. 208’ to EL. 220’. Refer to the attached *Exploration Location Plan* for the approximate locations of the areas explored.

### 2.2 Regional Geologic Setting

JTC’s review of the “*Surficial Geologic Map of the Manchester South Quadrangle, Hillsborough and Rockingham Counties, New Hampshire*” (C. Koteff, 2000) indicates site soils are likely to consist of Lake Bottom deposits consisting of clay, silt, and fine to very fine sand. Review of the *USDA Natural Resource Conservation Service (NRCS) Web Soil Survey* (2020) indicates that



surficial soils likely consist of udipsammets group soils, which are made up of outwash sand.

### 2.3 Proposed Development

JTC understands that the proposed development involves the removal of the described sections of Taxiways 'H' and 'L', and the construction of new Taxiways 'K' and 'L'. Based on communications with the client, the taxiway pavement section will consist of approximately 3 to 4 feet total of asphalt and pavement base. Finished grades will be approximately coincident with site grades of EL. 208' to EL. 220'.

## 3.0 GEOTECHNICAL EXPLORATIONS

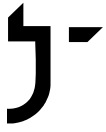
JTC subcontracted Soil Exploration Corp. (Soil-X) to drill twelve (12) geotechnical test borings and perform nine (9) asphalt cores on October 20, 22, and 23, 2020. Additionally, JTC performed Dynamic Cone Penetrometer (DCP) testing at three (3) test pit locations where California Bearing Ratio (CBR) samples were taken, and performed infiltration testing in the vicinity of one (1) boring location. The approximate locations of the subsurface explorations are shown in the attached *Exploration Location Plan*. Borings were performed at locations designated B-1 through B-4. Borings and asphalt cores were performed at locations designated CB-1 through CB-8, and a single additional asphalt core was performed at location C100. DCP testing and CBR sampling were performed at locations designated TP-1 through TP-3, and infiltration testing was performed at a boring, IT-1, drilled in the immediate vicinity of boring B-4.

### 3.1 Soil Borings

Soil Exploration Corp. (Soil-X) drilled twelve (12) geotechnical test borings at exploration locations B-1 through B-4 and CB-1 through CB-8, via an Acker AD-II truck-mounted drill rig. JTC directed the drilling, testing, and sampling activities and logged the subsurface conditions encountered at each boring location.

The test boring locations were selected by the client and altered under the constraints of drill rig access and utility conflicts. Subsequently, the relative location of each boring was established by JTC and the client via measurements from existing site features. The approximate locations of the borings are shown on the attached *Exploration Location Plan*.

All test borings were advanced to a depths of 9 to 11 feet bgs (below ground surface) utilizing a 4¼-inch inside-diameter hollow stem auger (HSA). As the borings were advanced, standard penetration tests (SPTs) were conducted at regular intervals and soil samples were obtained via 2-inch outside-diameter split-spoon samplers driven by a 140-pound automatic hammer. SPTs were performed in general accordance with ASTM D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils. Soil samples were sealed in moisture-tight containers and returned to JTC's office for further review, classification, and/or geotechnical laboratory testing.



The test borings were backfilled with soil cuttings upon completion of drilling. Asphalt at boring locations was patched with cold patch asphalt. Detailed records of the drilling, testing, and sampling performed, and the soil, bedrock, and groundwater conditions observed at each test boring location are provided on the attached *Test Boring Logs*.

### 3.2 Asphalt Coring

Soil Exploration Corp. (Soil-X) performed nine (9) asphalt cores at exploration locations CB-1 through CB-8, and C100 via a lightweight asphalt core machine with a 4-inch ID bits. Asphalt cores were measured and photographed. The core locations were patched at the completion of coring with cold-patch asphalt. Results of coring are summarized in the *Subsurface Conditions* section and some photographs are attached in the *Site Photographs* appendix.

## 4.0 GEOTECHNICAL FIELD TESTING

### 4.1 Dynamic Cone Penetrometer Testing

JTC performed Dynamic Cone Penetrometer (DCP) testing at three (3) locations in small, hand-dug test pits, designated TP-1 through TP-3, via a DGSi Sowers Dynamic Cone Penetrometer. DCP testing was performed at depths ranging from 37 inches to 44 inches bgs. Results from DCP testing are summarized in Table 3 and Appendix E. Samples for California Bearing Ratio (CBR) laboratory testing were collected from each test pit location as well.

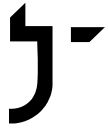
### 4.2 Infiltration Testing

Soil-X drilled a boring, designated IT-1, in the immediate vicinity of boring B-4 for the purpose of infiltration testing. JTC and MJI decided that infiltration testing was not needed at boring B-1, as originally planned, due to the clayey material present there.

#### 4.2.1 Infiltration Test Procedure

Infiltration testing was performed in general accordance with the *New Hampshire Stormwater Manual* and proceeded as follows:

- A 3-inch diameter Schedule 40 polyvinyl chloride (PVC) casing was placed approximately 3 feet bgs at test location IT-1. The pipe was set in place with bentonite at the exterior bottom of each pipe. The annulus of each pipe was backfilled with soil cuttings;
- An approximately 2-inch thick layer of fine gravel was placed at the bottom of the casing to protect the soil there from scouring and sedimentation;
- Each casing was filled with water to about 2 feet above the bottom of the boring to pre-soak for approximately 24 hours;



JTC returned to the site the following day to perform infiltration testing at the prepared locations. The testing procedure consisted of:

- Filling the pipe with water to a depth of 2 feet above the ground surface;
- Taking regular water level measurements over the following hour;
- Refilling the water after each hour and repeating the process for a total of four cycles.

#### 4.2.2 Infiltration Testing Results

The infiltration test results are summarized in the following table:

Table 1 – Summary of Infiltration Testing Results								
Infiltration Test #	Location	Depth (in. bgs)	Soil Type	Measured Infiltration Rate (in/hr)				Average Measured Rate (in/hr)
				Round 1	Round 2	Round 3	Round 4	
IT-1	B-4	36	Sand (SP)	54.0	41.8	40.0	33.3	36.6*

\*Average of testing rounds 3 and 4

No factors of safety have been applied to the measured rates presented in the table. JTC recommends applying a minimum safety factor of 2 to the measured rates for design purposes.

## 5.0 GEOTECHNICAL LABORATORY TESTING

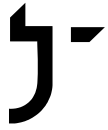
JTC selected representative soil samples for geotechnical laboratory testing at our in-house laboratory. The following tests were performed:

- 24 Moisture Contents;
- 24 Washed Sieve Analyses;
- 3 Modified Proctors;
- 3 California Bearing Ratios

Geotechnical laboratory testing was performed in general accordance with ASTM procedures. Test results are provided on the attached *Geotechnical Laboratory Testing Reports* appendix.

### 5.1 Particle Size Analyses

Particle size analyses, consisting of washed sieve analyses, were performed on twenty-four (24) samples. The following table summarizes the particle size data obtained from the analyses.



**Table 2 – Summary of Particle Size Analysis Results**

Exploration Location	Depth Range (bgs)	USCS Desc.	Percent by Weight Passing Sieve			
			No. 4	No. 10	No. 40	No. 200
B-1	4' - 6'	CL-ML	100.0	100.0	100.0	97.2
B-1	8' - 10'	CL-ML	100.0	100.0	100.0	98.4
B-2	2' - 4'	SP	100.0	100.0	99.1	3.4
B-2	8' - 10'	ML	100.0	100.0	100.0	94.4
B-3	0' - 2'	SM	97.6	92.9	68.6	33.1
B-3	8' - 10'	SM	100.0	100.0	89.1	36.3
B-4	4' - 6'	SP	100.0	100.0	96.2	2.7
B-4	6' - 8'	ML	100.0	100.0	100.0	97.5
CB-1	0' - 2'	SM	99.5	96.9	75.6	17.1
CB-1	6' - 8'	SP-SM	100.0	100.0	91.9	8.8
CB-2	2' - 4'	SP-SM	100.0	100.0	81.3	7.0
CB-2	6' - 8'	SP	99.9	99.2	68.3	3.7
CB-3	0' - 2'	SP-SM	100.0	100.0	99.6	6.0
CB-3	4' - 6'	ML	100.0	100.0	100.0	69.1
CB-4	4' - 6'	SP	100.0	100.0	84.1	3.0
CB-4	8' - 10'	ML	100.0	100.0	99.9	73.3
CB-5	0' - 2'	SP	100.0	100.0	91.0	4.3
CB-5	6' - 8'	CL-ML	100.0	100.0	100.0	94.8
CB-6	2' - 4'	SP-SM	100.0	97.3	76.3	9.5
CB-6	6' - 8'	CL-ML	100.0	100.0	99.7	92.0
CB-7	2' - 4'	SP-SM	100.0	100.0	88.9	10.7
CB-7	6' - 8'	SP	100.0	100.0	85.8	2.6
CB-8	2' - 4'	SP-SM	99.8	99.3	89.8	5.7
CB-8	8' - 10'	ML	100.0	100.0	99.1	78.6

## 5.2 California Bearing Ratio (CBR) and Modified Proctors

Modified proctor tests (ASTM D1557) were performed on all CBR samples (results in Table 4). CBR testing was performed in accordance with ASTM D1883. CBR samples were soaked and compacted to 100 percent or greater of maximum modified proctor density prior to testing. The results of the CBR lab testing are provided in Table 3. CBR values are based on the CBR at 0.1-inch penetration.

Field CBR values are also provided in Table 3 and are based on the correlation of Sowers Dynamic Cone Penetrometer Testing value to SPT values, and further correlation of SPT to CBR values.

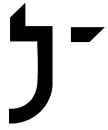


Table 3 – CBR Testing Results							
Sample/ Location #	USCS Soil Type	Laboratory CBR Values & Test Conditions				Field CBR Values	
		Depth of Lab Sample (bgs)	Laboratory CBR Value (Corrected)	Soaked Moisture Content (%)	In-Situ Moisture Content (%)	Depth Range of Field Testing (bgs)	Field Tested CBR Value
TP-1	SP-SM	37" – 49"	26	8.3	0.2	37" - 42"	7
TP-2	SM	38" – 50"	7	7.2	0.1	38" – 43"	8.5
TP-3	SP	36" – 48"	13	10.3	0.12	36" – 41"	5

Table 4 - Modified Proctor, Particle Size Analysis and Moisture Content					
Exploration and Sample Depth	Maximum Dry Density (pcf)	Optimum Moisture (%)	Percent Finer (by weight)		USCS Soil Type
			#4	#200	
TP-1 (37" – 49" bgs)	115.2	8.6	0.4	11.2	SP-SM
TP-2 (38" – 50 bgs)	107.3	7.1	2.8	28.8	SM
TP-3 (36" – 48" bgs)	106.0	10.4	0.6	2.0	SP

## 6.0 SUBSURFACE CONDITIONS

The following subsections describe the site asphalt, soil, bedrock, and groundwater conditions encountered, based on results of the geotechnical explorations and laboratory testing. Detailed descriptions of the conditions observed at each test boring are provided on the attached *Test Boring Logs*.

### 6.1 Asphalt

Nine (9) asphalt cores were performed during the exploration program. The following table summarizes the asphalt thickness and approximate base course thickness in each of the core locations. Photos of the asphalt cores are provided in the *Site Photographs* Appendix.



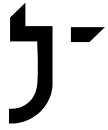


Table 5 – Asphalt and Base Course Thickness Data		
Location	Asphalt Thickness (in.)	Base/Subbase Thickness (in.)
CB-1	13	13
CB-2	13	11
CB-3	13	6
CB-4	5	9
CB-5	12	6
CB-6	13	6
CB-7	13	2
CB-8	12	6
C100	3	---

## 6.2 Soil Profile

The primary soil strata are briefly described in the paragraphs below.

### 6.2.1 Topsoil

Topsoil was encountered underlying the ground surface in borings B-1 through B-4. The topsoil generally consisted of dark brown Sand (SP) to silty Sandy (SM). The topsoil layer extended to approximate depths of 5, 9, 5, and 6 inches bgs in borings B-1 through B-4, respectively, and was generally loose to medium dense.

### 6.2.2 Pavement Base

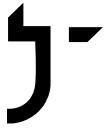
Soils interpreted to be the base and subbase course for the existing pavement were encountered underlying the asphalt in borings CB-1 through CB-8. The base course soils generally consisted of gray to dark brown, dense to very dense, poorly graded Sand (SP) with gravel or poorly graded Sand (SP-SM) with gravel and silt. The measured thickness of the combined base and subbase are provided in Table 5.

### 6.2.3 Existing Fill

Soils interpreted to be fill material were encountered underlying the topsoil in boring B-4. The fill material consisted of brown, medium dense, sandy Silt (ML) with trace gravel, and extended to an approximate depth of 2 feet bgs.

### 6.2.4 Outwash

The native soils underlying the topsoil, pavement base, or existing fill in all boring explorations consisted of outwash sand. The sands generally consisted orange-tan to tan, poorly graded Sand (SP), poorly graded Sand (SP-SM) with silt, silty Sand (SM), or sandy Silt (ML). The native sands



were generally medium dense to very dense. The sands extended to depths ranging from 4 feet bgs to beyond the maximum depth of exploration in some borings (11 feet bgs). It is possible that some of the outwash sands encountered consisted of reworked native soil.

#### **6.2.5 Lake Bottom Deposits**

The native soils underlying the outwash sands in borings B-1, B-2, B-4, CB-4, CB-5, CB-6, and CB-8, consisted of fine-grained Lake Bottom deposits. The deposits generally consisted of light brown or gray to gray-tan Silt (ML), silty Clay (CL-ML), or Silt (ML) with sand. The silt and silty clay soils were generally stiff to hard, and the silt with sand was generally medium dense to dense. The Lake Bottom deposits extended beyond the maximum depth of exploration (9 to 11 feet bgs), in all explorations where present.

### **6.3 Bedrock**

Bedrock was not encountered at any of the exploration locations and is not expected to impact the project based on the results of this investigation.

### **6.4 Groundwater**

Groundwater was encountered in borings B-1, B-2, B-4, CB-2, CB-4, CB-5, CB-6, CB7, and CB-8 at approximate depths between 4 and 9 feet bgs. JTC estimates that this investigation occurred during a period of seasonally normal groundwater. Site groundwater levels should be expected to fluctuate seasonally and in response to precipitation events, construction activity, site use, and adjacent site use.

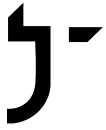
## **7.0 GEOTECHNICAL ANALYSIS & RECOMMENDATIONS**

The evaluation of the site and the proposed project was based on the subsurface conditions encountered at the exploration locations and results of geotechnical laboratory and field testing.

### **7.1 California Bearing Ratio and Subgrade Preparation**

Based on the results of California Bearing Ratio (CBR) laboratory and field testing, JTC recommends using a CBR design value of 6 percent for the native soils encountered at the proposed subgrade elevation.

Subgrade soils should be compacted to the FAA standards provided in *AC 150/5320-6F*. Based on JTC's observations, existing taxiway subgrade soils as well as proposed subgrade soils should be suitable to meet the FAA standards. Subgrade soils should consist of competent, native outwash sand (SP, SP-SM, or SM) or native lake bottom deposits (ML, CL-ML). A geotechnical engineer should evaluate the subgrade soils. Any loose, soft, wet, and/or otherwise unsuitable soils should be over-excavated to expose suitable soils, or other remedial measures should be taken, as



approved by the on-site geotechnical engineer. The over-excavation should then be backfilled with properly placed and compacted *Structural Fill*.

## 7.2 Frost Susceptibility

Based on laboratory analyses of the native soils encountered at the site, soils above a depth of approximately 4 feet bgs generally consist of poorly graded Sand (SP), poorly graded Sand (SP-SM) with silt, or silty Sand (SM) with an average amount passing the No. 200 sieve of 10.8 percent by weight. Below a depth of 4 feet bgs, native soils generally began to grade to siltier sands or fine-grained clay and silt material. Based on these results and Table 2-2 in *AC 150/5320-6F*, JTC recommends the native subgrade soils above a depth of 4 feet bgs be classified as frost group FG-2, and the native soils below a depth of 4 feet bgs be classified as frost group FG-4.

## 7.3 Seismic Considerations

Based on site class definitions of the American Society of Civil Engineers (ASCE) Standard 7-10, Minimum Design Loads for Buildings and Other Structures and the conditions encountered at the test boring locations, the site is classified as:

**Site Class D:** Stiff Soil Profile.

Liquefaction refers to the loss of strength in saturated cohesionless soils due to the buildup of pore water pressures during cyclic or seismic loading. Based on the conditions encountered at the test boring locations, the site is not considered to be susceptible to liquefaction.

## 7.4 Re-Use of Site Soils

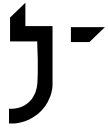
Based on the gradation requirements provided in the FAA *AC 150/5370-10H* and the results of the particle size analyses, the native outwash sands and Lake Bottom deposits do not meet the specifications for *P-154 Subbase Course* or *P-209 Crushed Aggregate Base Course*. These soils may be re-used in areas to be landscaped, subject to conformance with the project specifications.

## 7.5 Construction Monitoring and Quality Control Testing

A qualified geotechnical engineer or representative should be retained to review the site preparation and grading activities at a minimum. Similarly, quality control testing, including in-place field density and moisture tests, should be performed to confirm that the specified compaction is achieved. It is recommended that JTC be retained to provide earthwork construction monitoring and quality control testing services.

Quality control testing recommendations are provided as follows:

- During site grading, 3 field density tests should be performed for every 1,000 square feet



(per lift) of *Gravel Borrow* or *Crushed Stone* placement, at a minimum. At least 3 tests should be performed on each lift of material even if the lift is less than 1,000 square feet;

- During backfilling of utility trenches, at least 1 test should be conducted per 50 linear feet (per lift) of trench; and
- During site grading and pavement subgrade preparation, 3 field density tests should be performed for every 1,000 square feet (per lift) at a minimum. At least 3 tests should be performed on each lift even if the lift is less than 1,000 square feet.

If FAA specifications require more frequent testing, then the quality control testing provider should adhere to the stricter requirements.

## 7.6 Additional Considerations

Additional design recommendations are provided as follows:

- Permanent fill or cut slopes should have a maximum slope of 2.5H:1V (horizontal to vertical) or flatter for dry conditions. Permanent fill or cut slopes should be no steeper than 3H:1V for wet/submerged conditions (e.g., stormwater basin) unless a properly designed surface slope stabilization system (e.g. rip rap, geosynthetics) is provided.

Additional construction considerations/recommendations are provided as follows:

- Safe temporary excavation and/or fill slopes are the responsibility of the Contractor. Excavations should be conducted in accordance with local, state, and federal (OSHA 29 CFR 1926) requirements, at a minimum.
- Proper groundwater control and stormwater management are necessary to maintain site stability. Groundwater should be removed in advance and continuously maintained at least 2 feet below the working construction grade until earthworks and/or backfilling are complete;
- All slopes should be protected from erosion during (and after) construction.

## 8.0 CLOSING

We trust the contents of this report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

## **APPENDIX A: LIMITATIONS**

### Explorations

1. The analyses and recommendations presented in this report are based in part upon the data obtained from widely-spaced subsurface explorations. Subsurface conditions between exploration locations may vary from those encountered at the exploration locations. The nature and extent of variations between explorations may not become evident until construction. If variations appear, it will be necessary to re-evaluate the recommendations of this report.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely-spaced explorations and samples; actual strata transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

### Review

4. It is recommended that John Turner Consulting, Inc. be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the geotechnical engineering recommendations provided herein.
5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and conclusions of the report modified or verified in writing by John Turner Consulting, Inc.

### Construction

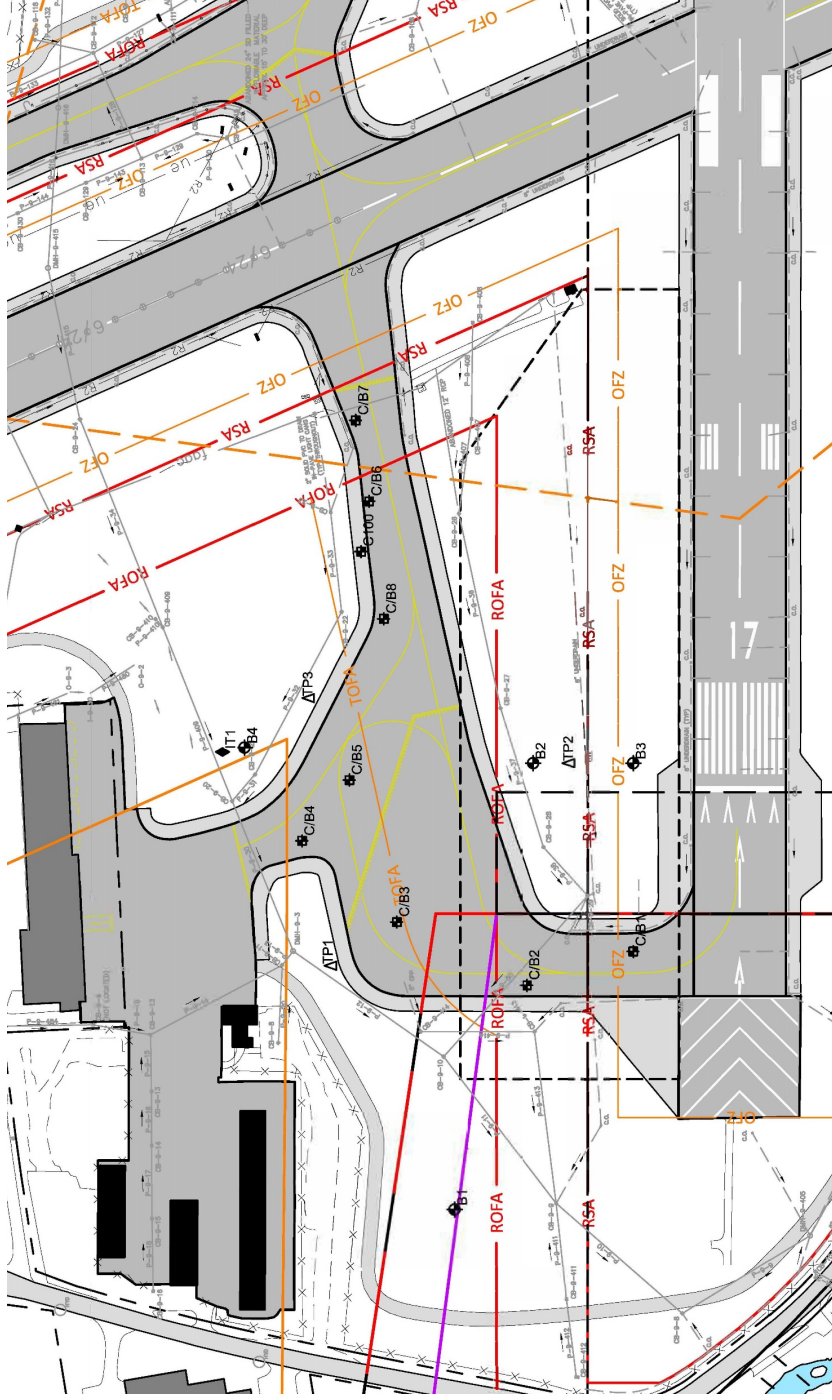
6. It is recommended that John Turner Consulting, Inc. be retained to provide geotechnical engineering services during the installation phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

### Use of Report

7. This report has been prepared for the exclusive use of McFarland Johnson for the Reconfigure of Taxiway 'H' at the Manchester-Boston Regional Airport in Manchester, New Hampshire. All considerations are based on the available information and is in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
8. This report has been prepared for this project by John Turner Consulting, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design consideration.

PAGE LEFT BLANK INTENTIONALLY

## **APPENDIX B: EXPLORATION LOCATION PLAN**



Notes:

1. Test borings were performed on Oct. 20 and 22 under the direction of JTC. Test boring locations should be considered approximate.
2. Refer to the Test Boring Logs for the subsurface conditions encountered at each boring location.
3. Basemap source(s): October 2020 "Taxiway H Boring Locations" prepared by McFarland Johnson
4. Not to Scale.

<p>McFarland Johnson, Inc c/o John Cole Architect 53 Regional Drive Concord, New Hampshire 03301</p>	<p>Reconfigure Taxiway H Project Manchester-Boston Regional Airport Manchester, New Hampshire</p>
<p>JOHN TURNER CONSULTING</p>	<p>EXPLORATION LOCATION PLAN</p>



## **APPENDIX C: TEST BORING LOGS & KEY TO SYMBOLS AND DESCRIPTIONS**

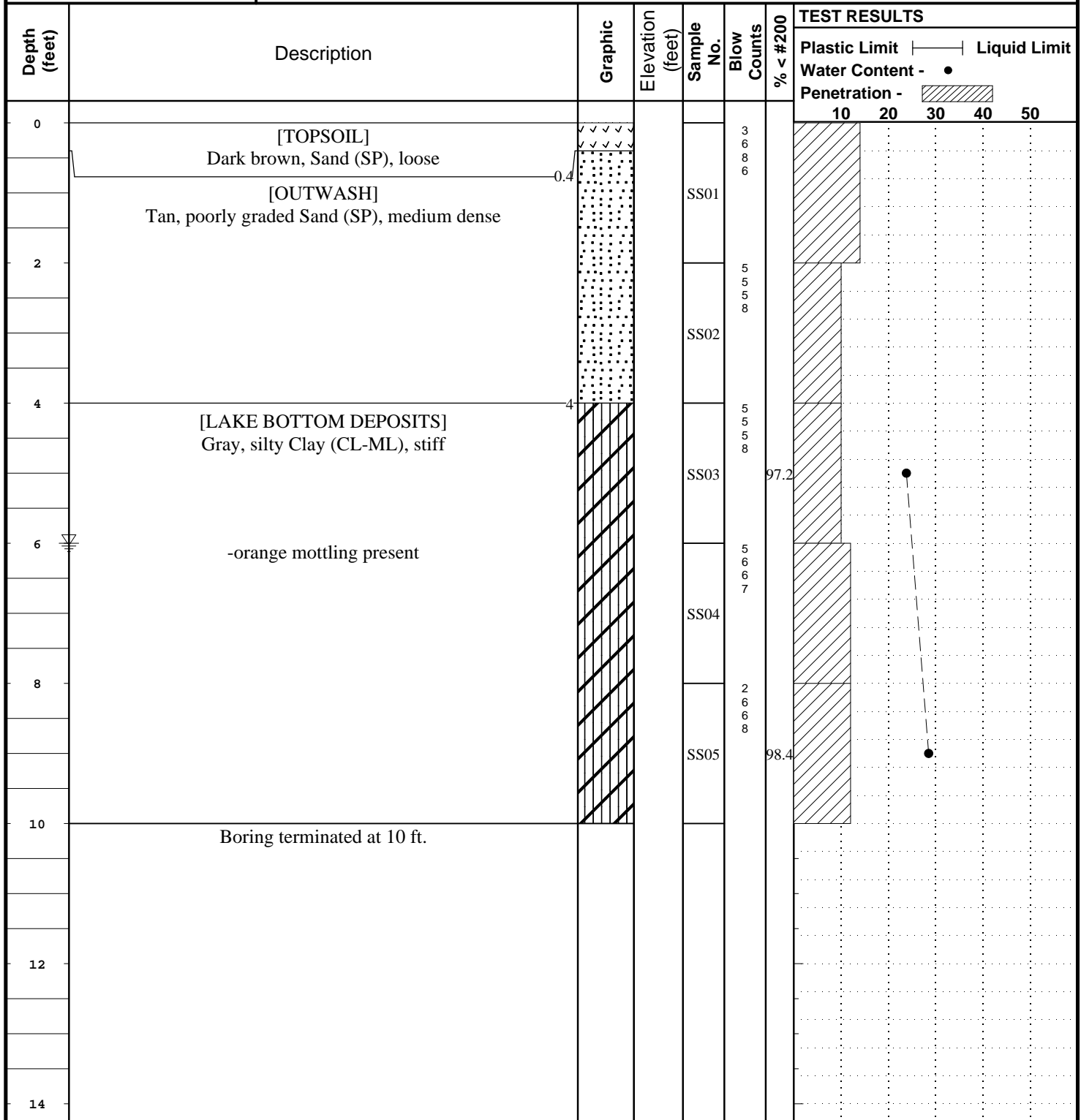
PAGE LEFT BLANK INTENTIONALLY



# LOG OF BORING No. B-1

**PROJECT:** Reconfigure Taxiway H Project **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan **ELEVATION:** EL. 211'  
**DRILLER:** Soil X **LOGGED BY:** JB  
**DRILLING METHOD:** HSA **DATE:** 10/20/2020  
**DEPTH TO - WATER> INITIAL:** 6 **AFTER 24 HOURS:** N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.



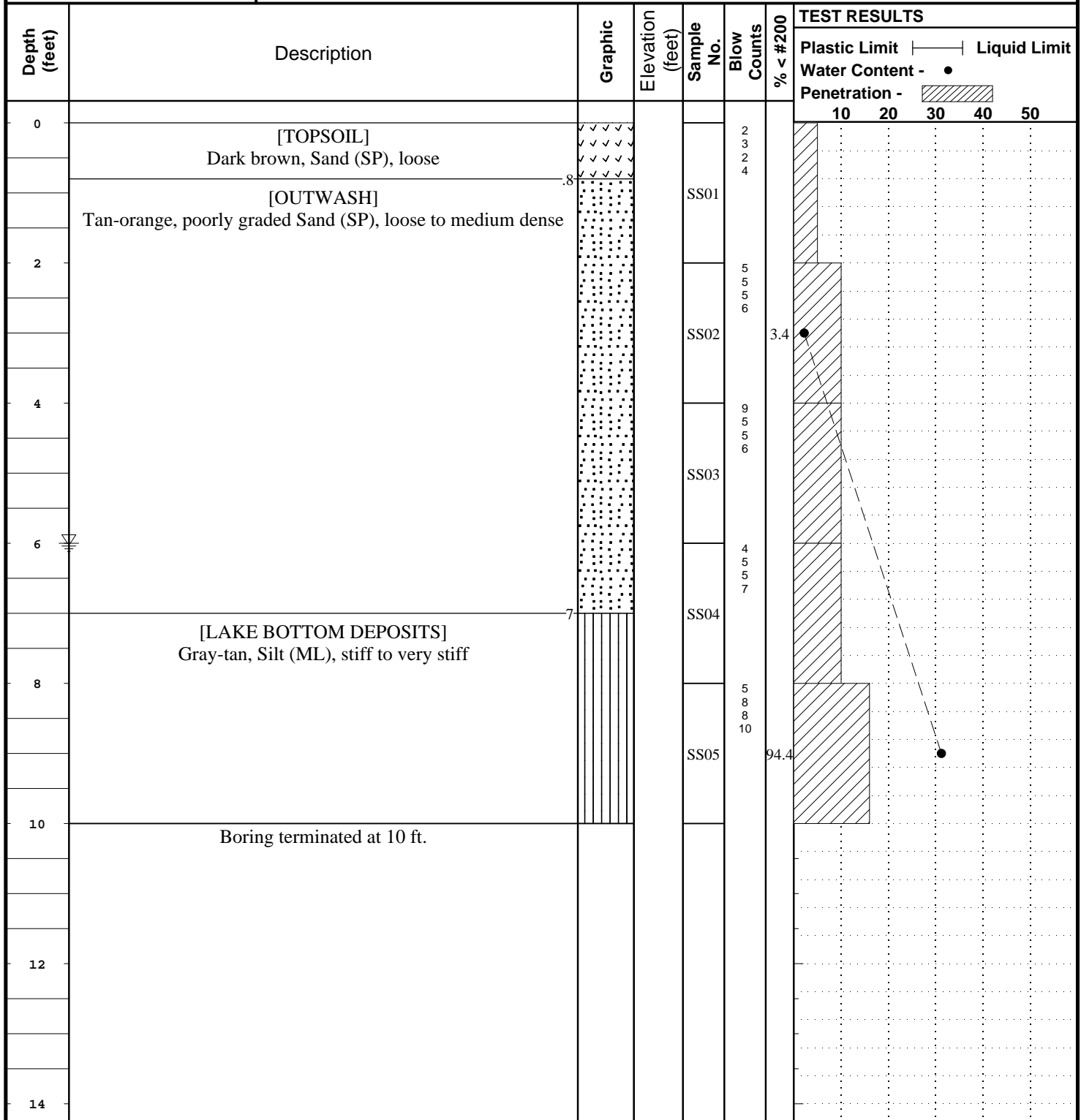
Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. B-2

**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan      **ELEVATION:** EL. 212'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/20/2020  
**DEPTH TO - WATER> INITIAL:** 6      **AFTER 24 HOURS:** N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.



Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. B-3

**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan      **ELEVATION:** EL. 213'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/20/2020  
**DEPTH TO - WATER> INITIAL:** N/A      **AFTER 24 HOURS:** N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS	
							Plastic Limit Water Content -	Liquid Limit Penetration -
0	[TOPSOIL] Dark brown, silty Sand (SM), medium dense				7 14 11 11			
	[OUTWASH] Tan-gray, silty Sand (SM), medium dense			SS01		33.1	•	
2	-becomes dense			SS02	24 29 14 19			
4	-becomes very dense			SS03	25 22 30 32			
6				SS04	30 30 29 25			
8	-becomes dense -exhibits orange mottling			SS05	12 14 17 20	36.3	•	
10	Boring terminated at 10 ft.							
12								
14								

Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. B-4

**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan      **ELEVATION:** EL. 214'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/22/2020  
**DEPTH TO - WATER> INITIAL:** 6      **AFTER 24 HOURS:** N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS				
							Plastic Limit	—	Liquid Limit	Water Content - ●	Penetration - ▨
0	[TOPSOIL] Dark brown, Sand (SP), loose				2 7 14 7						
0.5	[FILL] Brown, sandy Silt (ML), trace gravel, medium dense			SS01							
2	[OUTWASH] Tan-orange, Sand (SP), orange layering present, medium dense			SS02	10 8 11 9						
4				SS03	7 6 9 9	2.7					
6	[LAKE BOTTOM DEPOSITS] Light brown, Silt (ML), exhibits orange mottling, very stiff			SS04	12 13 15 16	97.9					
8	-becomes hard			SS05	16 19 26 23						
10	Boring terminated at 10 ft.										
12											
14											



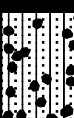
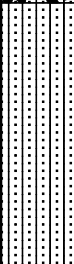


Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. CB-1

**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** [OUTWASH]      **ELEVATION:** EL. 213'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/20/2020  
**DEPTH TO - WATER> INITIAL:**  $\nabla$  N/A      **AFTER 24 HOURS:**  $\nabla$  N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS
							Plastic Limit ——— Liquid Limit Water Content - ● Penetration - 
0	[PAVEMENT] 13" flexible pavement						
			1.08		22 38 39 62		
2	[PAVEMENT BASE/SUBBASE] Gray, silty Sand (SM) with gravel, very dense			SS01	17.1	77	
			2.2		30 33 18 19		
4	[OUTWASH] Tan, silty Sand (SM), very dense			SS02			
			5		35 37 18 19		
6	Tan, poorly graded Sand (SP-SM) with silt, very dense			SS03			
					29 30 18 12		
8	-exhibits orange mottling			SS04	8.8		
	Boring terminated at 9 ft.						
10							
12							
14							

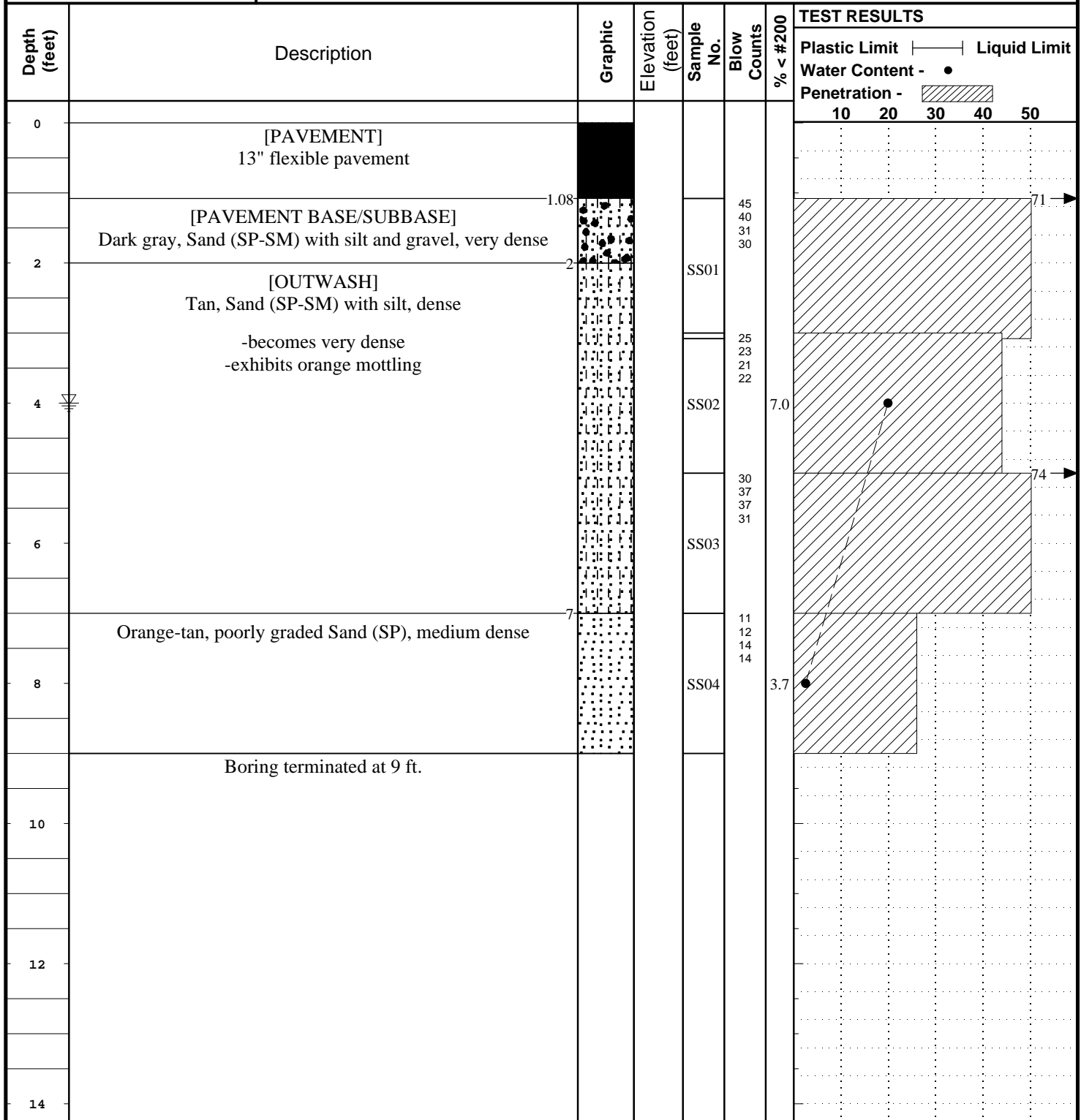
Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. CB-2

**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan      **ELEVATION:** EL. 211'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/20/2020  
**DEPTH TO - WATER> INITIAL:**  $\nabla$  4      **AFTER 24 HOURS:**  $\nabla$  N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.



Boring was backfilled with soil cuttings derived from the investigation.

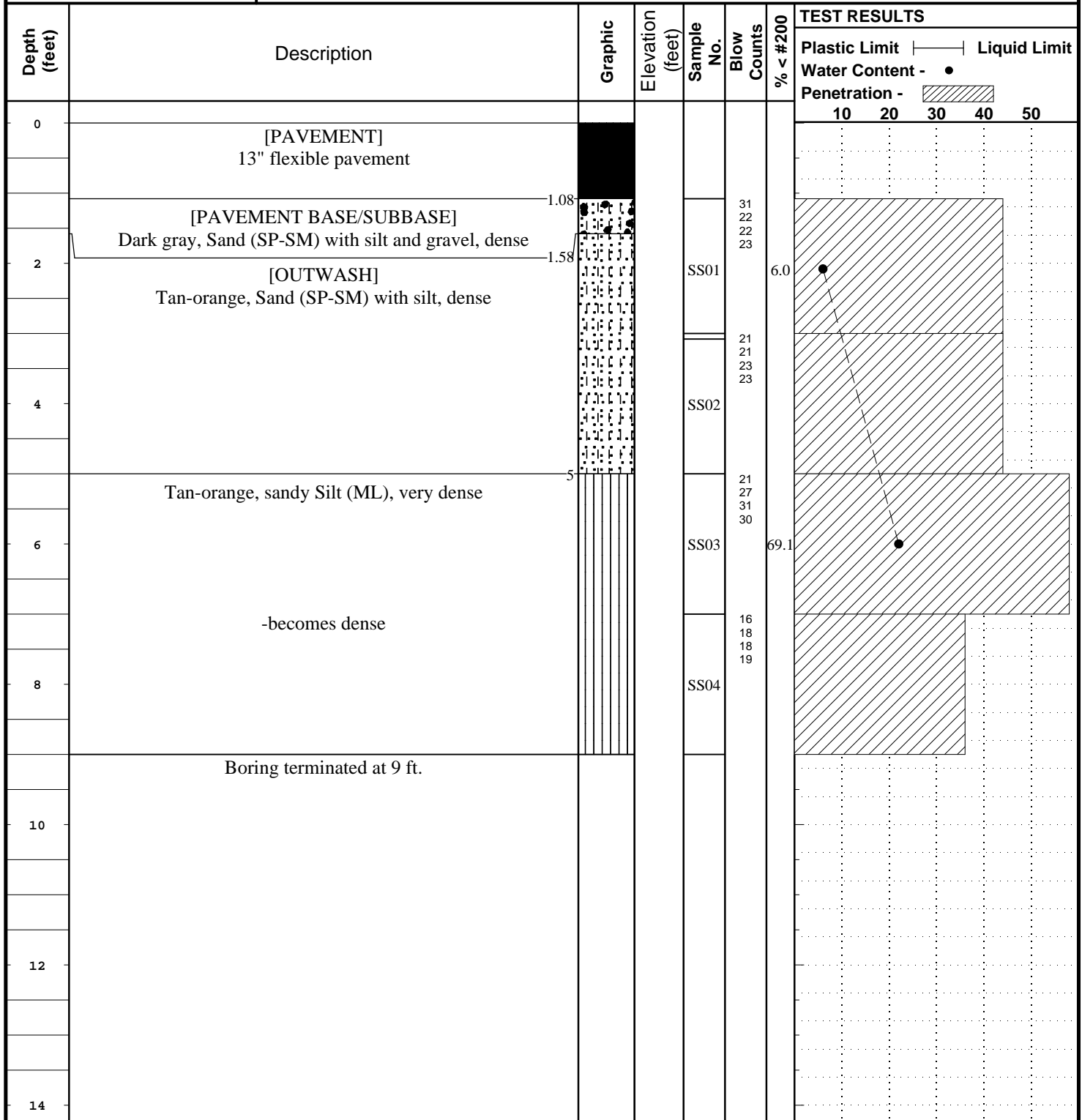




# LOG OF BORING No. CB-3

**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan      **ELEVATION:** EL. 211'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/20/2020  
**DEPTH TO - WATER> INITIAL:**  $\nabla$  N/A      **AFTER 24 HOURS:**  $\nabla$  N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.



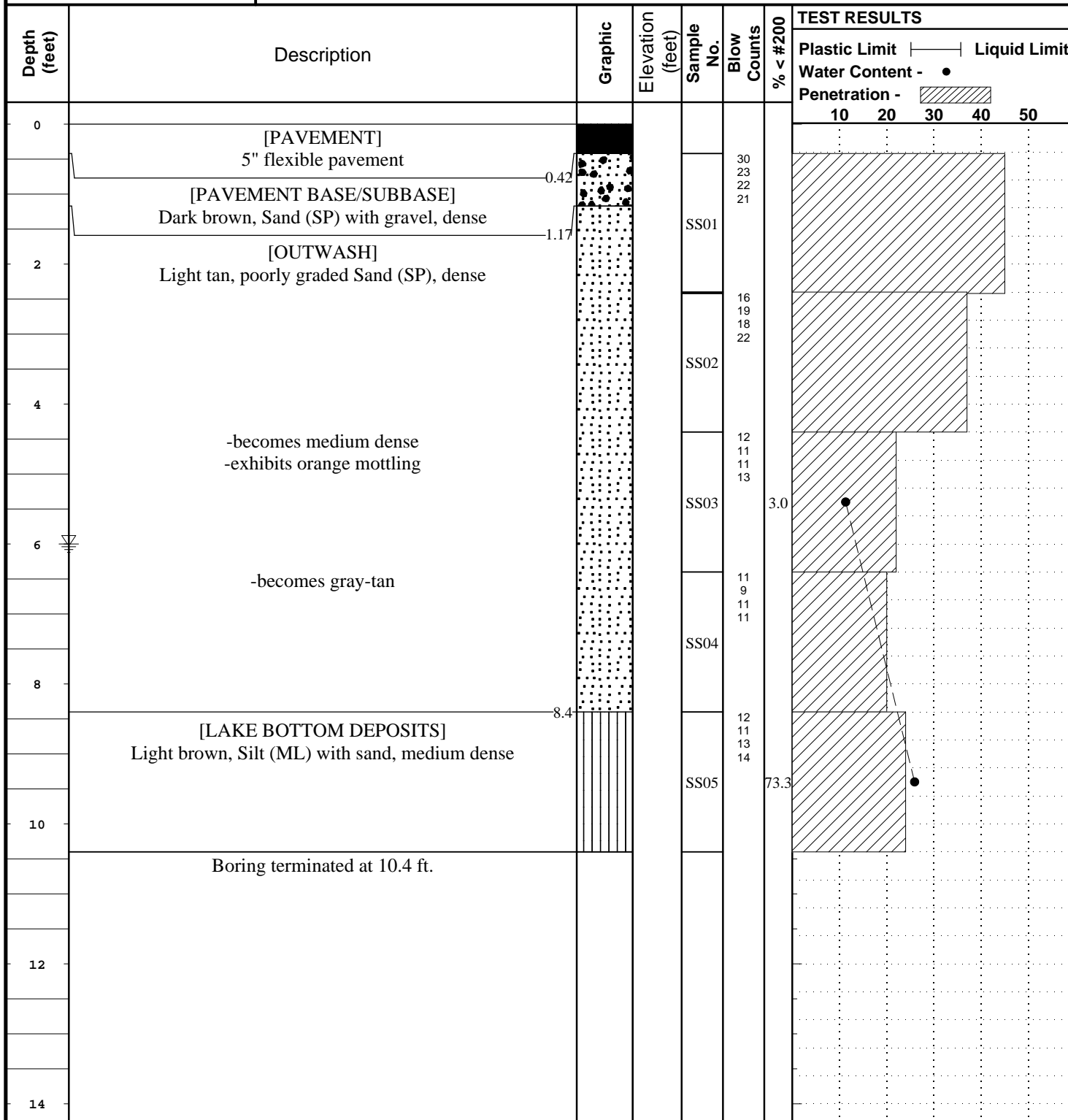
Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. CB-4

**PROJECT:** Reconfigure Taxiway H Project **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan **ELEVATION:** EL. 214'  
**DRILLER:** Soil X **LOGGED BY:** JB  
**DRILLING METHOD:** HSA **DATE:** 10/22/2020  
**DEPTH TO - WATER> INITIAL:** 6 **AFTER 24 HOURS:** N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.






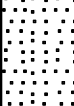
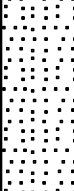
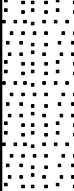
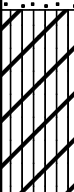

Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. CB-5

**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan      **ELEVATION:** EL. 213'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/22/2020  
**DEPTH TO - WATER> INITIAL:** 6      **AFTER 24 HOURS:** N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS				
							Plastic Limit	—	Liquid Limit	Water Content - •	Penetration - 
0	[PAVEMENT] 12" flexible pavement										
1	[PAVEMENT BASE/SUBBASE] Dark brown, Sand (SP) with gravel, very dense				27 29 25 21						
2	[OUTWASH] Light tan, poorly graded Sand (SP), dense			SS01							
4	-becomes medium dense			SS02	18 19 19 20	4.3					
6				SS03	13 12 12 14						
8	[LAKE BOTTOM DEPOSITS] Light brown, silty Clay (CL-ML), hard			SS04	13 23 23 24	94.8					
10	Boring terminated at 9 ft.			SS05	17 19 24 19						
12											
14											

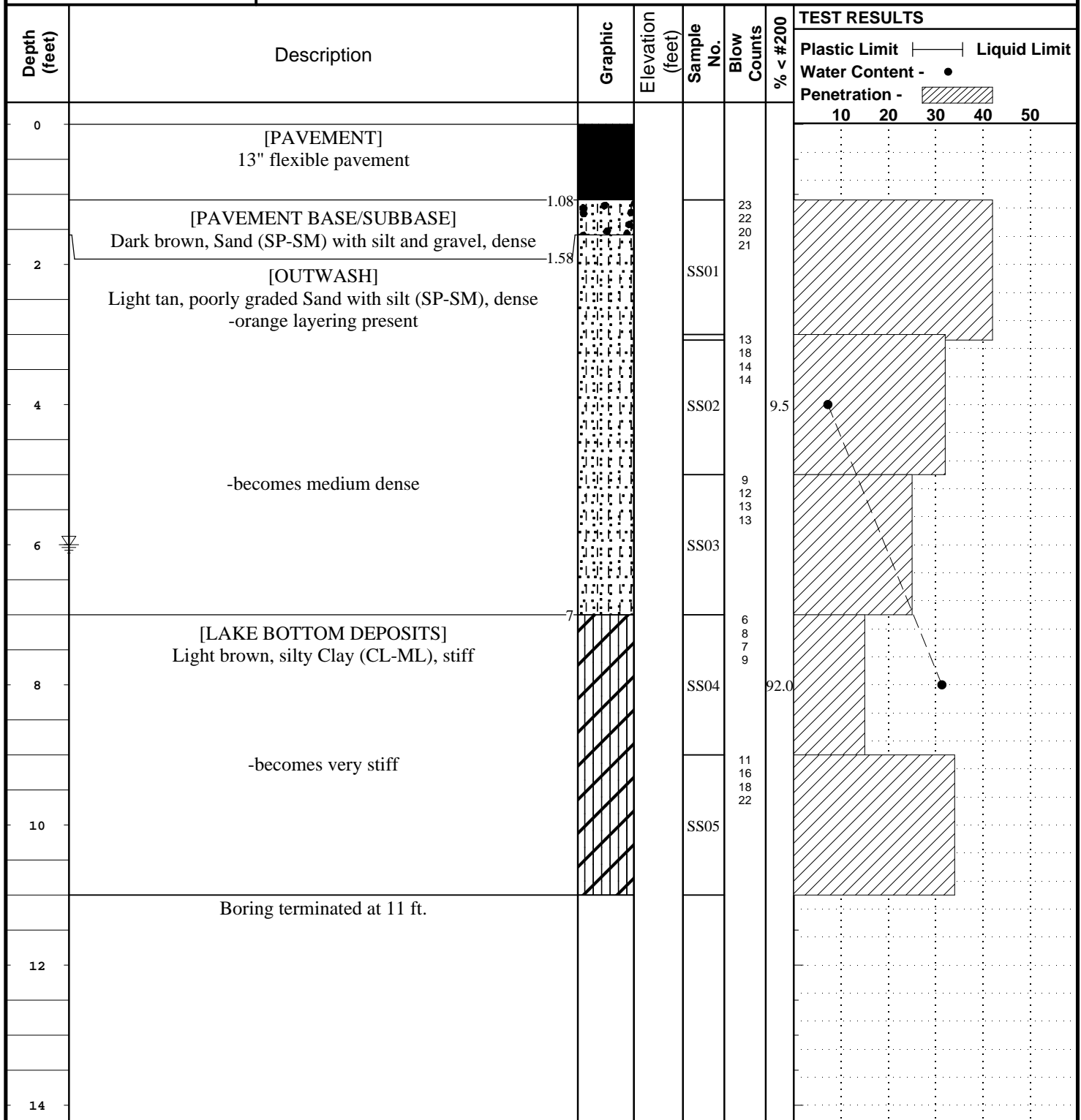
Boring was backfilled with soil cuttings derived from the investigation.



# LOG OF BORING No. CB-6

**PROJECT:** Reconfigure Taxiway H Project **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan **ELEVATION:** EL. 215'  
**DRILLER:** Soil X **LOGGED BY:** JB  
**DRILLING METHOD:** HSA **DATE:** 10/22/2020  
**DEPTH TO - WATER> INITIAL:** 6 **AFTER 24 HOURS:** N/A

This information pertains only to this boring and should not be interpreted as being indicative of the site.



Boring was backfilled with soil cuttings derived from the investigation.



**PROJECT NO.:** 20-04-093

**PROJECT LOCATION:** Manchester-Boston Regional Airport

**ELEVATION:** EL. 218'

**LOGGED BY:** JB

**DATE:** 10/22/2020

**AFTER 24 HOURS:**  N/A

[illegible]

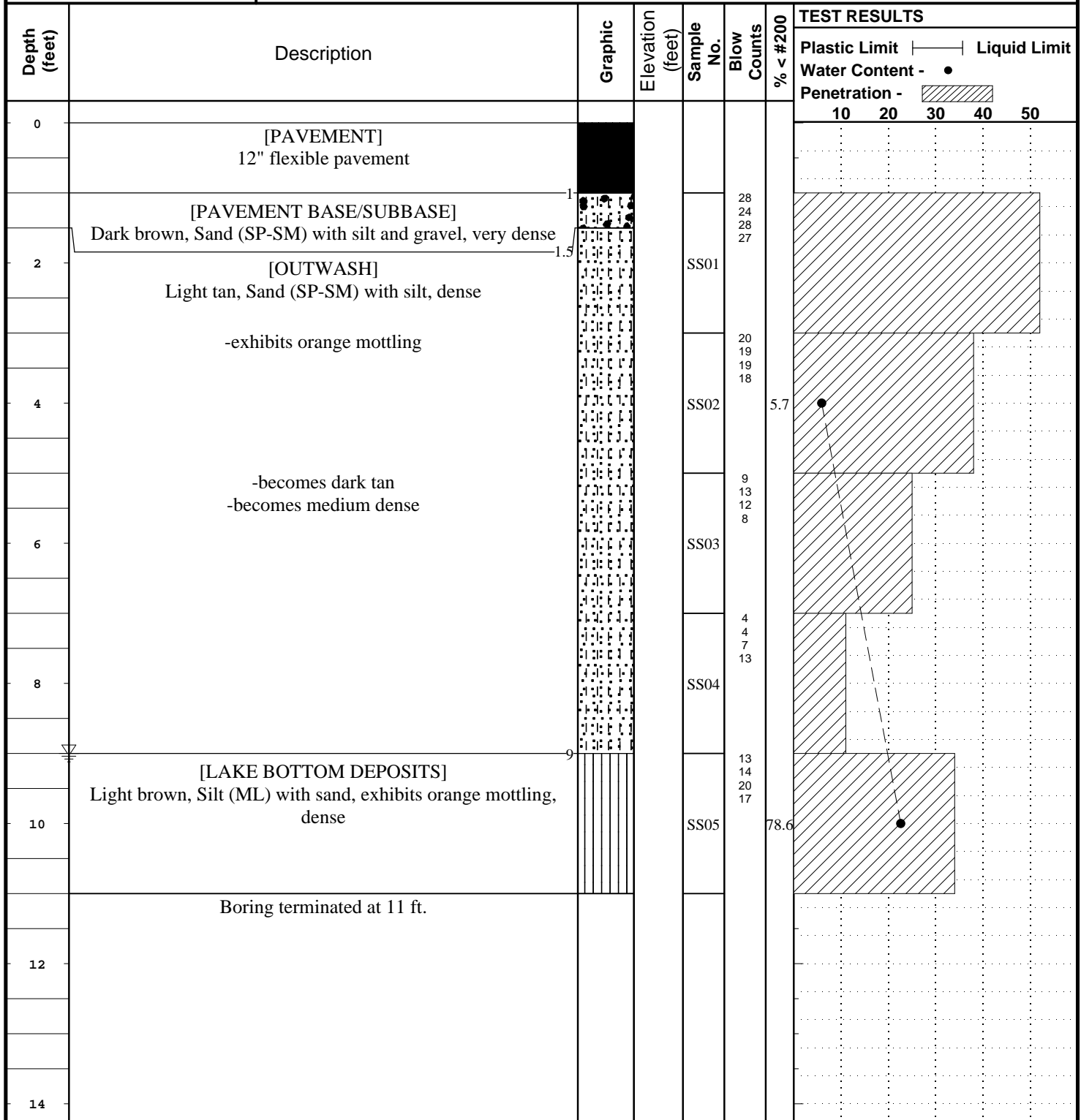
**This information pertains only to this boring and should not be interpreted as being indicative of the site.**



# LOG OF BORING No. CB-8













**PROJECT:** Reconfigure Taxiway H Project      **PROJECT NO.:** 20-04-093  
**CLIENT:** McFarland Johnson  
**PROJECT LOCATION:** Manchester-Boston Regional Airport  
**LOCATION:** Refer to Exploration Location Plan      **ELEVATION:** EL. 215'  
**DRILLER:** Soil X      **LOGGED BY:** JB  
**DRILLING METHOD:** HSA      **DATE:** 10/22/2020  
**DEPTH TO - WATER> INITIAL:** 9      **AFTER 24 HOURS:** N/A

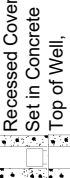
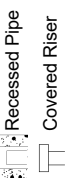
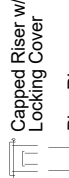


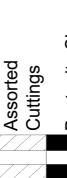
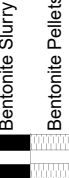
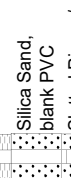
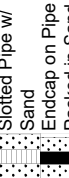
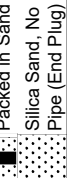



This information pertains only to this boring and should not be interpreted as being indicative of the site.

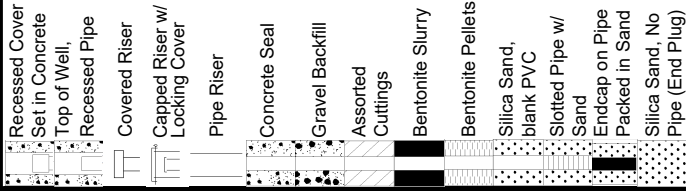


Boring was backfilled with soil cuttings derived from the investigation.

KEY TO SYMBOLS AND DESCRIPTIONS

	Shelby Tube		Auger Cuttings
	Standard Split Spoon Sample		3" Split Spoon Sample
	Rock Core		Dynamic Cone Penetrometer
	Vane Shear		Bulk/Grab Sample
	Geoprobe Sample		Sonic or Vibro-Core Sample
	Water Table (at time of drilling)		Water Table (after 24 hours)
TYPICAL SYMBOLS			
SOIL MOISTURE MODIFIERS			
Term	Description		
Dry	Absence of moisture; dusty, dry to touch		
Moist	Damp but no visible water		
Wet	Visible free water		
The descriptor "damp" should not be used (use "moist"). The descriptor "saturated" should not be used (use "wet").			

	Recessed Cover Set in Concrete Top of Well, Recessed Pipe
	Covered Riser
	Capped Riser w/ Locking Cover
	Pipe Riser
	Concrete Seal
	Gravel Backfill
	Assorted Cuttings
	Bentonite Slurry
	Bentonite Pellets
	Silica Sand, blank PVC
	Slotted Pipe w/ Sand
	Endcap on Pipe Packed in Sand
	Silica Sand, No Pipe (End Plug)
WELL SYMBOLS	



CLASSIFICATION	RANGE OF GRAIN SIZES		RELATIVE DENSITY/CONSISTENCY				PERCENT OR PORTIONS OF SOIL		
	U.S. Standard Sieve Size	Grain Size in Millimeters	Gravel, Sand, and Silt (nonplastic)		Silt (plastic) and Clay		Term	Description	
BOULDERS	Above 12"	Above 305	N-Value	Relative Density	N-Value	Su	Consistency		
COBBLES	12" to 3"	305 to 76.2	0 - 4	Very Loose	0 - 2	0 - 250	Very Soft	Parting:	
			5 - 10	Loose	3 - 4	251 - 500	Soft	Seam:	
			11-30	Medium Dense	5 - 8	501 - 1000	Medium Stiff	Layer:	
GRAVEL coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.75 76.2 to 19.1 19.1 to 4.75	31 - 50	Dense	9 - 15	1001 - 2000	Stiff	Stratum:	
			51 +	Very Dense	16 - 30	2001 - 4000	Very Stiff	Pocket:	
					31 +	4001+	Hard	Lens:	
SAND coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.75 to 0.075 4.75 to 2.00 2.00 to 0.425 0.425 to 0.075	Standard Penetration Testing (SPT) N <sub>60</sub> based on blows per 12 inches.						
			WR = Weight of Rods; WH = Weight of Hammer						
SILT & CLAY	Below No. 200	Below 0.075						Varved	Alternating seams or layers of silt and/or clay and sometimes f. sand

REFERENCE: UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488-93

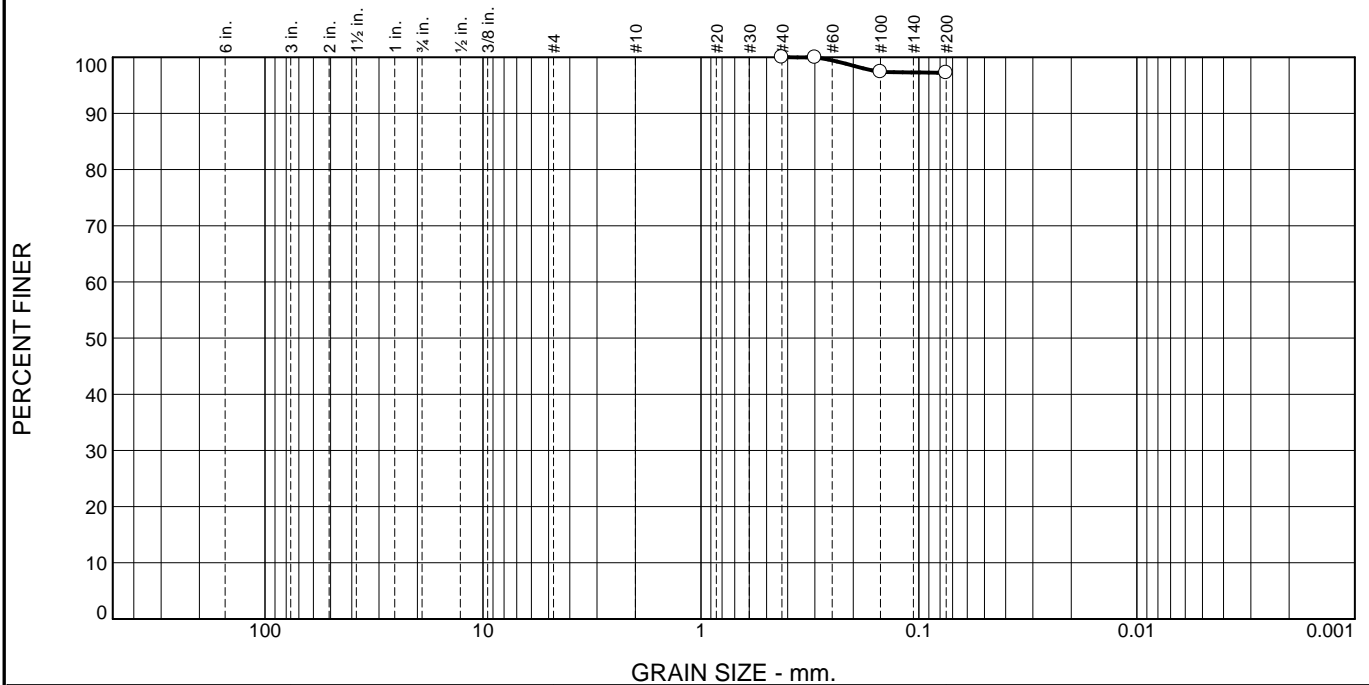
PAGE LEFT BLANK INTENTIONALLY



## **APPENDIX D: LABORATORY PARTICLE SIZE ANALYSIS RESULTS**

PAGE LEFT BLANK INTENTIONALLY

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	2.8	97.2	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	100.0		
#50	100.0		
#100	97.4		
#200	97.2		

\* (no specification provided)

<b>Material Description</b>		
Brownish gray silty clay		
<b>Atterberg Limits (ASTM D 4318)</b>		
PL= -	LL= -	PI= -
<b>Classification</b>		
USCS (D 2487)=	CL-ML	AASHTO (M 145)= -
<b>Coefficients</b>		
D <sub>90</sub> =	D <sub>85</sub> =	D <sub>60</sub> =
D <sub>50</sub> =	D <sub>30</sub> =	D <sub>15</sub> =
D <sub>10</sub> =	C <sub>u</sub> =	C <sub>c</sub> =
<b>Remarks</b>		
Moisture content =23.8%		
<b>Date Received:</b> 10/26/2020 <b>Date Tested:</b> 11/4/2020		
<b>Tested By:</b> Matthew Watson		
<b>Checked By:</b> Shalini Kanuganti		
<b>Title:</b> Lab Manager		

Location: B-1 SS03

Sample Number: 3520-648

Depth: 4'-6'

Date Sampled: 10/26/2020



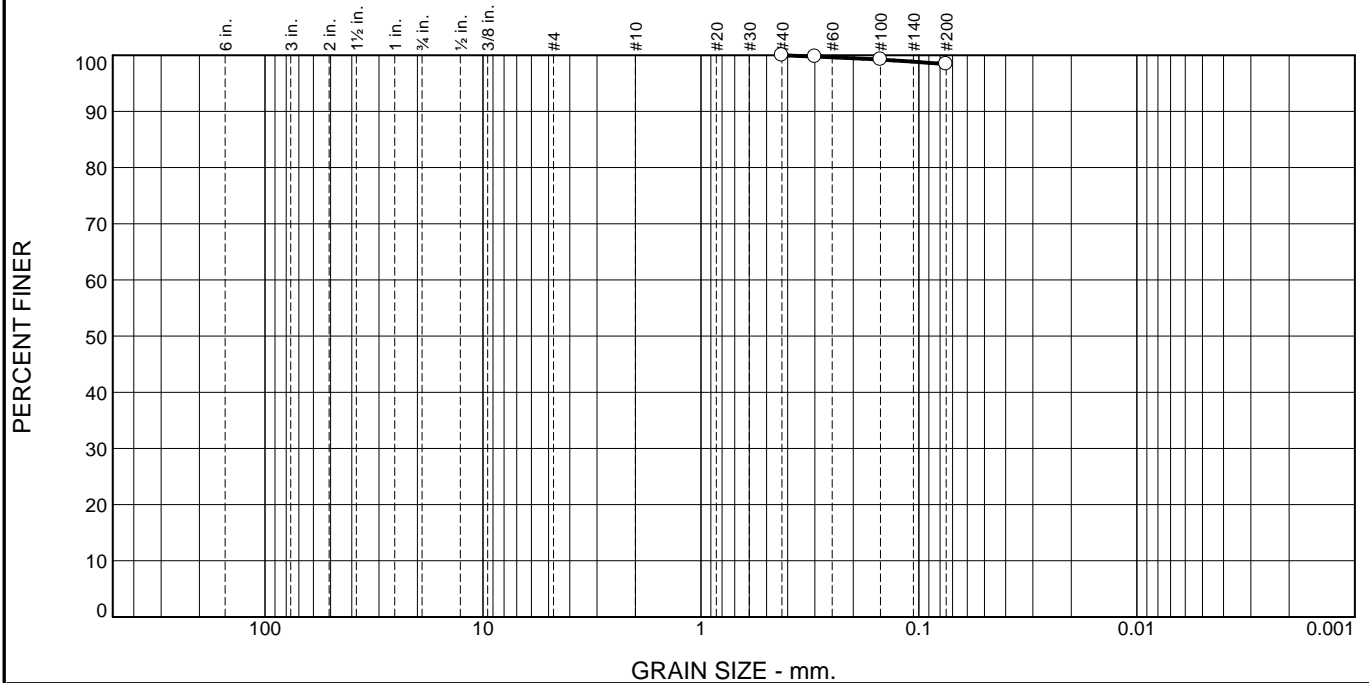
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 648A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	1.6	98.4	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	100.0		
#50	99.8		
#100	99.2		
#200	98.4		

\* (no specification provided)

**Material Description**

Light gray silty clay

**Atterberg Limits (ASTM D 4318)**

PL= - LL= - PI= -

**Classification**

USCS (D 2487)= CL-ML AASHTO (M 145)= -

**Coefficients**

D<sub>90</sub>= D<sub>85</sub>= D<sub>60</sub>=  
D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**

Moisture content =28.5%

**Date Received:** 10/26/2020 **Date Tested:** 11/4/2020

**Tested By:** Matthew Watson

**Checked By:** Shalini Kanuganti

**Title:** Lab Manager

Location: B-1 SS05

Sample Number: 3520-649

Depth: 8'-10'

Date Sampled: 10/26/2020



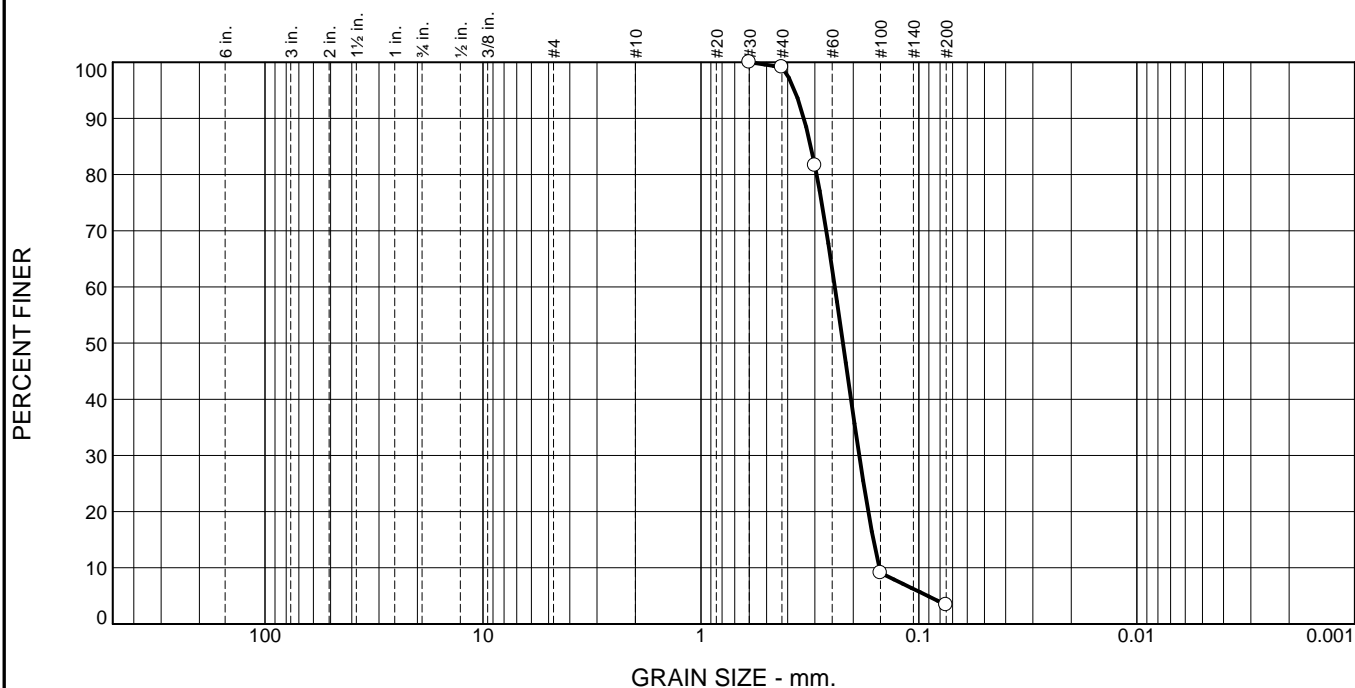
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 649A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.9	95.7	3.4	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#30	100.0		
#40	99.1		
#50	81.6		
#100	9.1		
#200	3.4		

\* (no specification provided)

**Material Description**  
Light brown sand

**Atterberg Limits (ASTM D 4318)**  
 PL= - LL= - PI= -

**Classification**  
 USCS (D 2487)= SP AASHTO (M 145)= -

**Coefficients**  
 D<sub>90</sub>= 0.3369 D<sub>85</sub>= 0.3129 D<sub>60</sub>= 0.2429  
 D<sub>50</sub>= 0.2231 D<sub>30</sub>= 0.1879 D<sub>15</sub>= 0.1617  
 D<sub>10</sub>= 0.1519 C<sub>u</sub>= 1.60 C<sub>c</sub>= 0.96

**Remarks**  
Moisture content =2.2%

**Date Received:** 10/26/2020 **Date Tested:** 11/6/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: B-2 SS02

Sample Number: 3520-638

Depth: 2'-4'

Date Sampled: 10/26/2020



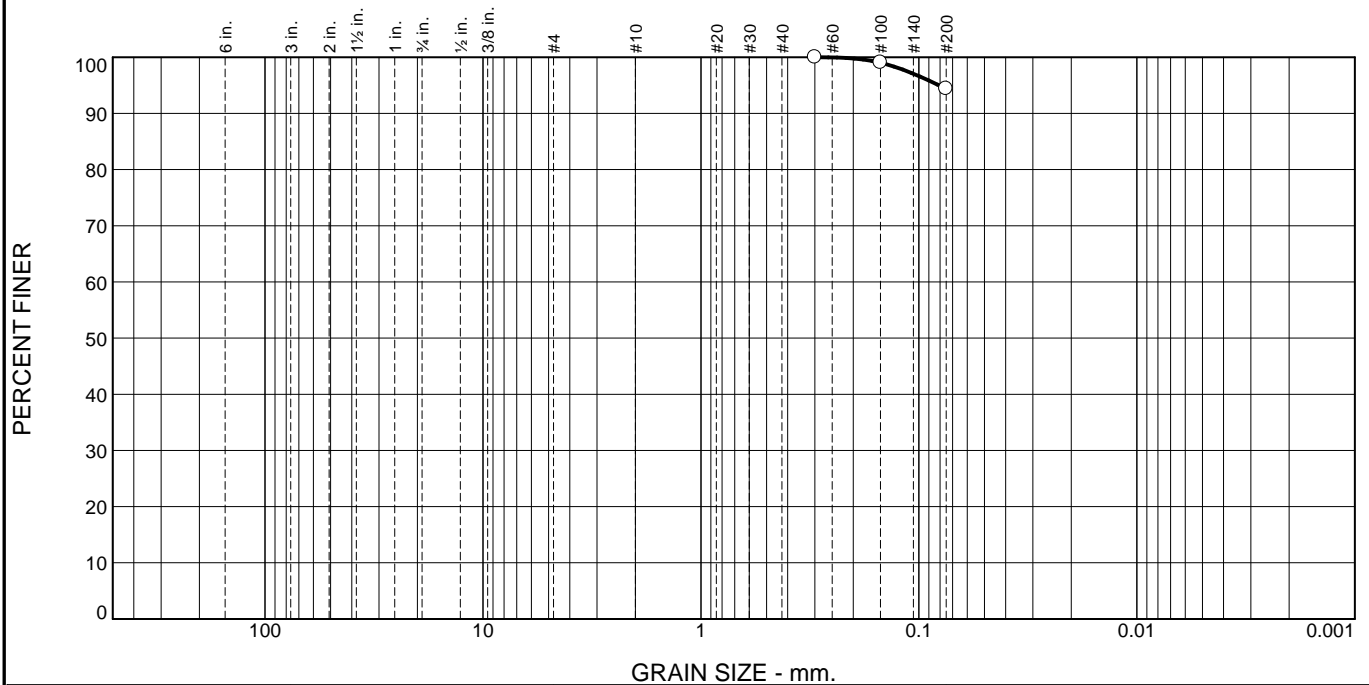
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 638A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	5.6	94.4	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#50	100.0		
#100	99.0		
#200	94.4		

\* (no specification provided)

**Material Description**  
Medium brown silt

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= ML AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= D<sub>85</sub>= D<sub>60</sub>=  
D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =31.2%

**Date Received:** 10/26/2020 **Date Tested:** 11/6/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: B-2 SS05

Sample Number: 3520-639

Depth: 8'-10'

Date Sampled: 10/26/2020



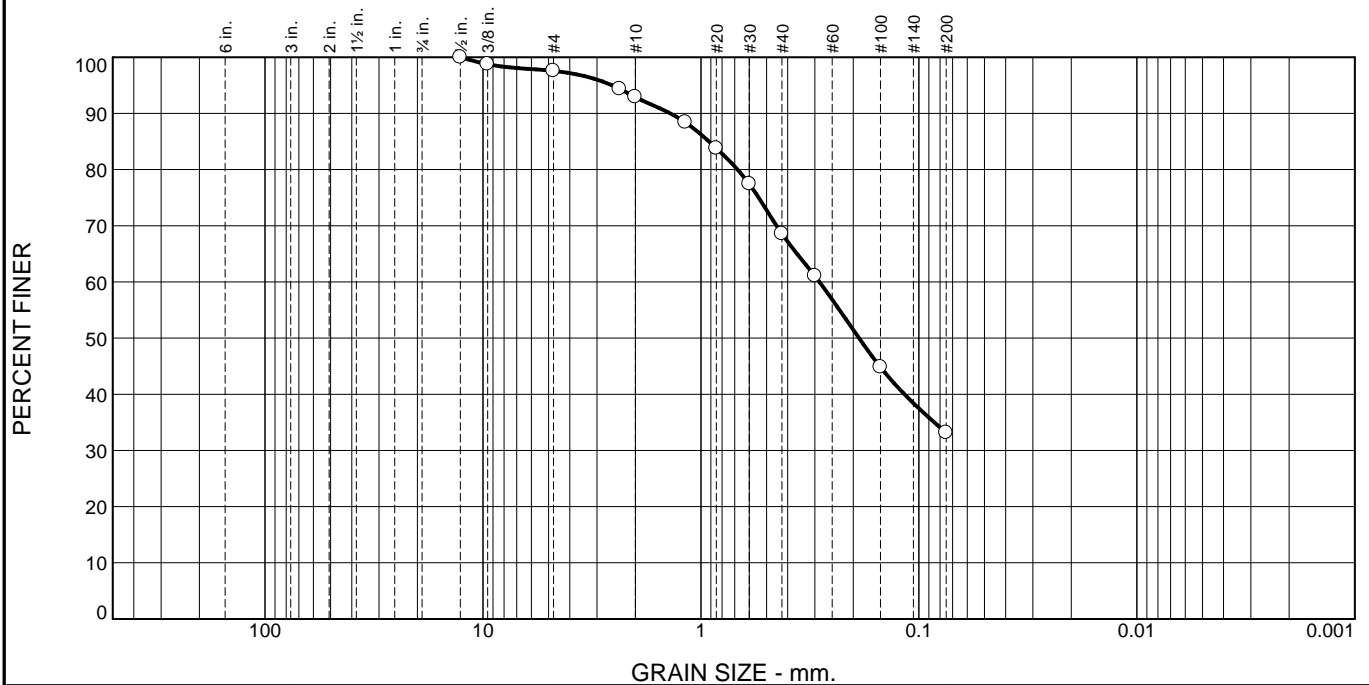
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 639A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	4.7	24.3	35.5	33.1	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2	100.0		
3/8	98.8		
#4	97.6		
#8	94.4		
#10	92.9		
#16	88.4		
#20	83.8		
#30	77.4		
#40	68.6		
#50	61.1		
#100	44.8		
#200	33.1		

\* (no specification provided)

**Material Description**  
Grayish brown silty sand

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= SM AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= 1.3828 D<sub>85</sub>= 0.9194 D<sub>60</sub>= 0.2859  
D<sub>50</sub>= 0.1883 D<sub>30</sub>= C<sub>u</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =6.6%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: B-3 SS01

Sample Number: 3520-640

Depth: 0'-2'

Date Sampled: 10/26/2020



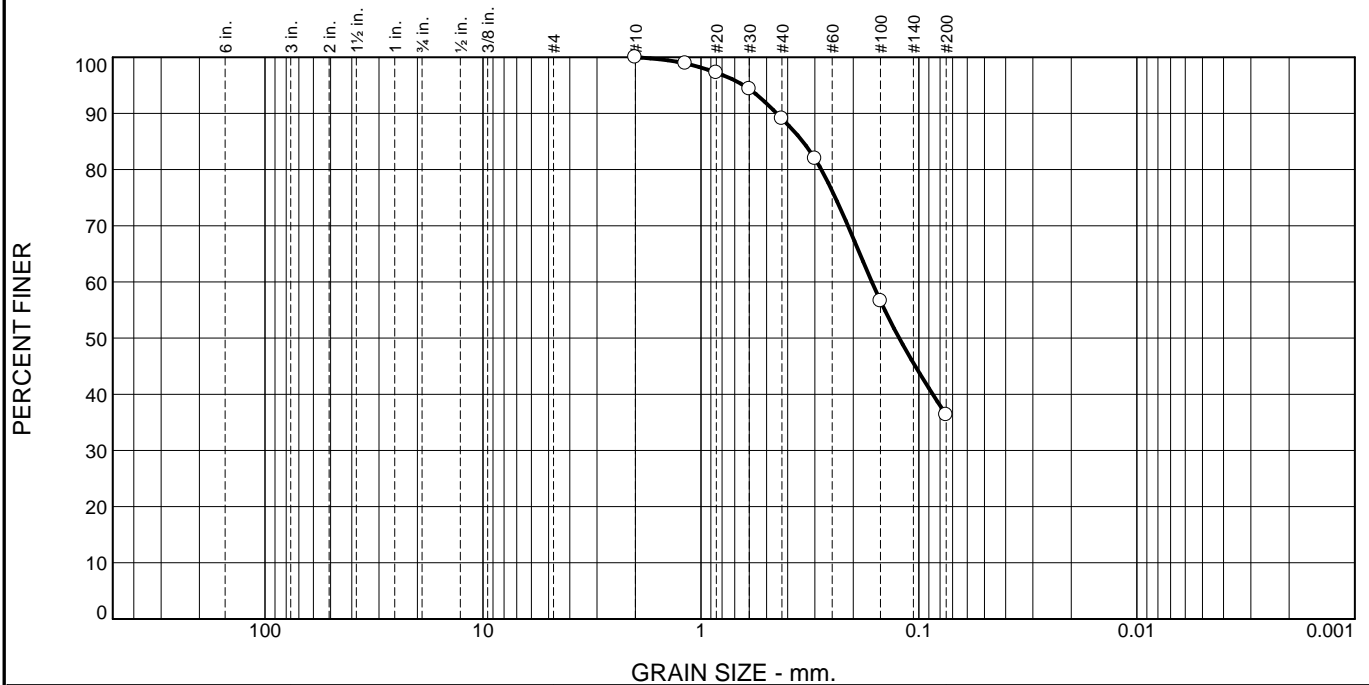
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 640A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	10.9	52.8	36.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	98.9		
#20	97.2		
#30	94.3		
#40	89.1		
#50	82.0		
#100	56.6		
#200	36.3		

\* (no specification provided)

**Material Description**  
Light brown silty sand

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= SM AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= 0.4492 D<sub>85</sub>= 0.3409 D<sub>60</sub>= 0.1643  
D<sub>50</sub>= 0.1232 D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =10.4%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: B-3 SS05

Sample Number: 3520-641

Depth: 8'-10'

Date Sampled: 10/26/2020



Client: McFarland-Johnson

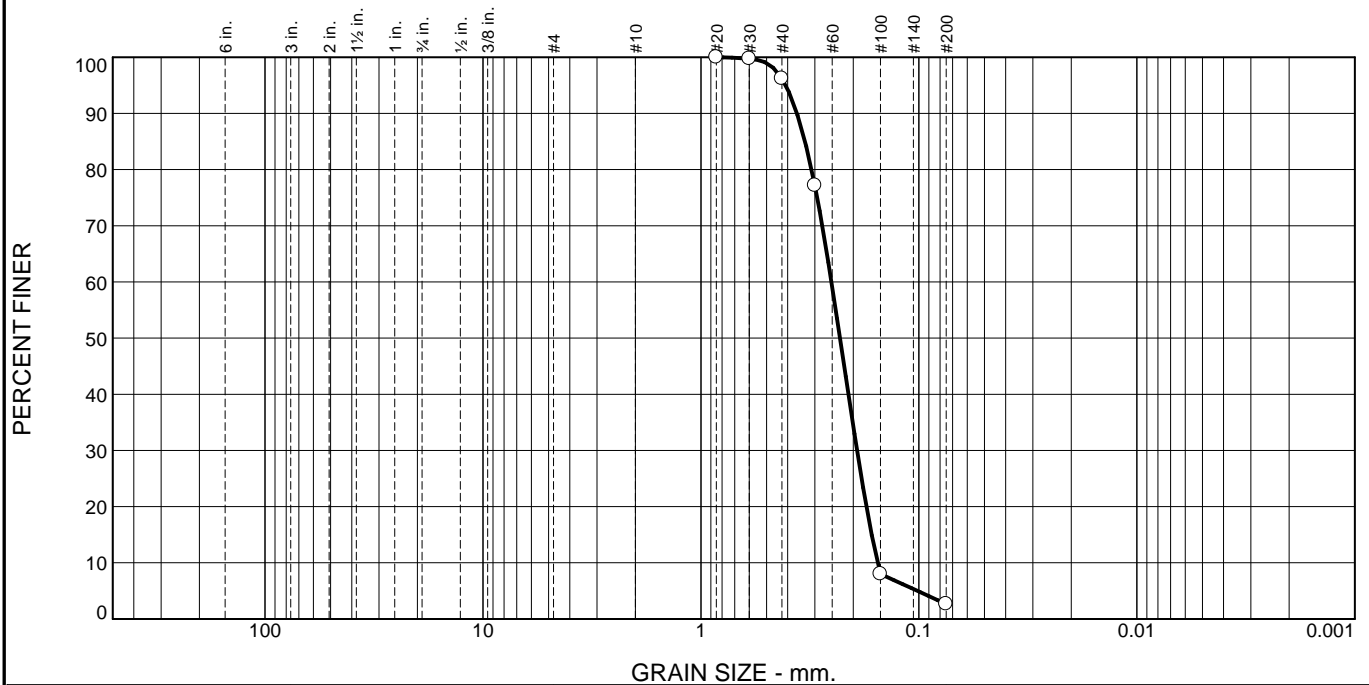
Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 641A



# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	3.8	93.5	2.7	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#20	100.0		
#30	99.7		
#40	96.2		
#50	77.1		
#100	8.0		
#200	2.7		

\* (no specification provided)

**Material Description**

Light brown sand

**Atterberg Limits (ASTM D 4318)**

PL= - LL= - PI= -

**Classification**

USCS (D 2487)= SP AASHTO (M 145)= -

**Coefficients**

D<sub>90</sub>= 0.3627 D<sub>85</sub>= 0.3330 D<sub>60</sub>= 0.2519  
D<sub>50</sub>= 0.2301 D<sub>30</sub>= 0.1922 D<sub>15</sub>= 0.1646  
D<sub>10</sub>= 0.1545 C<sub>u</sub>= 1.63 C<sub>c</sub>= 0.95

**Remarks**

Moisture content =6.9%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020

**Tested By:** Matthew Watson

**Checked By:** Shalini Kanuganti

**Title:** Lab Manager

Location: B-4 SS03

Sample Number: 3520-642

Depth: 4'-6'

Date Sampled: 10/26/2020



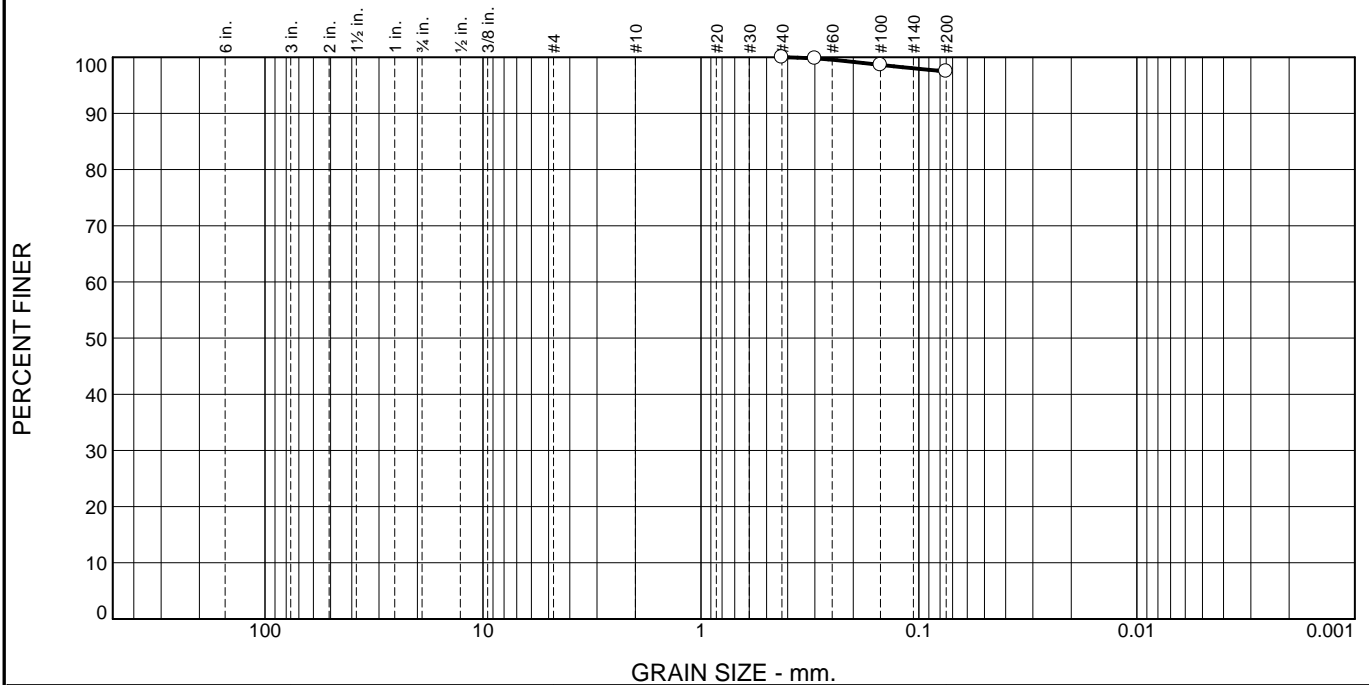
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 642A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	2.5	97.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	100.0		
#50	99.8		
#100	98.6		
#200	97.5		

\* (no specification provided)

**Material Description**  
Light brown silt

**Atterberg Limits (ASTM D 4318)**  
 PL= - LL= - PI= -

**Classification**  
 USCS (D 2487)= ML AASHTO (M 145)= -

**Coefficients**  
 D<sub>90</sub>= D<sub>85</sub>= D<sub>60</sub>=  
 D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
 D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =26.9%

**Date Received:** 10/26/2020 **Date Tested:** 11/4/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: B-4 SS04

Sample Number: 3520-643

Depth: 6'-8'

Date Sampled: 10/26/2020



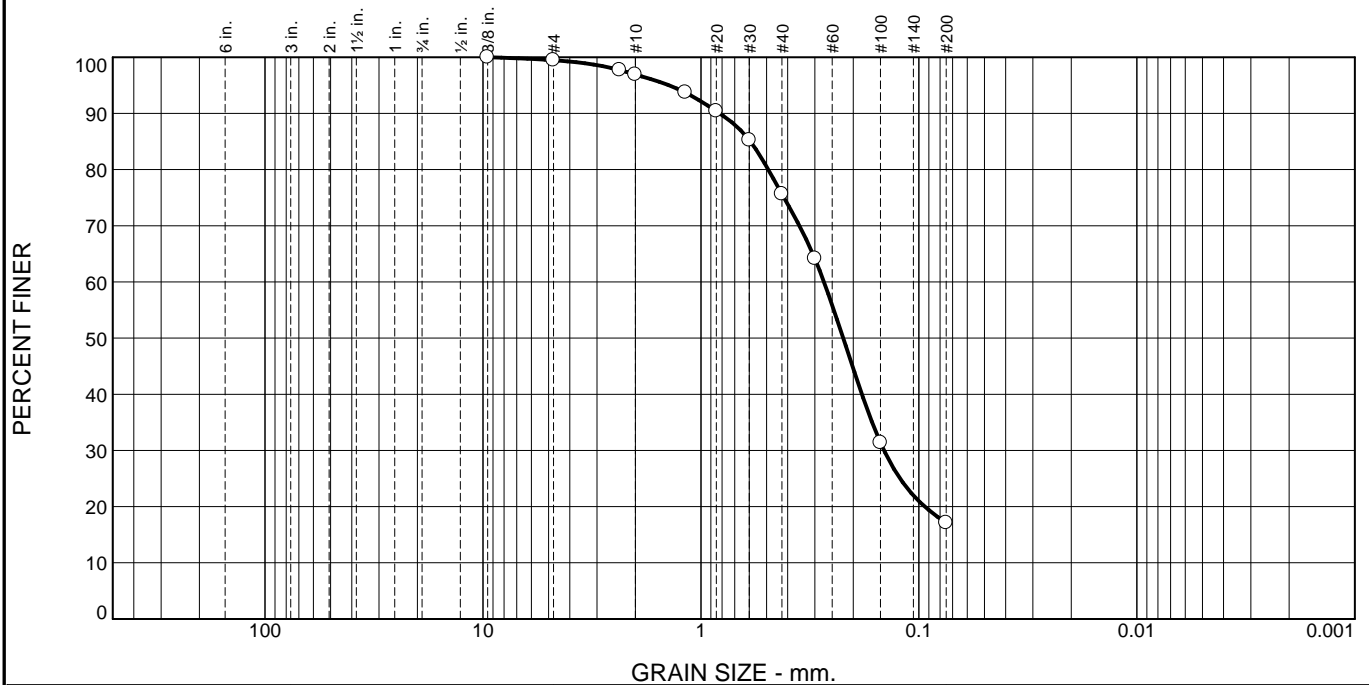
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 643A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	2.6	21.3	58.5	17.1	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8	100.0		
#4	99.5		
#8	97.7		
#10	96.9		
#16	93.7		
#20	90.4		
#30	85.2		
#40	75.6		
#50	64.2		
#100	31.4		
#200	17.1		

\* (no specification provided)

**Material Description**  
Medium brown silty sand

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= SM AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= 0.8211 D<sub>85</sub>= 0.5933 D<sub>60</sub>= 0.2725  
D<sub>50</sub>= 0.2225 D<sub>30</sub>= 0.1445 D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =3.8%

**Date Received:** 10/26/2020 **Date Tested:** 11/6/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: CB-1 SS01

Sample Number: 3520-644

Depth: 0'-2'

Date Sampled: 10/26/2020



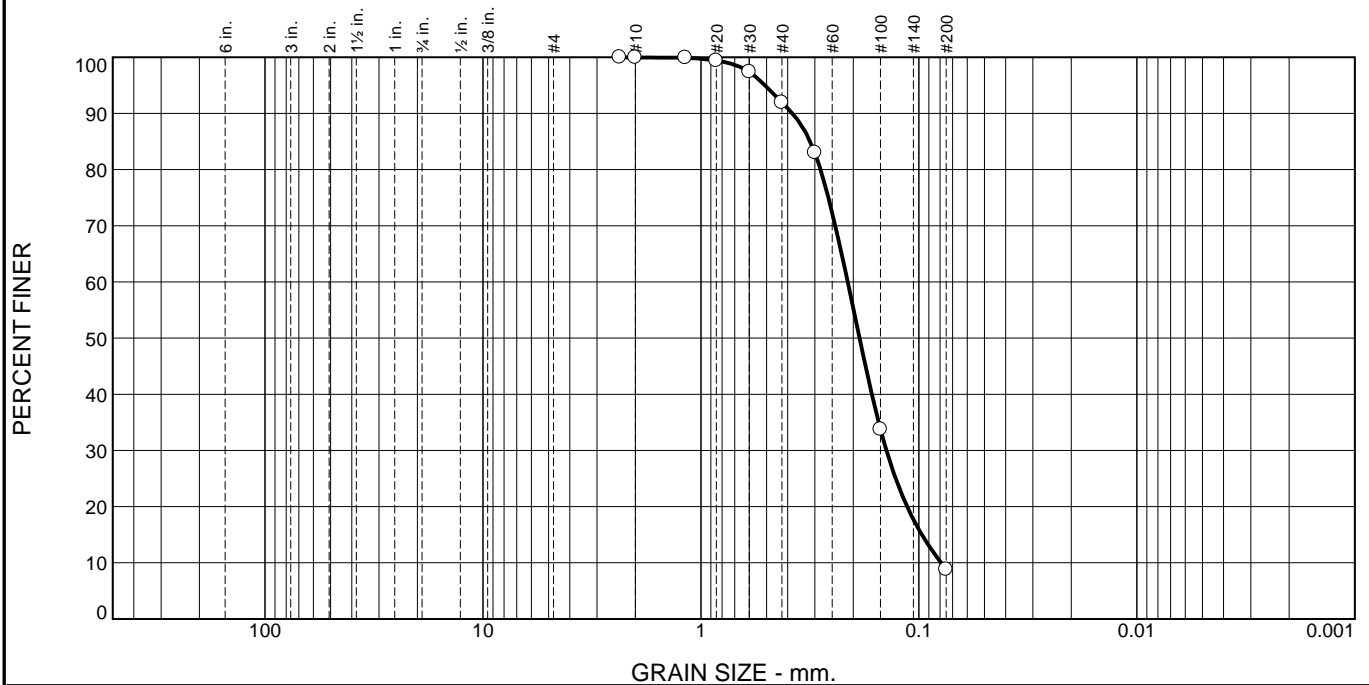
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 644A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	8.1	83.1	8.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.4		
#30	97.4		
#40	91.9		
#50	83.0		
#100	33.7		
#200	8.8		

\* (no specification provided)

## Material Description

Light brown sand with silt

## Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

## Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

## Coefficients

D<sub>90</sub>= 0.3805 D<sub>85</sub>= 0.3149 D<sub>60</sub>= 0.2122  
D<sub>50</sub>= 0.1873 D<sub>30</sub>= 0.1409 D<sub>15</sub>= 0.0969  
D<sub>10</sub>= 0.0791 C<sub>u</sub>= 2.68 C<sub>c</sub>= 1.18

## Remarks

Moisture content =9.9%

Date Received: 10/26/2020 Date Tested: 11/6/2020

Tested By: Matthew Watson

Checked By: Shalini Kanuganti

Title: Lab Manager

Location: CB-1 SS04

Sample Number: 3520-645

Depth: 6'-8'

Date Sampled: 10/26/2020



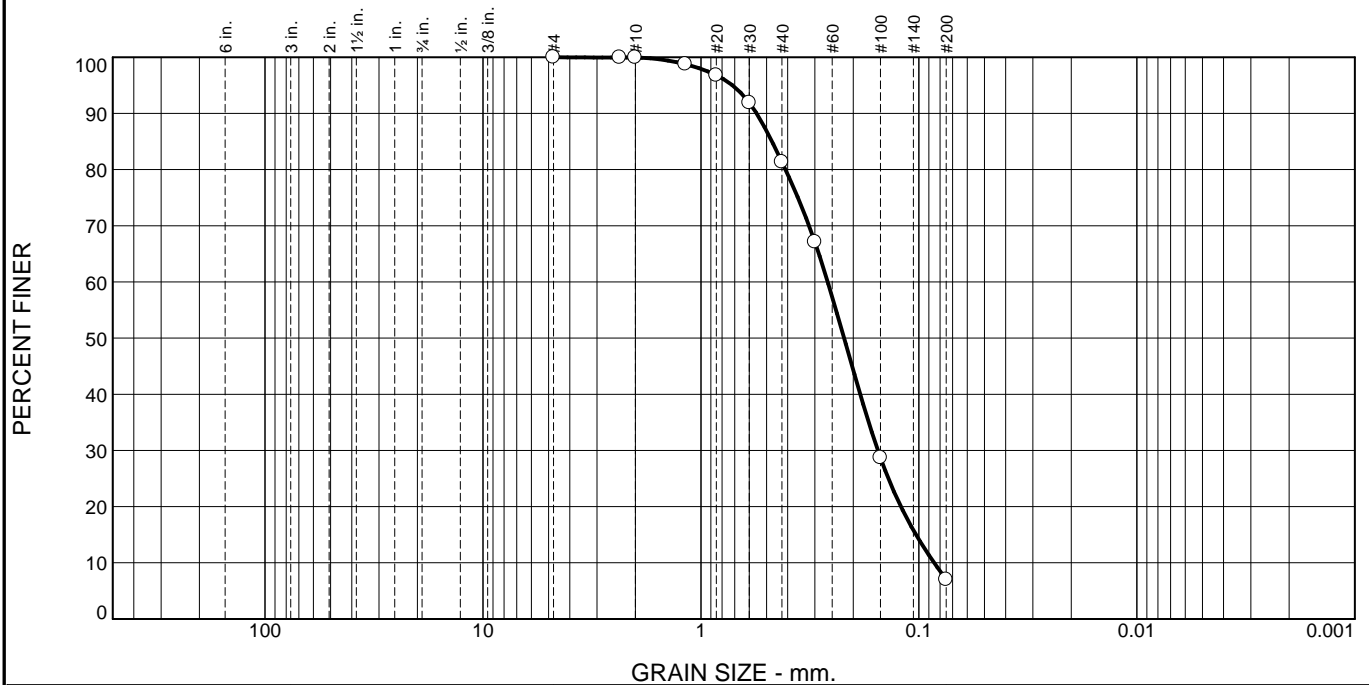
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 645A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	18.7	74.3	7.0	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	100.0		
#10	100.0		
#16	98.8		
#20	96.8		
#30	91.9		
#40	81.3		
#50	67.1		
#100	28.7		
#200	7.0		

\* (no specification provided)

**Material Description**  
Light brown sand with silt

**Atterberg Limits (ASTM D 4318)**  
 PL= - LL= - PI= -

**Classification**  
 USCS (D 2487)= SP-SM AASHTO (M 145)= -

**Coefficients**  
 D<sub>90</sub>= 0.5558 D<sub>85</sub>= 0.4722 D<sub>60</sub>= 0.2620  
 D<sub>50</sub>= 0.2204 D<sub>30</sub>= 0.1542 D<sub>15</sub>= 0.1031  
 D<sub>10</sub>= 0.0851 C<sub>u</sub>= 3.08 C<sub>c</sub>= 1.07

**Remarks**  
Moisture content =19.9%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: CB-2 SS02

Sample Number: 3520-646

Depth: 2'-4'

Date Sampled: 10/26/2020



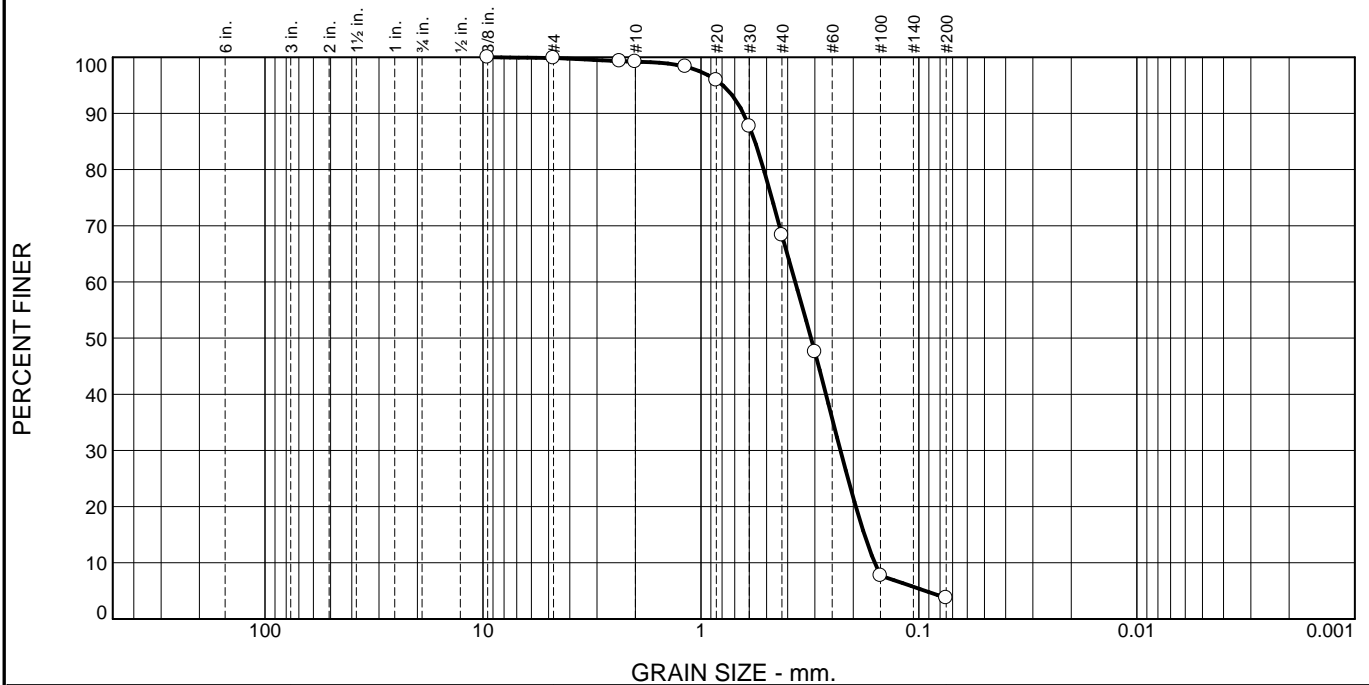
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 646A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.7	30.9	64.6	3.7	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8	100.0		
#4	99.9		
#8	99.3		
#10	99.2		
#16	98.3		
#20	95.9		
#30	87.7		
#40	68.3		
#50	47.5		
#100	7.7		
#200	3.7		

\* (no specification provided)

**Material Description**  
Orangish brown sand

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= SP AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= 0.6380 D<sub>85</sub>= 0.5656 D<sub>60</sub>= 0.3695  
D<sub>50</sub>= 0.3123 D<sub>30</sub>= 0.2291 D<sub>15</sub>= 0.1777  
D<sub>10</sub>= 0.1595 C<sub>u</sub>= 2.32 C<sub>c</sub>= 0.89

**Remarks**  
Moisture content =2.5%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020

**Tested By:** Matthew Watson

**Checked By:** Shalini Kanuganti

**Title:** Lab Manager

Location: CB-2 SS04

Sample Number: 3520-647

Depth: 6'-8'

Date Sampled: 10/26/2020



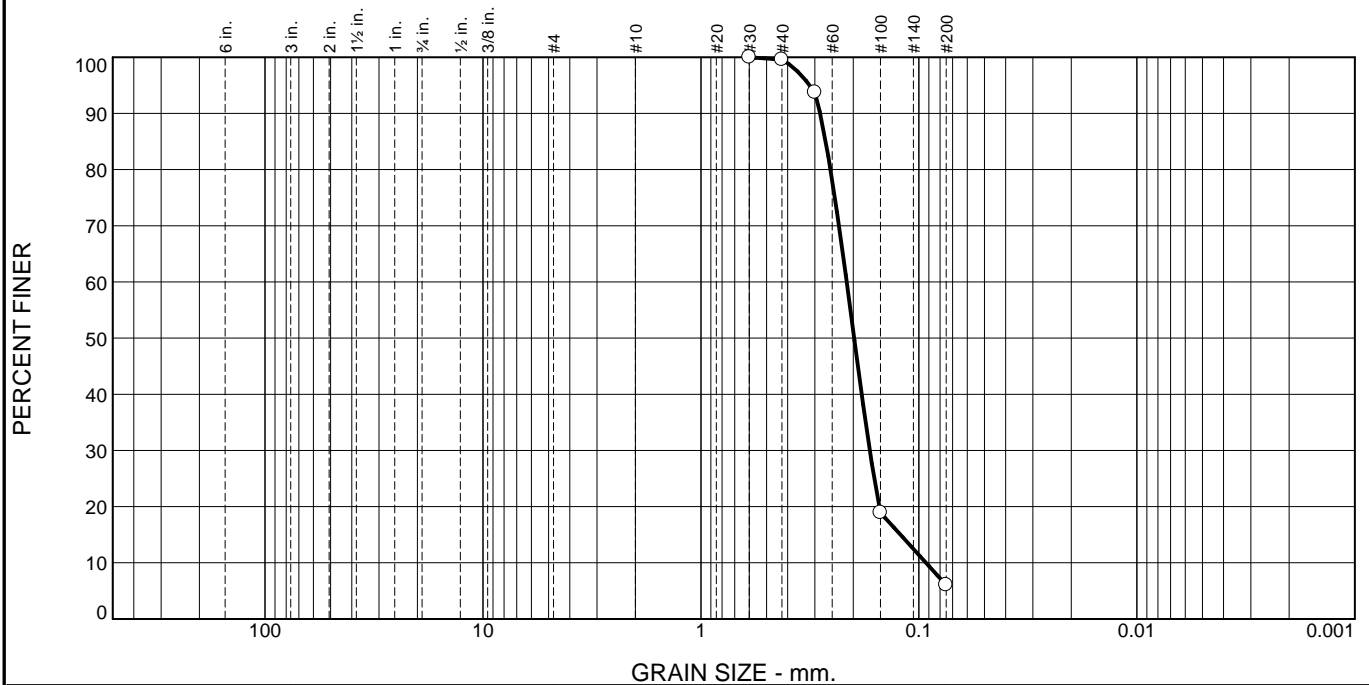
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 647A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	93.6	6.0	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#30	100.0		
#40	99.6		
#50	93.7		
#100	18.9		
#200	6.0		

\* (no specification provided)

**Material Description**  
Medium brown sand with silt

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= SP-SM AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= 0.2838 D<sub>85</sub>= 0.2675 D<sub>60</sub>= 0.2145  
D<sub>50</sub>= 0.1982 D<sub>30</sub>= 0.1680 D<sub>15</sub>= 0.1215  
D<sub>10</sub>= 0.0928 C<sub>u</sub>= 2.31 C<sub>c</sub>= 1.42

**Remarks**  
Moisture content =6.0%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020

**Tested By:** Matthew Watson

**Checked By:** Shalini Kanuganti

**Title:** Lab Manager

Location: CB-3 SS01

Sample Number: 3520-650

Depth: 0'-2'

Date Sampled: 10/26/2020



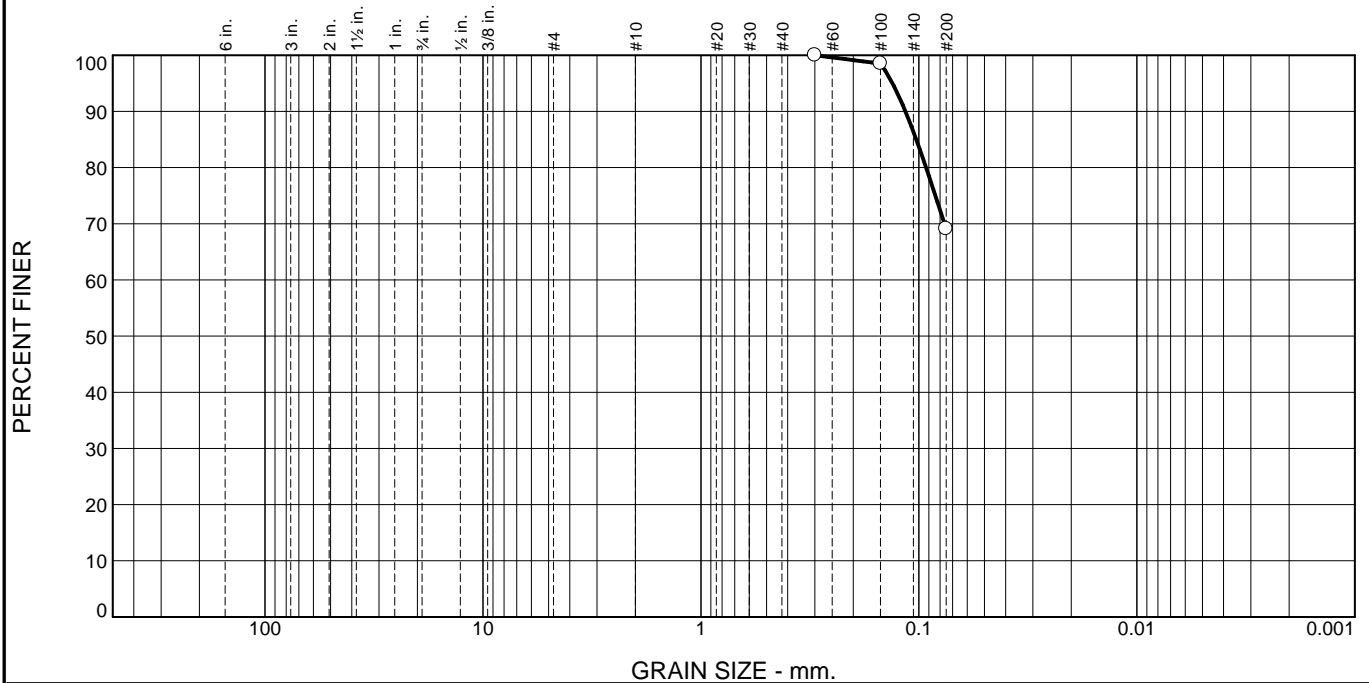
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 650A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	30.9	69.1	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#50	100.0		
#100	98.5		
#200	69.1		

\* (no specification provided)

**Material Description**  
Light brown sandy silt

**Atterberg Limits (ASTM D 4318)**  
 PL= - LL= - PI= -

**Classification**  
 USCS (D 2487)= ML AASHTO (M 145)= -

**Coefficients**  
 D<sub>90</sub>= 0.1153 D<sub>85</sub>= 0.1028 D<sub>60</sub>=  
 D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
 D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =22.0%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: CB-3 SS03

Sample Number: 3520-651

Depth: 4'-6'

Date Sampled: 10/26/2020



Client: McFarland-Johnson

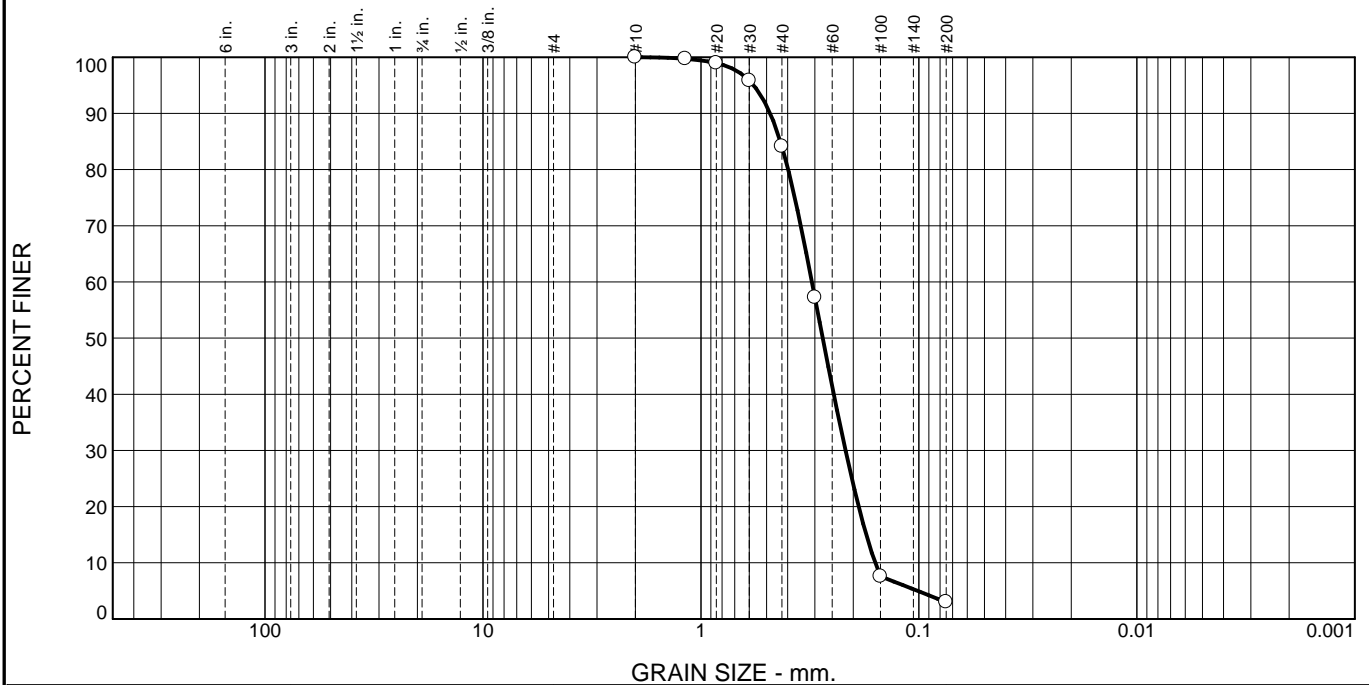
Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 651A



# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	15.9	81.1	3.0	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	99.7		
#20	98.9		
#30	95.8		
#40	84.1		
#50	57.2		
#100	7.6		
#200	3.0		

\* (no specification provided)

**Material Description**  
 Light brown sand

**Atterberg Limits (ASTM D 4318)**  
 PL= -      LL= -      PI= -

**Classification**  
 USCS (D 2487)= SP      AASHTO (M 145)= -

**Coefficients**  
 D<sub>90</sub>= 0.4811      D<sub>85</sub>= 0.4318      D<sub>60</sub>= 0.3096  
 D<sub>50</sub>= 0.2761      D<sub>30</sub>= 0.2171      D<sub>15</sub>= 0.1744  
 D<sub>10</sub>= 0.1587      C<sub>u</sub>= 1.95      C<sub>c</sub>= 0.96

**Remarks**  
 Moisture content =11.3%

Date Received: 10/26/2020      Date Tested: 11/5/2020  
 Tested By: Matthew Watson  
 Checked By: Shalini Kanuganti  
 Title: Lab Manager

Location: CB-4 SS03

Sample Number: 3520-652

Depth: 4'-6'

Date Sampled: 10/26/2020



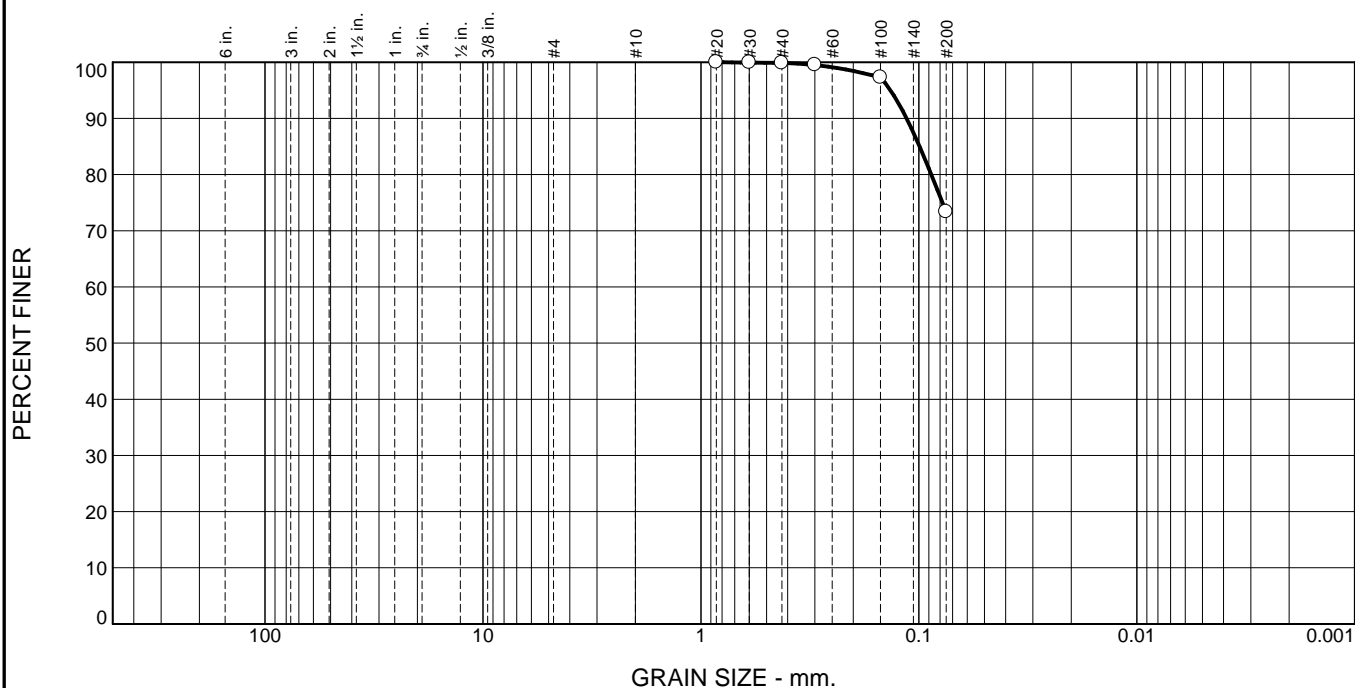
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 652A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	26.6	73.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#20	100.0		
#30	99.9		
#40	99.9		
#50	99.5		
#100	97.3		
#200	73.3		

\* (no specification provided)

**Material Description**  
Light brown silt with sand

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= ML AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= 0.1139 D<sub>85</sub>= 0.0993 D<sub>60</sub>=  
D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =25.9%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: CB-4 SS05

Sample Number: 3520-653

Depth: 8'-10'

Date Sampled: 10/26/2020



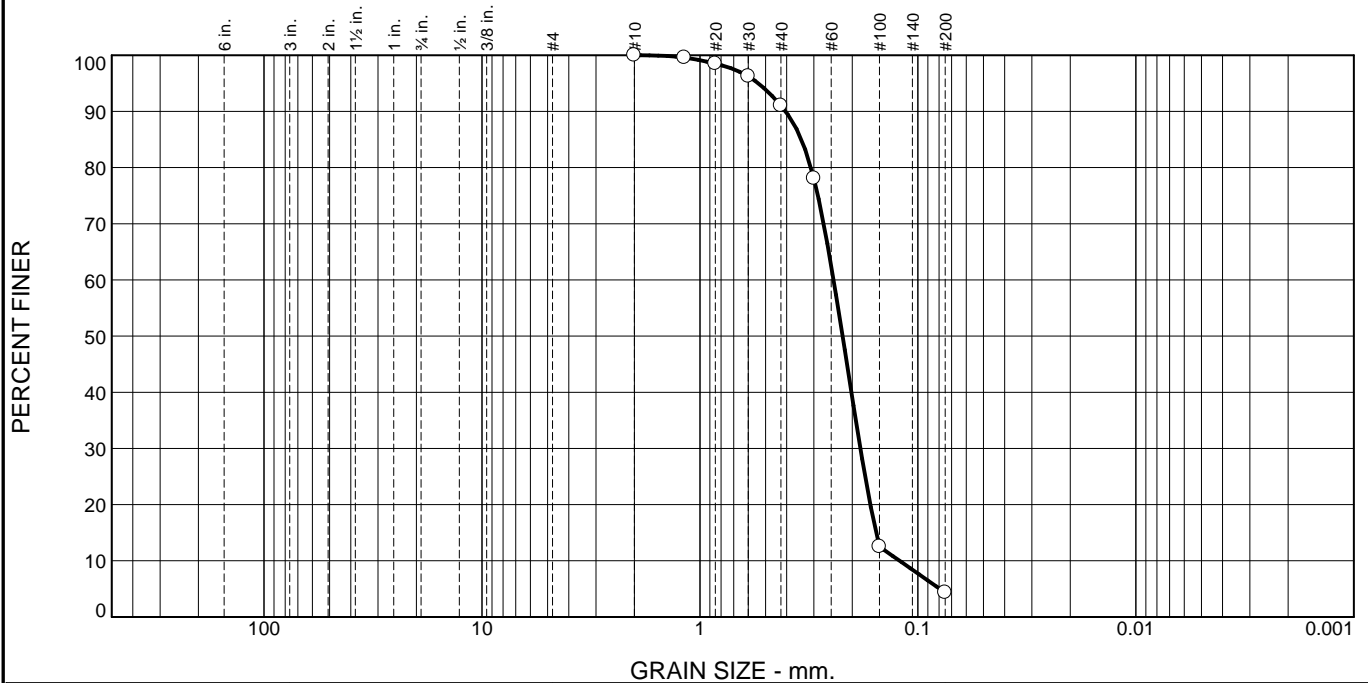
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 653A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	9.0	86.7	4.3	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	99.6		
#20	98.5		
#30	96.2		
#40	91.0		
#50	78.1		
#100	12.5		
#200	4.3		

\* (no specification provided)

**Material Description**

Light brown sand

**Atterberg Limits (ASTM D 4318)**

PL= - LL= - PI= -

**Classification**

USCS (D 2487)= SP AASHTO (M 145)= -

**Coefficients**

D<sub>90</sub>= 0.4050 D<sub>85</sub>= 0.3423 D<sub>60</sub>= 0.2436  
D<sub>50</sub>= 0.2215 D<sub>30</sub>= 0.1836 D<sub>15</sub>= 0.1554  
D<sub>10</sub>= 0.1213 C<sub>u</sub>= 2.01 C<sub>c</sub>= 1.14

**Remarks**

Moisture content =7.3%

**Date Received:** 10/26/2020 **Date Tested:** 11/4/2020

**Tested By:** Matthew Watson

**Checked By:** Shalini Kanuganti

**Title:** Lab Manager

Location: CB-5 SS02

Sample Number: 3520-654

Depth: 0'-2'

Date Sampled: 10/26/2020



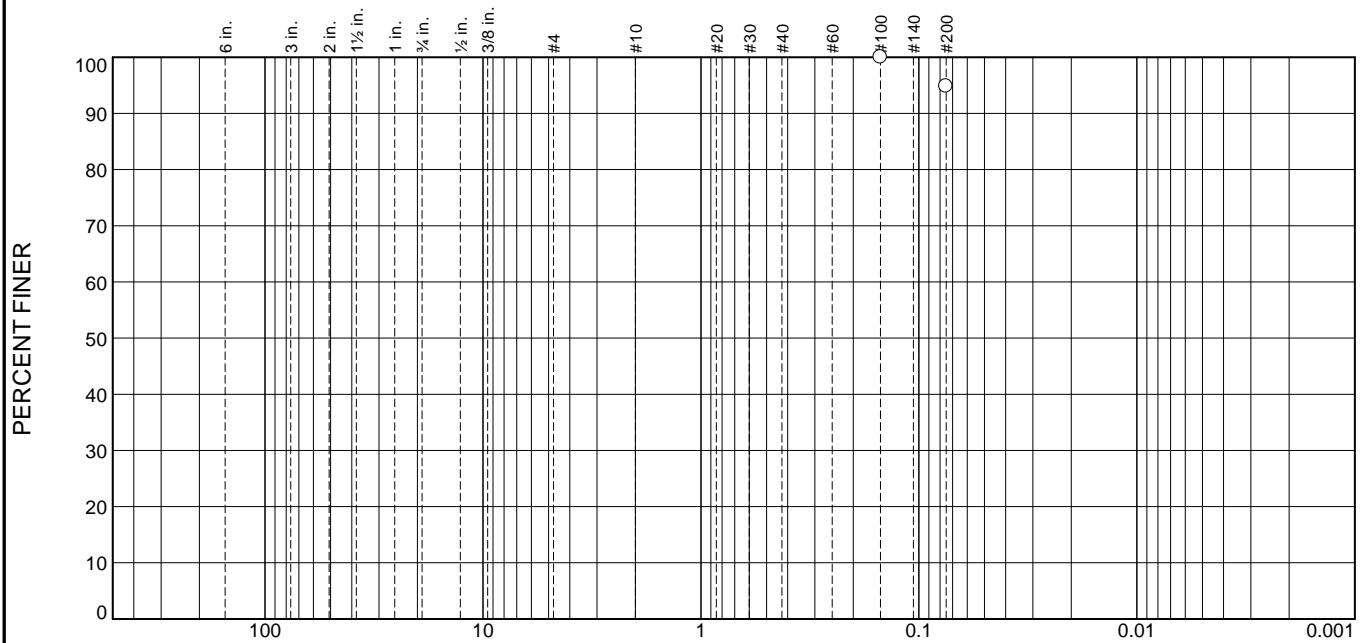
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 654A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	5.2	94.8	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#100	100.0		
#200	94.8		

\* (no specification provided)

**Material Description**  
Light brown clayey silt

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= CL-ML AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= D<sub>85</sub>= D<sub>60</sub>=  
D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =21.5%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: CB-5 SS04

Sample Number: 3520-655

Depth: 6'-8'

Date Sampled: 10/26/2020



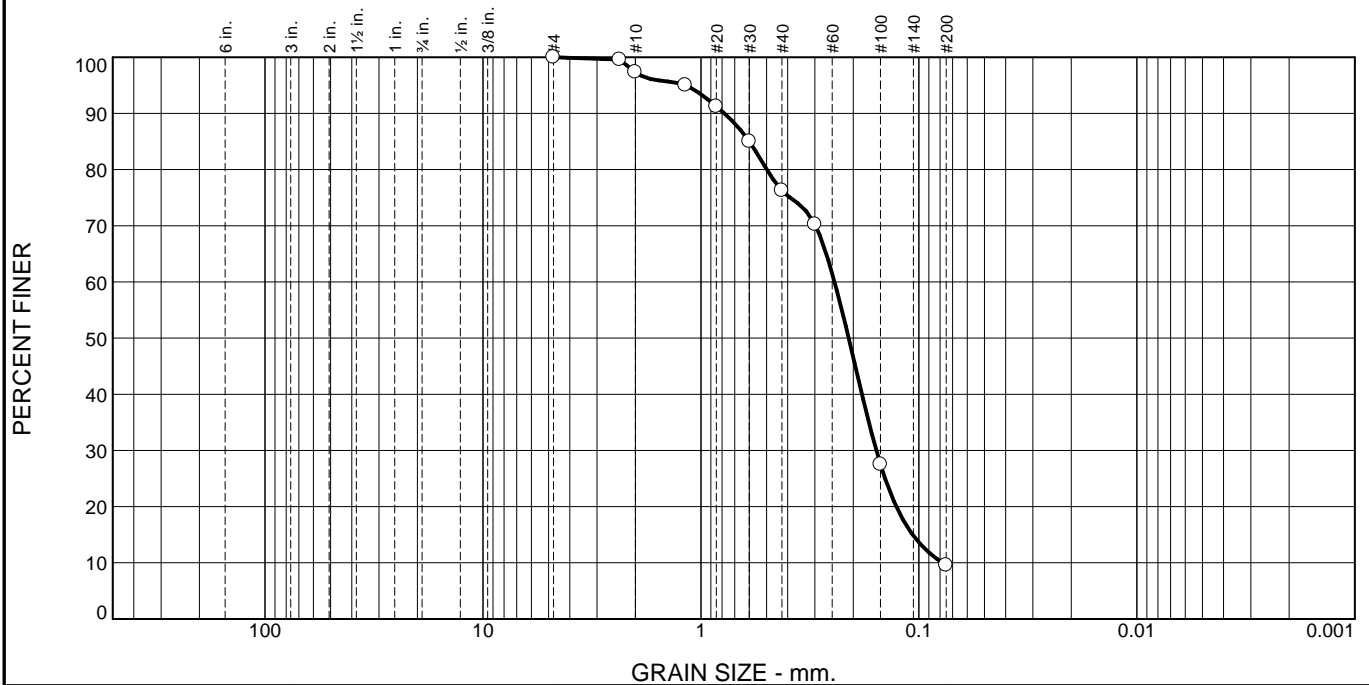
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 655A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.7	21.0	66.8	9.5	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.6		
#10	97.3		
#16	95.0		
#20	91.2		
#30	85.0		
#40	76.3		
#50	70.2		
#100	27.5		
#200	9.5		

\* (no specification provided)

## Material Description

Light brown sand with silt

## Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

## Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

## Coefficients

D<sub>90</sub>= 0.7819 D<sub>85</sub>= 0.5998 D<sub>60</sub>= 0.2437  
D<sub>50</sub>= 0.2100 D<sub>30</sub>= 0.1567 D<sub>15</sub>= 0.1070  
D<sub>10</sub>= 0.0780 C<sub>u</sub>= 3.13 C<sub>c</sub>= 1.29

## Remarks

Moisture content =7.2%

Date Received: 10/26/2020 Date Tested: 11/5/2020

Tested By: Matthew Watson

Checked By: Shalini Kanuganti

Title: Lab Manager

Location: CB-6 SS02

Sample Number: 3520-656

Depth: 2'-4'

Date Sampled: 10/26/2020



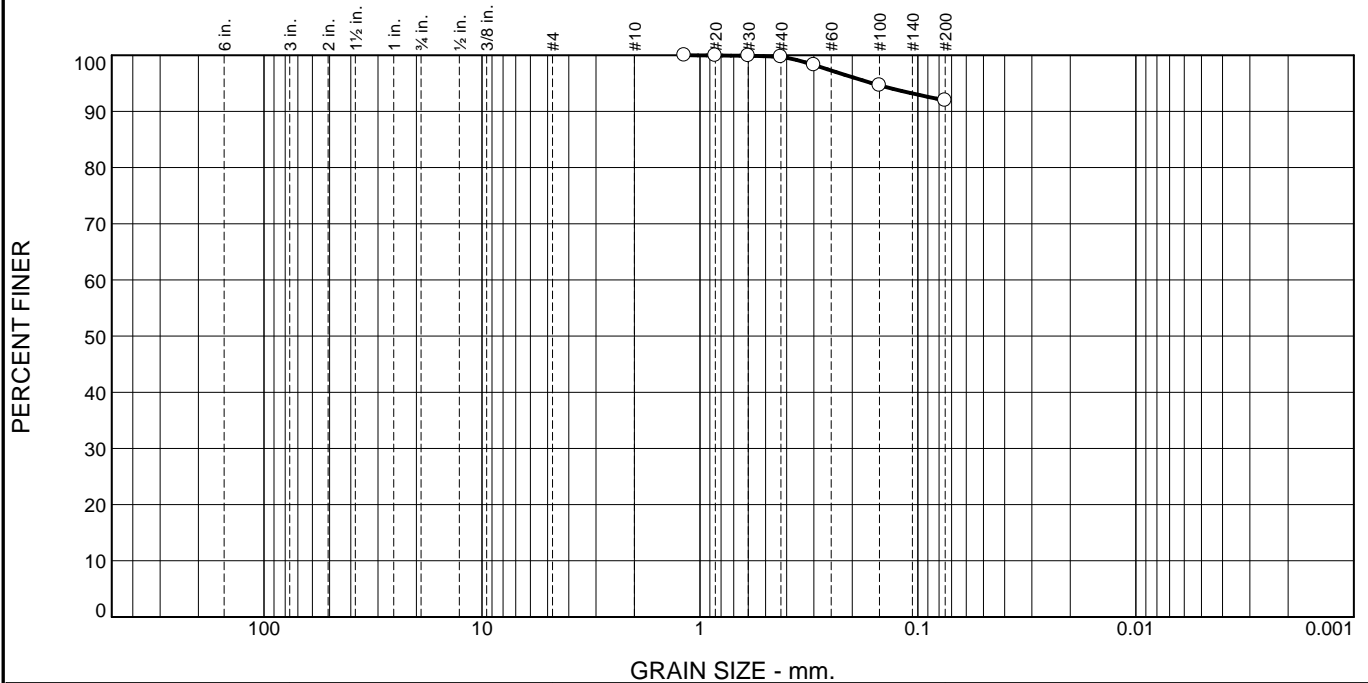
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 656A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	7.7	92.0	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#16	100.0		
#20	100.0		
#30	99.9		
#40	99.7		
#50	98.3		
#100	94.7		
#200	92.0		

\* (no specification provided)

**Material Description**  
Light brown silty clay

**Atterberg Limits (ASTM D 4318)**  
 PL= - LL= - PI= -

**Classification**  
 USCS (D 2487)= CL-ML AASHTO (M 145)= -

**Coefficients**  
 D<sub>90</sub>= D<sub>85</sub>= D<sub>60</sub>=  
 D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
 D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =31.3%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: CB-6 SS04

Sample Number: 3520-657

Depth: 6'-8'

Date Sampled: 10/26/2020



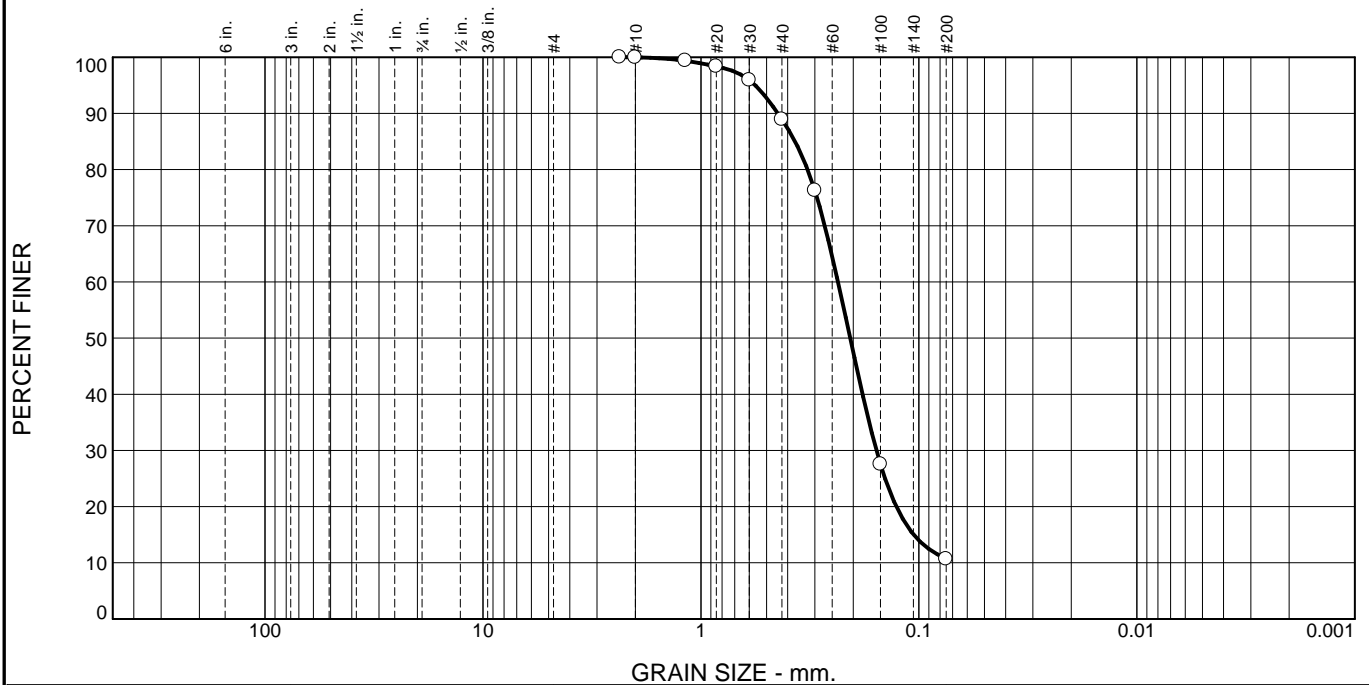
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 657A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	11.1	78.2	10.7	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	100.0		
#16	99.4		
#20	98.4		
#30	95.9		
#40	88.9		
#50	76.3		
#100	27.5		
#200	10.7		

\* (no specification provided)

## Material Description

Light brown sand with silt

## Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

## Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

## Coefficients

D<sub>90</sub>= 0.4437 D<sub>85</sub>= 0.3701 D<sub>60</sub>= 0.2351  
D<sub>50</sub>= 0.2066 D<sub>30</sub>= 0.1565 D<sub>15</sub>= 0.1058  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

## Remarks

Moisture content =5.5%

Date Received: 10/26/2020 Date Tested: 11/4/2020

Tested By: Matthew Watson

Checked By: Shalini Kanuganti

Title: Lab Manager

Location: CB-7 SS02

Sample Number: 3520-658

Depth: 2'-4'

Date Sampled: 10/26/2020



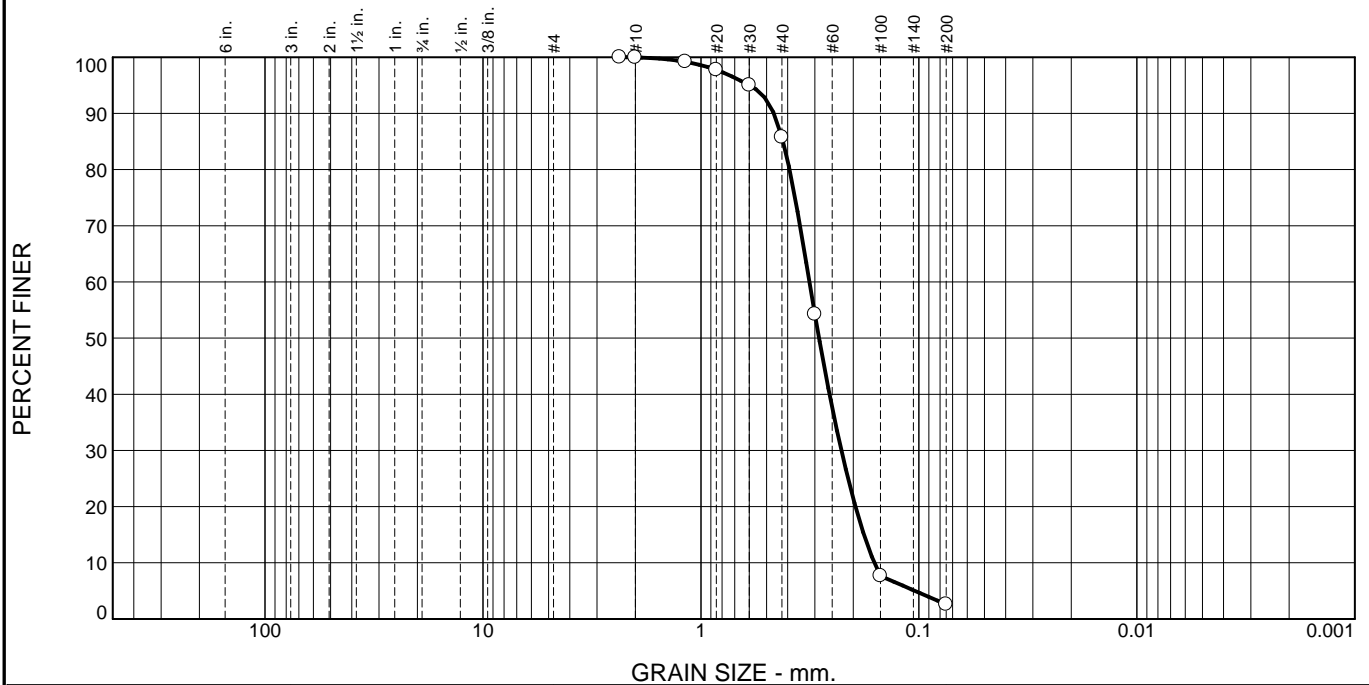
Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 658A

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	14.2	83.2	2.6	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	100.0		
#16	99.2		
#20	97.7		
#30	95.0		
#40	85.8		
#50	54.2		
#100	7.7		
#200	2.6		

\* (no specification provided)

**Material Description**

Light brown sand

**Atterberg Limits (ASTM D 4318)**

PL= - LL= - PI= -

**Classification**

USCS (D 2487)= SP AASHTO (M 145)= -

**Coefficients**

D<sub>90</sub>= 0.4630 D<sub>85</sub>= 0.4198 D<sub>60</sub>= 0.3178  
D<sub>50</sub>= 0.2871 D<sub>30</sub>= 0.2268 D<sub>15</sub>= 0.1787  
D<sub>10</sub>= 0.1601 C<sub>u</sub>= 1.99 C<sub>c</sub>= 1.01

**Remarks**

Moisture content =24.6%

**Date Received:** 10/26/2020 **Date Tested:** 11/5/2020

**Tested By:** Matthew Watson

**Checked By:** Shalini Kanuganti

**Title:** Lab Manager

Location: CB-7 SS04

Sample Number: 3520-659

Depth: 6'-8'

Date Sampled: 10/26/2020



Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

Project No: 20-04-093

Figure 659A



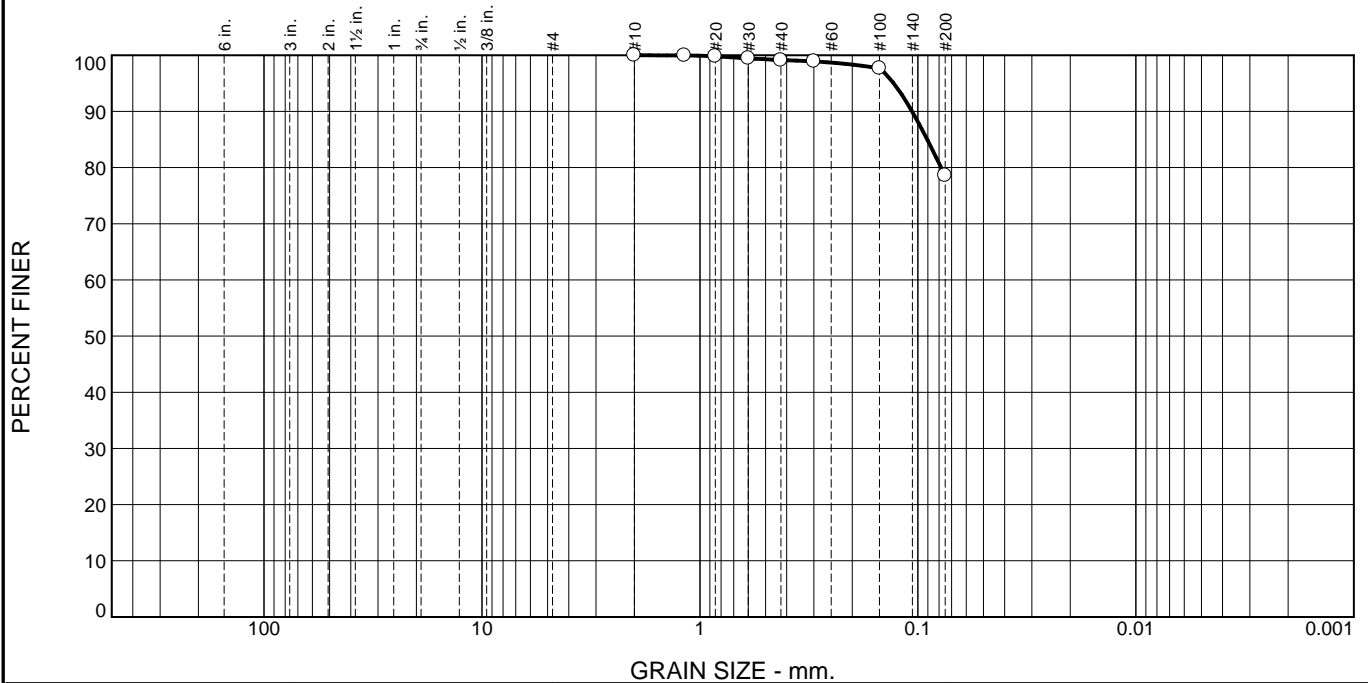
The graph illustrates the grain size distribution of a soil sample. The y-axis represents the percentage of soil finer than a given grain size, ranging from 0 to 100. The x-axis represents the grain size in millimeters on a logarithmic scale, ranging from 100 mm to 0.001 mm. The curve shows that approximately 100% of the soil is finer than 0.425 mm, and about 18% is finer than 0.075 mm. The soil is classified as a fine-grained soil based on these percentages.

Grain Size (mm)	Percent Finer (%)
100	100
60	100
40	100
30	100
20	100
15	100
10	100
7.5	100
6	100
4.75	100
3.75	100
3.0	100
2.5	100
2.0	100
1.5	100
1.18	100
0.85	100
0.75	100
0.6	100
0.425	100
0.3	98
0.25	95
0.2	90
0.15	80
0.106	20
0.075	18
0.06	5
0.05	5

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8	100.0		
#4	99.8		
#8	99.5		
#10	99.3		
#16	98.1		
#20	96.6		
#30	94.3		
#40	89.8		
#50	78.7		
#100	17.5		
#200	5.7		

**Figure 660A**

# Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.9	20.5	78.6	

Test Results (ASTM D422 & ASTM D1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	100.0		
#20	99.8		
#30	99.5		
#40	99.1		
#50	98.9		
#100	97.7		
#200	78.6		

\* (no specification provided)

**Material Description**  
Light brown silt with sand

**Atterberg Limits (ASTM D 4318)**  
PL= - LL= - PI= -

**Classification**  
USCS (D 2487)= ML AASHTO (M 145)= -

**Coefficients**  
D<sub>90</sub>= 0.1063 D<sub>85</sub>= 0.0906 D<sub>60</sub>=  
D<sub>50</sub>= D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

**Remarks**  
Moisture content =22.6%

**Date Received:** 10/26/2020 **Date Tested:** 11/4/2020  
**Tested By:** Matthew Watson  
**Checked By:** Shalini Kanuganti  
**Title:** Lab Manager

Location: CB-8 SS05

Sample Number: 3520-661

Depth: 8'-10'

Date Sampled: 10/26/2020



Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport - NH

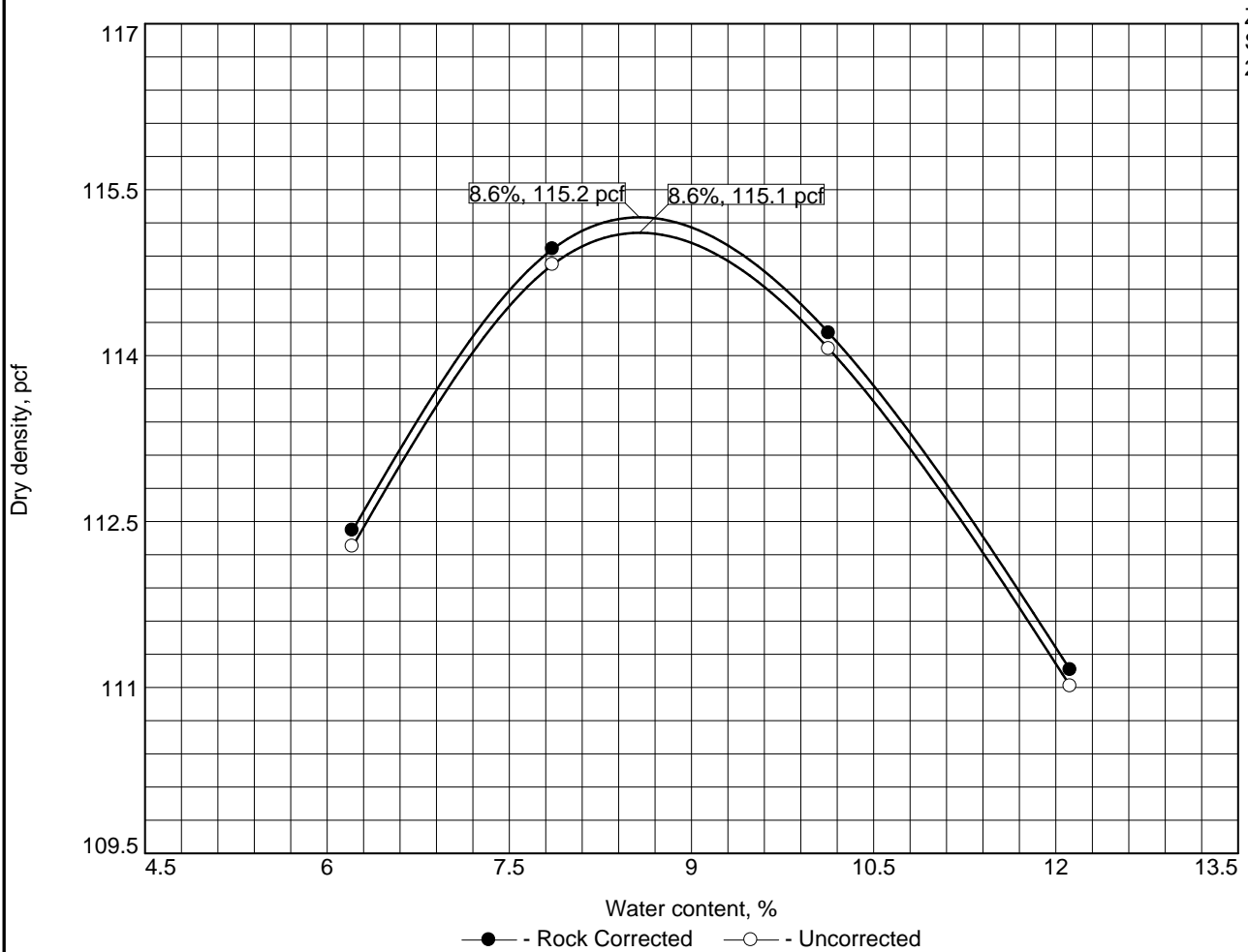
Project No: 20-04-093

Figure 661A

## **APPENDIX E: LABORATORY CBR AND FIELD DCP TESTING RESULTS**

PAGE LEFT BLANK INTENTIONALLY

# COMPACTION TEST REPORT



ZAV for  
Sp.G. =  
2.65

Test specification: ASTM D 1557-12 Method A Modified  
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
6'	SP-SM	-	-	2.65			0.4	11.2


ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 115.2 pcf		115.1 pcf	Light brown sand with silt
Optimum moisture = 8.6 %		8.6 %	
<b>Project No.</b> 20-04-093 <b>Client:</b> McFarland-Johnson <b>Project:</b> Task Order No. 2 Runway Incursion Mitigation Project To Reconfigure Taxiway H-Manchester Airport - NH <b>Date:</b> 11/4/2020 <input type="radio"/> <b>Location:</b> CBR-1 <b>Sample Number:</b> 3520-662			<b>Remarks:</b>
<div> <b>JOHN TURNER</b> CONSULTING</div>			
			<b>Figure</b> 662A

Figure 662A

Tested By: Matthew Watson

Checked By: Shalini Kanuganti



## Report of California Bearing Ratio (ASTM D1883)

Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation  
Project  
To Reconfigure Taxiway H-Manchester Airport  
Bradley International Airport  
Manchester, NH

Date: November 12, 2020

Report #: 20-04-093-001

Sample Source: TP-1

Material ID#: 3520-662

Date Received: 10/26/2020

Method of Test: ASTM D1883

Soaked 96 Hours

Compacted 100%+ Modified Proctor

Moisture Content = 8.2%

Material Type: Light brown sand

Intended Use: Subgrade

Sampled by: Jonathan Benoit

Tested by: Shalini Kanuganti

Moisture After Soak: 8.3%

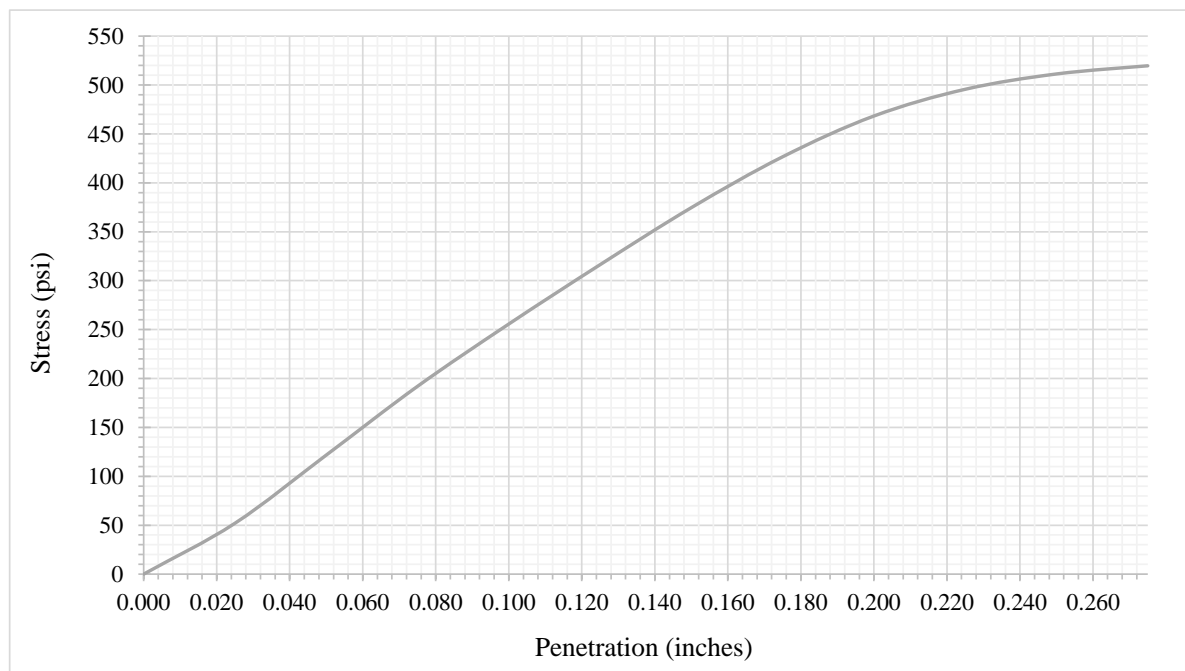
Swell: 0.0%

Uncorrected CBR @ 0.100": 26

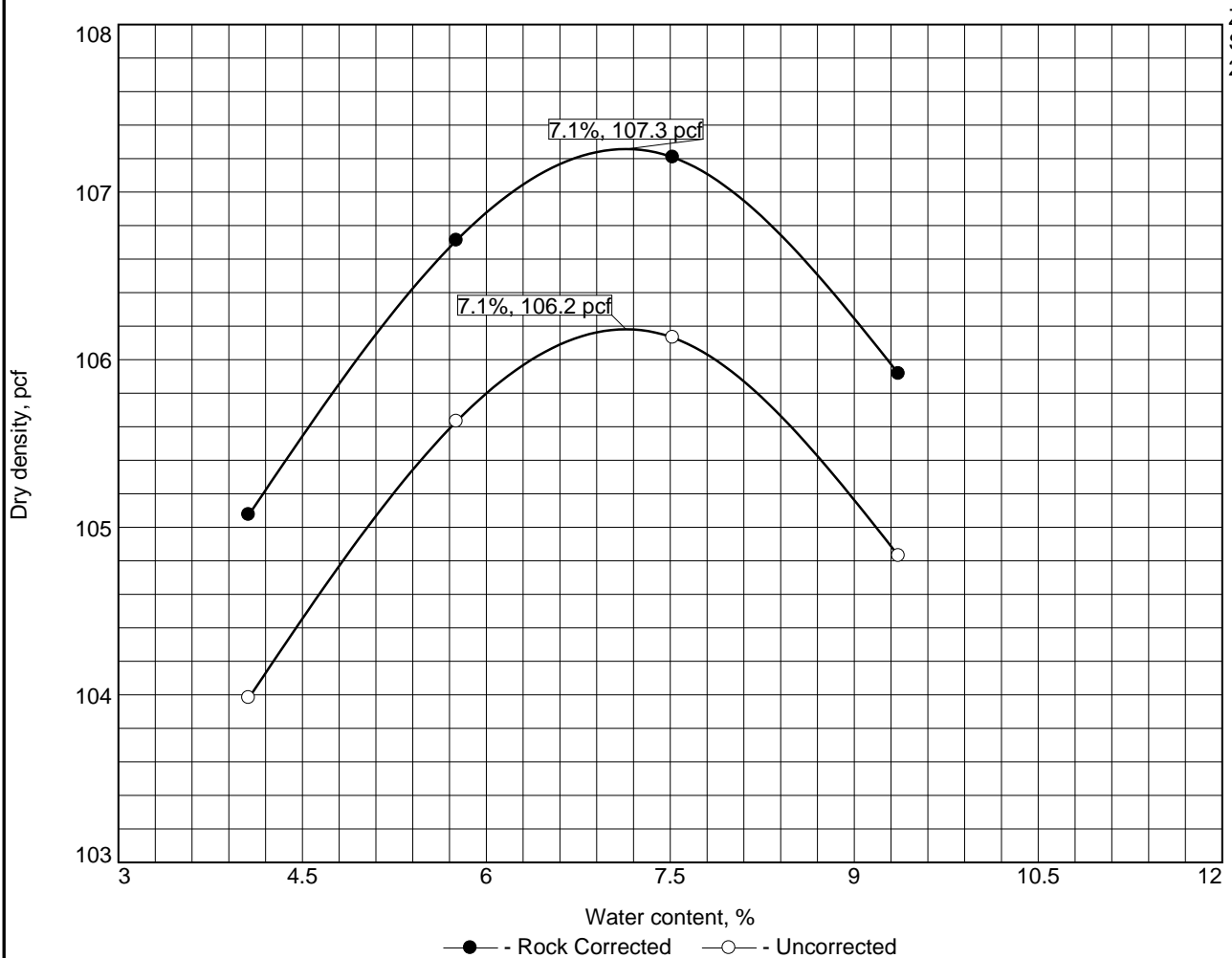
Uncorrected CBR @ 0.200": 31

Corrected CBR @ 0.100": 26

Corrected CBR @ 0.200": 31




# COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified  
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
6'	SM	-	-	2.65	-	-	2.8	28.8

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 107.3 pcf		106.2 pcf	Light brown silty sand
Optimum moisture = 7.1 %		7.1 %	
<b>Project No.</b> 20-04-093 <b>Client:</b> McFarland-Johnson <b>Project:</b> Task Order No. 2 Runway Incursion Mitigation Project To Reconfigure Taxiway H-Manchester Airport - NH <b>Date:</b> 11/4/2020 ○ <b>Location:</b> CBR-2 <b>Sample Number:</b> 3520-663			<b>Remarks:</b>
			

**Figure** 663A

**Tested By:** Matthew Watson

**Checked By:** Shalini Kanuganti



## Report of California Bearing Ratio (ASTM D1883)

Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation  
Project  
To Reconfigure Taxiway H-Manchester Airport  
Bradley International Airport  
Manchester, NH

Date: November 12, 2020

Report #: 20-04-093-002

Sample Source: TP-2

Material ID#: 3520-663

Date Received: 10/26/2020

Method of Test: ASTM D1883

Soaked 96 Hours

Compacted 100%+ Modified Proctor

Moisture Content 7.1%

Material Type: Light brown sand

Intended Use: Subgrade

Sampled by: Jonathan Benoit

Tested by: Shalini Kanuganti

Moisture After Soak: 7.2%

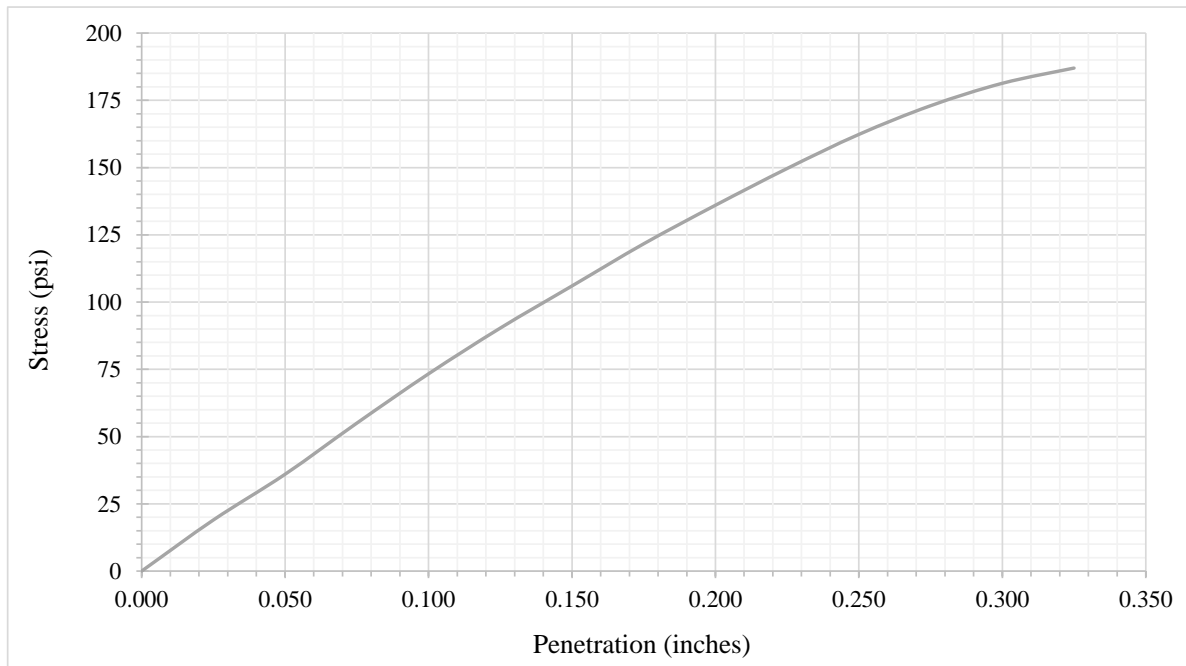
Swell: 0.0%

Uncorrected CBR @ 0.100": 7

Uncorrected CBR @ 0.200": 9

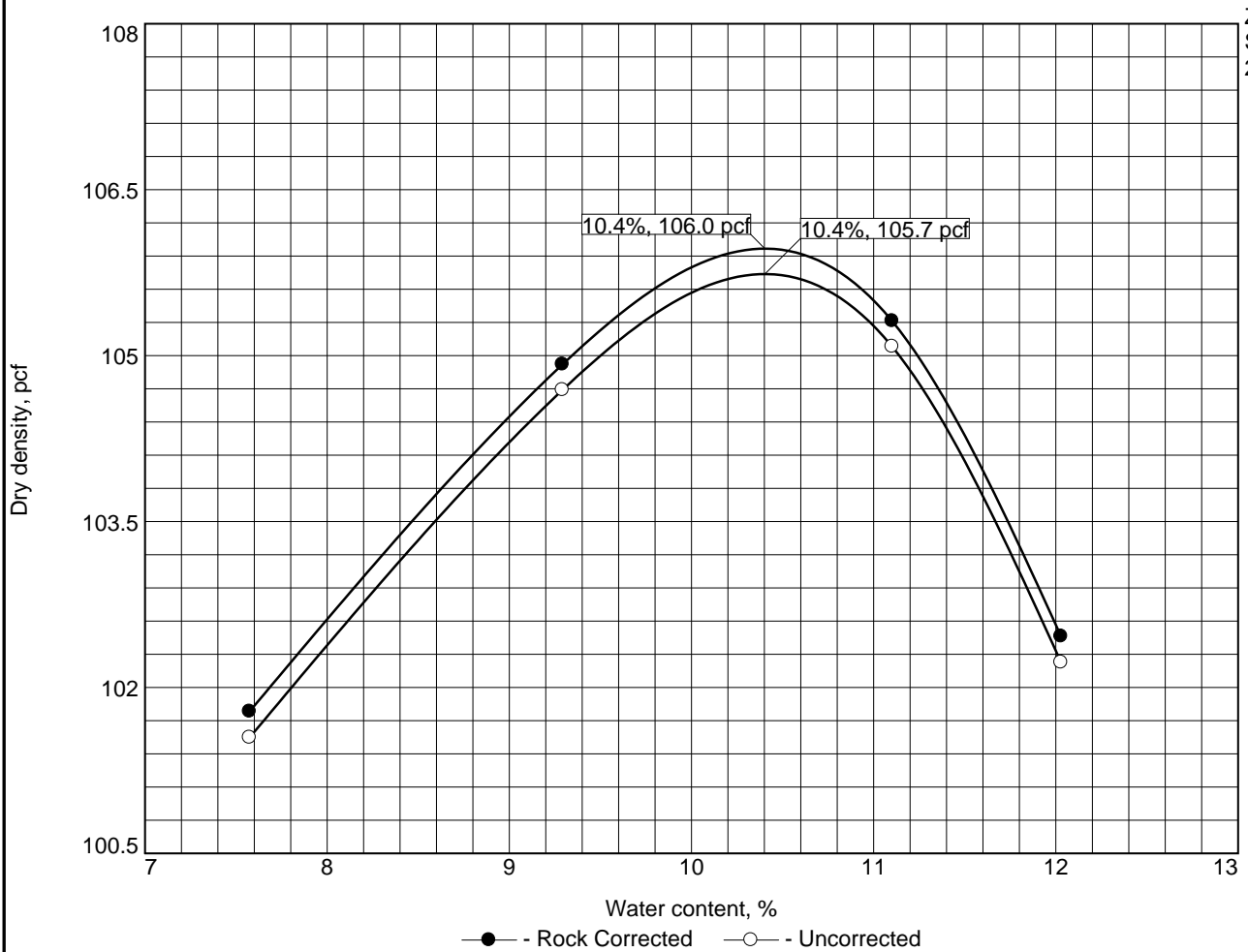
Corrected CBR @ 0.100": 7

Corrected CBR @ 0.200": 9





# COMPACTION TEST REPORT



ZAV for  
Sp.G. =  
2.65

Test specification: ASTM D 1557-12 Method A Modified  
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
6'	SP	-	-	2.65	-	-	0.6	2.0

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 106.0 pcf		105.7 pcf	Light brown Sand
Optimum moisture = 10.4 %		10.4 %	
<div><div><div><div><div>Project No.</div><div>20-04-093</div></div><div><div>Client:</div><div>McFarland-Johnson</div></div></div><div><div>Project:</div><div>Task Order No. 2 Runway Incursion Mitigation Project</div></div><div><div>To Reconfigure Taxiway H-Manchester Airport - NH</div><div>Date: 11/4/2020</div></div><div><div>Location: CBR-3</div><div>Sample Number: 3520-664</div></div></div></div>			Remarks:
<div><div><div><div><div></div><div></div></div><div><div>JOHN TURNER</div><div>CONSULTING</div></div></div></div></div>			

Figure 664A

Tested By: Matthew Watson

Checked By: Shalini Kanuganti



## Report of California Bearing Ratio (ASTM D1883)

Client: McFarland-Johnson

Project: Task Order No. 2 Runway Incursion Mitigation Project  
To Reconfigure Taxiway H-Manchester Airport  
Bradley International Airport  
Manchester, NH

Date: November 12, 2020

Report #: 20-04-093-003

Sample Source: TP-3

Material ID#: 3520-664

Date Received: 10/26/2020

Method of Test: ASTM D1883

Soaked 96 Hours

Compacted 100%+ Modified Proctor

Moisture Content 10.5%

Material Type: Light brown sand

Intended Use: Subgrade

Sampled by: Jonathan Benoit

Tested by: Shalini Kanuganti

Moisture After Soak: 10.6%

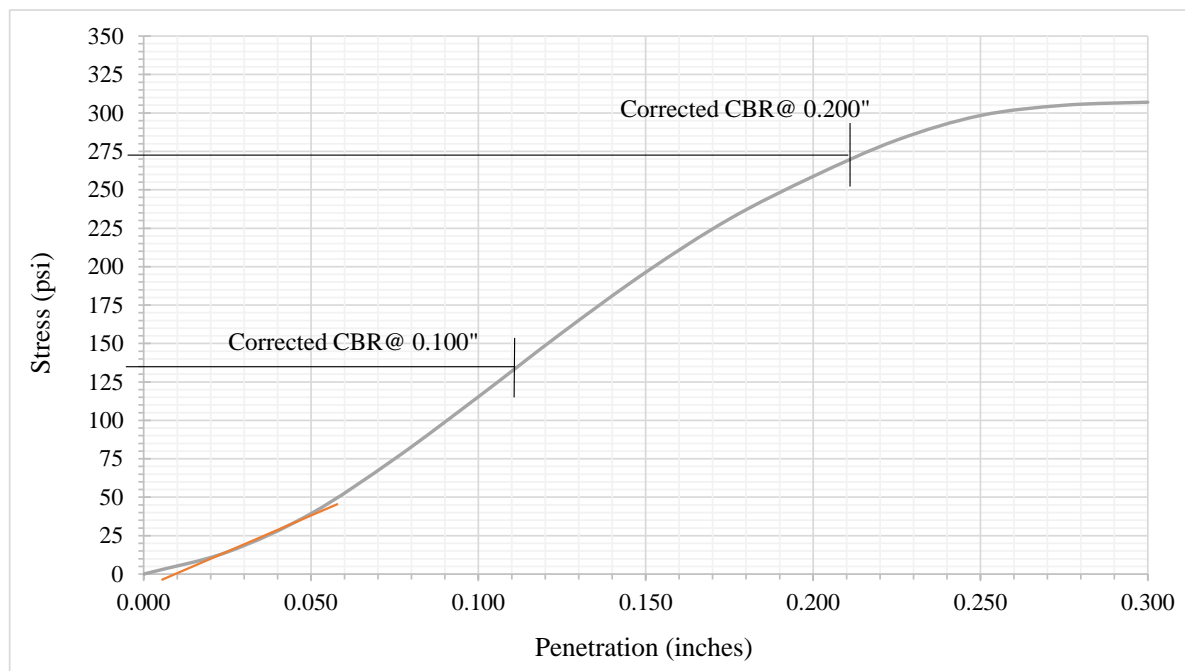
Swell: 0.0%

Uncorrected CBR @ 0.100": 12

Uncorrected CBR @ 0.200": 17

Corrected CBR @ 0.100": 13

Corrected CBR @ 0.200": 18



### Dynamic Cone Penetrometer (DCP) Field Data and CBR Calculation

DCP-1 at TP-1		
Depth BGS (ft)	Depth Increment (in)	Blows
3.08	***	***
3.23	1.75	14
3.37	1.75	18
3.52	1.75	22

Average Blows/1.75 in,: 18.0  
Correlated SPT (blows/ft): 11.0  
Correlated SPT (mm/blow): 27.71  
**Correlated CBR: 7** (Lab CBR: 26)

DCP-2 at TP-2		
Depth BGS (ft)	Depth Increment (in)	Blows
3.17	***	***
3.32	1.75	32
3.46	1.75	29
3.61	1.75	27

Average Blows/1.75 in,: 29.3  
Correlated SPT (blows/ft): 14.5  
Correlated SPT (mm/blow): 21.02  
**Correlated CBR: 8.5** (Lab CBR: 7)

DCP-3 at TP-3		
Depth BGS (ft)	Depth Increment (in)	Blows
3	***	***
3.15	1.75	9
3.29	1.75	10
3.44	1.75	14

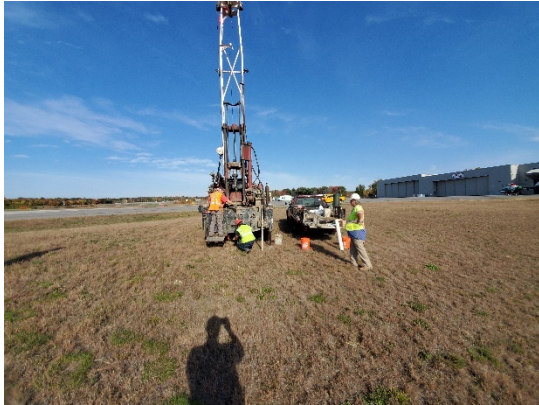
Average Blows/1.75 in,: 11.0  
Correlated SPT (blows/ft): 8.0  
Correlated SPT (mm/blow): 38.10  
**Correlated CBR: 5** (Lab CBR: 13)

PAGE LEFT BLANK INTENTIONALLY

## **APPENDIX F: SITE PHOTOGRAPHS**

**Reconfigure Taxiway H Project  
Manchester-Boston Regional Airport  
Manchester, New Hampshire**

**SITE PHOTOGRAPHS**



**Acker Drill Rig Onsite, Facing North**



**Split Spoon Sample from B-3 Showing Outwash**

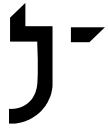


**Split Spoon Sample from C/B-5 Showing Silty Sand**



**Split Spoon Sample from B-3 Showing Lake Bottom  
Deposits**





**Asphalt Core CB-1**



**Asphalt Core CB-2**



**Asphalt Core CB-3**



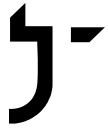
**Asphalt Core CB-4**



**Asphalt Core CB-5**



**Asphalt Core CB-6**



**Asphalt Core CB-7**



**Asphalt Core CB-8**



**Asphalt Core C-100**



**TECHNICAL SPECIFICATIONS**  
**SCHEDULE A – TAXIWAYS ‘A1’ & ‘A2’ HOLD LINE RECONFIGURATION**

THIS PAGE INTENTIONALLY LEFT BLANK

TECHNICAL SPECIFICATIONS  
SCHEDULE A - TAXIWAYS 'A1' & 'A2' HOLD LINE RECONFIGURATION

TABLE OF CONTENTS

G-001	Special Work Requirements .....
C-105	Mobilization.....
M-100	Gate Guard Allowance.....
M-200	Maintenance and Protection of Traffic .....
M-300	Modifications to ALCMS Equipment.....
P-101	Pavement Preparation .....
P-152	Excavation, Subgrade and Embankment .....
P-209	Crushed Aggregate Base Course .....
P-403	Asphalt Mix Pavement– Surface Course .....
P-603	Emulsified Asphalt Tack Coat .....
P-605	Joint Sealants for Pavement.....
P-606	Adhesive Components, Two-Component for Sealing Wire and Lights in Pavement.....
P-608	Emulsified Asphalt Seal Coat .....
P-610	Concrete for Miscellaneous Structures .....
P-620	Runway and Taxiway Marking.....
T-901	Seeding.....
T-905	Topsoil .....
T-908	Mulching.....
L-108	Underground Power Cable for Airports.....
L-110	Airport Underground Electrical Duct Banks and Conduits .....
L-125	Installation of Airport Lighting Systems .....

*Latest Revision: FAA Standard Specifications taken from AC 150/5370-10H dated 12/21/2018*

THIS PAGE INTENTIONALLY LEFT BLANK

## ITEM G-001 SPECIAL WORK REQUIREMENTS

### GENERAL

**001-1.1 General.** The purpose of these requirements is to ensure that the contract work does not damage private property or create any hazard to aircraft operations, and to bring to the Contractor's attention special coordination that the Contractor should be aware of that may be unique to airfield construction or unique to the Owner's Facility. It is Contractor's responsibility to conduct all work in strict accordance with the requirements set forth herein and to fully cooperate with the Resident Project Representative (RPR) in every way necessary to fulfill the purposes of these requirements as set forth above.

**001-1.2 Work Limitations.** All work shall be performed during the [hours of 6AM to 6PM Monday through Friday. Work on weekends is permitted and shall be requested to the RPR/Owner 72 hours in advance.](#) Work may not be allowed on specific days as determined by the RPR and/or the Owner. Such days will not count towards exhausted contract time.

The following specification sections and regulations further define how work must be executed.

- General Provisions Section 80-04 Limitation of Operations
- General Provisions Section 80-04.1 Operational Safety on Airport During Construction
- FAA Advisory Circular 150/5370-2 (latest revision) "Operational Safety on Airports during Construction"
- The Construction Safety and Phasing Plans
- Airport Security and Compliance Requirements

**001-1.3 Prior Notification.** In accordance with Section 100-04 *Project Progress Schedule* of the General Provisions, the Contractor shall provide an overall project schedule prior to the pre-construction meeting. This schedule shall be updated during the project as specified.

In addition, the Contractor shall coordinate with the RPR and Owner and submit a detailed written weekly schedule of work that provides the work task by specification number for each day of the following week. The weekly schedule shall be submitted each week for the duration of the project, a minimum of 3-days prior to the week covered by the schedule.

In accordance with Section 80-04 of the General Provisions, the Contractor shall notify the RPR at least 48 hours in advance of the time he intends to start work or begin work in a new work area. It should be noted by the Contractor that 48 hours is the minimum time required by the Owner to issue a proper Notice to Airmen (NOTAM) of the pending construction activities. The Contractor's weekly construction schedules will also provide advance notice. The RPR and/or Owner may disallow work in areas not included in the weekly schedule and for which the required 48-hours advance notice is not provided. Such instance shall not be a valid claim for delays. Prior to the beginning of work each day, the Contractor's Site Superintendent shall meet with the RPR to discuss the day's work schedule. The Contractor must notify the RPR at least 24-hours in advance of any items that will require acceptance testing. 72-hours' notice must be provided for testing on Mondays or testing the day immediately following a Holiday.

**001-1.4 Operational Safety.** Work performed under this contract will require safety and phasing in accordance with FAA regulations defined in Section 80-04.1 *Operational Safety on Airports During Construction* of the General Provisions. The Contractor shall take all precautions necessary to ensure the safety of operating aircraft, as well as his/her own equipment and personnel.

**001-1.5 Coordination.** The Contractor must coordinate all operations with the RPR and/or Owner. The

RPR or Owner will handle coordination with the Federal Aviation Administration, Air Traffic Control Tower, and Tenants.

**001-1.6 Regulations.** All work shall be performed in accordance with FAA Advisory Circular 150/5370-2 (latest revision), “*Operational Safety on Airports during Construction*”.

**001-1.7 Construction Safety and Phasing Plans (CSPP).** In addition, all work shall be performed in accordance with the approved Construction Safety and Phasing Plans. The plans have been prepared by the Owner and Engineer of Record and approved by the FAA. It outlines the site-specific requirements for safely performing the work in accordance with AC 150/5370-2 (latest revision). The Contractor shall review, in detail, the Construction Safety and Phasing Plans.

**001-1.8 Contractor’s Safety Plan Compliance (SPCD).** Once the Contractor has read and fully understands the CSPP, they shall prepare and submit for approval a Safety Plan Compliance Document (SPCD) as required by FAA AC 150/5370-2 (latest revision).

Similar to a shop drawing the SPCD, including all requirements of this specification, shall be submitted to the Engineer of Record and RPR for review prior to the Pre-Construction Meeting. The SPCD must be reviewed and approved by the Owner prior to issuance of the notice-to-proceed.

The Contractor shall designate an individual as the Site Safety officer (SSO). The SSO may be the Contractor’s Site Superintendent who is responsible for day to day operations on the site. The SSO shall be on site daily and work on a daily basis to implement and enforce the CSPP and SPCD. The SSO shall conduct daily inspections. Among other items, the daily inspections shall include inspection of the barricades, lights, closure markers and protection of the taxiway/runway safety and object free areas.

When necessary, the SSO will work with the RPR and Owner on safety related items.

**001-1.9 Barricades.** The Contractor shall place and maintain construction barricades to clearly define and close work areas to aircraft operations. The barricades are shown in the [safety and phasing plans](#). Barricades shall be placed as shown or as directed by the RPR and/or Owner. Barricades shall meet the minimum requirement of FAA AC 150/5370-2 (latest revision). Refer to details in the contract documents. All temporary lights and barricades shall be weighted against jet blasts (100 mph). The barricades shall be supplied by the Contractor. The Contractor will maintain ownership of the barricades at the completion of the project. Reference Section 70-08 *Barricades, Warning Signs, and Hazard Markings* of the General Provisions for further requirements.

**001-1.10 Runway and Taxiway Closure Markers.** The Contractor shall transport, place, and maintain runway and taxiway closure markers to clearly define surfaces closed to aircraft operations. The Runway and Taxiway Closure Markers will be supplied by the Owner. The required markers are shown in the Contract Drawings. Markers shall be placed as shown or as directed by the RPR and/or Owner. Closure Markers shall meet the minimum requirement of FAA AC 150/5370-2 (latest revision). The method and procedure for securing the markers from dislodging must be approved by the Owner and RPR. Refer to marker details in the contract documents.

**001-1.11 Height Restrictions.** No equipment will be allowed to penetrate the Runway approach surfaces and transitions defined in 49 CFR Part 77 when the runway is active. Tall equipment, such as cranes or boom trucks, will be required to have a flag attached to the highest point. Additionally, during periods of darkness or reduced visibility a red light at the highest point shall also be required.

**001-1.12 Marking of Vehicles and Equipment.** Each motorized vehicle operating on the airport shall be equipped with an amber flashing light. All equipment must have a 3-foot square flag consisting of international orange and white squares not less than one foot square displayed in full view above the vehicle.

Equipment must also have an amber flashing light when operated during periods of limited visibility including darkness, fog, and rain. When not in use, all equipment shall be returned to the designated staging area and lowered to the maximum extent possible. All Contractor and subcontractor vehicles shall have the company identification plainly visible on both sides of the vehicle in order to identify the vehicle.

**001-1.13 Setback Requirements.** No construction operations shall be carried on within 129.5 feet from the centerline of any active taxiway or within 250 feet of the centerline of any active runway unless prior approval has been obtained and such actions are included in the phasing plans. The distances above represent the Taxiway Object Free Area and the Runway Object Free Area respectively.

**001-1.14 Protection of Restricted Areas.** The Contractor shall stake and permanently mark on the ground with a readily recognizable marking (football field marking, flagging, cones, or similar material) the restriction lines adjacent to the work area so that workmen can readily recognize the limitations. The restricted areas are defined in the phasing plans and contract drawings.

**001-1.15 Trenches and Excavations.** The Contractor will not be permitted to leave any trenches or other excavations open at night, on weekends or at other times when the Contractor is not on the site, except as approved by the RPR. Open trenches must be clearly defined, confined to the work area(s), and completely surrounded with construction barricades. In addition, no excavations exceeding three inches (3”) in depth shall be left open within the object free areas while the runway, taxiways, or aprons, are in use. All excavations in paved areas must be backfilled and the pavement repaired and properly cured prior to the area being opened to traffic.

**001-1.16 Grading of Temporary Conditions.** The following applies when runways or taxiways must be re-opened. The Contractor shall ensure that the work area within the safety areas of the runways, taxiways and aprons are graded away from the pavements at a maximum slope of 5% and shall be left in such condition that it will drain readily and effectively and will not pose a hazard to aircraft. No piles of soil shall be left unspread, no drops or projections in excess of three inches, no sharp changes in grade will be permitted, and the surface shall be thoroughly compacted.

**001-1.17 Radio Control and Communication.** At a minimum, the Contractor shall have two-way communications (radios or cell phones) between the superintendent, escorts, and gate guards to coordinate access to and from the work site. No FAA or airport frequency shall be used for this purpose.

When work areas are adjacent to, within, or require traversing active movement areas (such as taxiways and the runway) the Contractor shall have on site at all times at least two radios capable of monitoring the FAA airport ground frequency (121.9). The radio shall be capable of reliable two-way communications from any location on the airport. The Contractor shall, before the start of construction, test his/her radio(s) with the appropriate agencies to demonstrate the capabilities and to demonstrate the performance of the operator and the equipment. Only MHT Operations will communicate directly with the ATCT. The Contractor shall operate these radios, at his/her expense

**001-1.18 Flagpersons.** The Contractor shall provide flagpersons or uniformed officers at locations where the haul routes enter public streets or highways from airport property in accordance with the applicable local requirements. Additionally, the Contractor shall provide flag persons whenever the service road is restricted to one lane of traffic.

**001-1.19 Owner Provided Escorts.** The Owner will provide escorts throughout the duration of construction. Contractor to coordinate schedule of activities at least one week in advance so that the Owner can schedule escorts.

**001-1.20 Contractor Provided Escorts.** Not required.

**001-1.21 Haul Routes.** When public highways must be used for haul routes, it will become the Contractors responsibility to obtain the proper permits needed for this function and to obey all rules and regulations pertinent to the public highways.

Haul routes on the airport are shown on the contract drawings and the safety plans. The Contractors vehicles and equipment shall operate within the limits of the indicated haul route.

The Contractor's personnel and vehicles will not have access to the entire airport, but shall be limited to the designated work area(s), staging area(s), and haul route(s).

All paved haul roads or access roads shall be kept clean at all times to prevent the accumulation of dirt and mud and the generation of dust by sweeping, washing or other methods as directed by the Airport. Unpaved haul roads, if any, shall be maintained by blading and filling when directed by the Airport and dust shall be controlled at all times.

All paved haul roads disturbed shall be restored to their original condition or better before the contract will be considered complete. All restoration and dust control on haul roads shall be at the Contractors expense.

All non-paved areas on the airport which are disturbed by the Contractors operations shall be scarified or otherwise loosened to a depth not less than five inches (5"). Clods shall be broken and the top three inches (3") of soil shall be worked into a satisfactory seedbed by disking, or by use of cultipackers, rollers, drags, harrows, or other appropriate means. This area shall be seeded, fertilized and mulched.

**001-1.22 Security and Contractor Provided Gate Guards.** The Contractor shall comply with all airport security requirements as directed by the Owner. The Contractor's personnel, equipment, materials and deliveries shall be subject to security checks prior to or while on airport property. Any delays incurred due to security inspections shall not be a valid claim for delays.

The Contractor is responsible for maintaining controlled access to the airfield via any and all project access gates. The Contractor must provide an Owner approved gate guard during all work hours. Gate guards are required to have an Airport issued SIDA badge. The Contractor shall only allow access to personnel directly working on the project. Refer to Section M-100-1 – Allowance Items for measurement and payment for Gate Guards.

The access gate will be opened and closed by a MHT Airport Operations Specialist.

Personal Vehicles (POV) are not permitted on the Airfield. The Contractor shall provide safe and adequate transportation to and from the area where POV s are parked and the work area(s).

**001-1.23 Disposal of Surplus and Unsuitable Materials.** All surplus and unsuitable materials not identified to be retained by the Owner, whether suitable or unsuitable, shall be legally disposed of by the Contractor off airport property. No separate measurement or payment will be made for the handling, hauling or disposal, but rather shall be incidental to the item that generated that material.

**001-1.24 Storm Water Management.** The Contractor is responsible for managing all storm water for the duration of the project including all diversion and dewatering of the site. The Contractor is also responsible for repairing all damage caused by storm water. All costs associated with the storm water management shall be incidental to the overall project. The Contractor shall follow all environmental protection agency and department of environmental protection agency regulations.

**001-1.25 Storage of Materials and Equipment.** The area for storing materials and parking/servicing equipment is shown in the contract drawings. The Contractor will be required to return all equipment to the appropriate Contractor's staging area at the end of work, each day, unless otherwise approved.



Equipment shall be parked in the designated area when not in use.

The Contractor shall provide all necessary temporary fencing and gates to protect materials and equipment from pilferage. The Owner is not responsible for any vandalized equipment or materials stored on the property.

Any area occupied or utilized by the Contractor shall be maintained in a clean and orderly condition satisfactory to the Owner. At the completion of the project, all Contractors' facilities shall be removed promptly and in a workman like manner and the area left clean and free of all debris or surplus material. The Contractor is responsible for restoring to original condition any areas used for the Contractor's operation at no additional cost to the Owner.

**001-1.26 Maintenance of the Construction Site.** The Contractor shall keep the construction site free of paper, boxes, and other debris that could be blown onto the runways, taxiways, and/or aprons.

All airport pavements shall be kept clear and clean at all times. All rocks, mud, and other debris carried on to the airport pavement by the Contractor's equipment must be report to the RPR or Airport Operations. Airport Operations will then close the affected area to air traffic and the Contractor will immediately sweep the area to the satisfaction of Airport Operations.

The Contractor shall have access to the equipment for the application of water to control dust within the construction site and on haul roads. The equipment shall be equipped with a shut-off control valve which can be operated from the cab by the operator. The Contractor shall apply water for dust control as necessary to prevent dust from the construction site and/or haul roads from being a hazard to aircraft and from being a nuisance to the public as direct by the RPR. All water shall be supplied by the Contractor.

The Contractor shall maintain at the job site at all times while the construction under this contract is in progress a self-propelled, self-contained vacuum sweeper with rotating brooms and with a 4-cubic yard capacity approved by the RPR. The sweeper shall operate as necessary to keep active aircraft pavements, access roads and the work areas clean. At the close of each day's work, all active aircraft pavements and airport paved roads used or dirtied by the Contractor shall again be swept.

The Contractor shall also be responsible for supplying any other equipment as may be necessary to clean all areas that are contaminated as a result of his/her operations to the complete satisfaction of the RPR and the Owner.

Trucks loaded in the construction area shall have loads trimmed as necessary to ensure that no particles, stones, or debris will fall off and that no legal load limits are exceeded.

The Contractor shall be particularly careful not to track foreign material onto pavements outside of the work area(s) (e.g., tack-coat, rocks, etc). The Contractor shall be responsible for removing foreign materials from vehicle tires prior to the vehicle leaving its work area.

**001-1.27 Maintenance of the Existing Airfield Lighting.** All existing airfield lighting systems required to safely operate aircraft shall be operational each night and during inclement weather throughout the construction period.

It shall be the responsibility of the Contractor to check the operation of the existing lights each day, to notify the RPR and the Owner of any problems and make any repairs necessary due to his/her operation.

The Contractor shall furnish and install all materials necessary to provide temporary lighting and make any temporary connections to keep the existing airfield lighting operational until the new lighting fixtures, cables, etc. can be installed.

**001-1.28 Smoking.** Absolutely no smoking will be permitted within the AOA. Any Contractor violating this rule shall be asked to leave the premises.

**001-1.29 Employee Identification Badges.** Full-time competent and responsible employees of the Contractor, such as superintendents and foremen, shall obtain an Airport SIDA badge. Additionally, employees who will be onsite for more than two continuous weeks shall obtain an Airport SIDA badge. The SIDA badge requires finger printing screening and a criminal history check. The badge application process may take up to fourteen (14) days, the Contractor shall plan accordingly.

The Contractor shall have a minimum of 1/2 (50%) of on-site workers, including sub-contractors, submit to the badging process, unless otherwise approved by MHT Operations Management. Badged individuals must display their Airport issued badges on their outermost garment at all times while on the airfield.

Refer to the Construction Safety and Phasing Plan (CSPP) and Supplemental Provision documents for more information and costs associated with obtaining badges and vehicle permit stickers. The costs associated with security access badges are the responsibility of the Contractor and shall not be paid for by the Owner.

At all times while on the airfield, non-badged workers must be:

1. Within 100 feet of a badged worker
2. Within visual contact of a badged worker
3. Able to respond to the requests of a badged worker
4. Able to command the attention of a badged worker.

Any non-badged workers will not be allowed on the airfield without valid picture identification acceptable to the TSA (current and valid driver's license, passport, etc.), and shall remain with a badged worker or Airport escort at all times.

The Contractor shall provide the Owner with a list of employees on the job site and their badge number. The list shall include subcontractors and employees. The list shall be updated and submitted weekly.

**Upon completion of the contract the Contractor shall turn all the badges in to the Owner for disposal.**

## **MATERIALS**

**001-2.1 Materials.** Prior to ordering, the Contractor shall submit shop drawings to the RPR for all materials to be used. The shop drawings shall include a manufacturer's certification that each product meets the specified standard(s), when applicable.

## **METHOD OF MEASUREMENT**

**001-3.1 Safety and Phasing.** No separate measurement for the Safety and Phasing of the Project under this item. Refer Section M-200 *Maintenance and Protection of Traffic* for the measurement for safety and phasing for the project.

**001-3.2 Contractor's Safety Plan Compliance Document (SPCD).** No separate measurement for the Contractor's SPCD under this item and shall be measured in accordance with Section M-200 *Maintenance and Protection of Traffic*.

**001-3.3 Gate Guard - Allowance.** Measurement for this allowance will be paid as outlined in Item M-100 *Gate Guard Allowance Item*.

**001-3.4 Safety Barricades.** Safety barricades will not be separately measured and will be incidental to the lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*.

**001-3.5 Mobilization.** Mobilization shall be measured in accordance with Item C-105 *Mobilization* lump sum item.

## **BASIS OF PAYMENT**

**001-4.1 Safety and Phasing.** Payment for the Safety and Phasing of the project will not be paid for separately and will be incidental to the Maintenance and Protection of Traffic lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*. Payment thereof shall constitute full compensation for all labor, preparation, materials, equipment, expenses and incidentals. Payment shall be made after review and upon acceptance of the document by the Owner and in accordance with the requirements in Item M-200 Basis of Payment.

**001-4.2 Safety Plan Compliance Document (SPCD).** Payment for the furnishing and implementing the SPCD, will not be paid for separately and will be incidental to the Maintenance and Protection of Traffic lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*. Payment thereof shall constitute full compensation for all labor, preparation, materials, equipment, expenses and incidentals. Payment shall be made after review and upon acceptance of the document by the Owner and in accordance with the requirements in Item M-200 Basis of Payment.

**001-4.3 Gate Guard - Allowance.** Payment for this allowance will be paid as outlined in Item M-100 *Gate Guard Allowance Item*.

**001-4.4 Safety Barricades.** Safety barricades will not be paid for separately and will be incidental to the Maintenance and Protection of Traffic lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*. Payment thereof shall constitute full compensation for all labor, preparation, materials, equipment, expenses and incidentals. Payment shall be made after review and upon acceptance of the materials by the Owner and in accordance with the requirements in Item M-200 Basis of Payment.

**001-4.5 Mobilization.** Mobilization will be paid for in accordance with the Item C-105 Mobilization lump sum item.

### **Payment shall be made under:**

Refer to the individual item descriptions for measurement and payment as referenced above. Any item from this section which are not specifically identified to be measured and paid under other referenced item sections shall be considered incidental to the overall project and will not be measured or paid for separately.

## **END OF ITEM G-001**

THIS PAGE INTENTIONALLY LEFT BLANK

## **ITEM C-105 MOBILIZATION**

**105-1 Description.** This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

**105-2 Mobilization limit.** Mobilization shall be limited to **ten (10)** percent of the total project cost for Schedule A items only.

**105-3 Posted notices.** Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster “Equal Employment Opportunity is the Law” in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL “Notice to All Employees” Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

**105-4 Engineer/RPR field office.** An Engineer/RPR field office is not required.

### **METHOD OF MEASUREMENT**

**105-5 Basis of measurement and payment.** Based upon the contract lump sum price for “Mobilization” partial payments will be allowed as follows:

- a. With first pay request, 25%.
- b. When 25% or more of the original contract is earned, an additional 25%.
- c. When 50% or more of the original contract is earned, an additional 40%.
- d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation*, the final 10%.

### **BASIS OF PAYMENT**

**105-6 Payment will be made under:**

Item C-105-1	Mobilization (Limit 10%) per Lump Sum
--------------	---------------------------------------

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD)

WH 1321 – Employee Rights under the Davis-Bacon Act Poster

**END OF SECTION C-105**

**ITEM M-100**  
**GATE GUARD ALLOWANCE ITEM**

**CONTRACT DOCUMENTS**

**100-0.1** This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

**a.** All Allowances, if noted on the Bid Form, shall be included in the Base Bid and shall be carried by the Contractor, unless specifically noted to be carried by a subcontractor.

**b.** The Contractor shall cause the work covered by these Allowances to be performed for such amounts and by such persons as the Owner may direct but he will not be required to employ persons against whom he makes a reasonable objection.

**c.** If the cost, when determined, is more than or less than the Allowance, the Contract Sum shall be adjusted accordingly by Change Order, and if allowable herein, will include additional or reduced handling costs on the site, labor, installation costs, overhead, profit and other expenses resulting to the Contractor from any increase over or decrease from the original Allowance.

**d.** Refer to related Drawings and Specifications for additional information regarding Work to be included as part of Allowances.

**DESCRIPTION**

**100-1.1** Under this item, the Contractor shall coordinate with Manchester-Boston Regional Airport and their gate guard security company to provide gate guards for the project under the allowance provided by this specification. The Contractor shall coordinate with the gate guard security company with regard to scheduling the gate guards and when the gate guards will be required to be performing their duties.

**MATERIALS**

**100-2.1** Not Used.

**CONSTRUCTION DETAILS**

**100-3.1** Not Used.

**METHOD OF MEASUREMENT**

**100-4.1** Measurement for the allowance for gate guards will be based on the actual time worked by the gate guard and any allowable associated costs. The exact amount of reimbursement to the gate guard security company will be indicated on the Gate Guard Security Company's invoice and will be the basis of measurement for the allowance without any additional mark-up by the Contractor. There shall be no separate measurement for the Contractor's cost to coordinate and administer the scheduling of the gate guards and it shall be considered incidental to the overall project.

**BASIS OF PAYMENT**

**100-5.1** The amount paid to the Contractor shall be the exact amount indicated on the Contractor's invoice from the gate guard security company without mark-up. There shall be no separate payment to

the Contractor to coordinate and administer the scheduling of the gate guards and these costs are considered incidental to the overall project.

Payment will be made under:

Project Item M-100-1	Allowance – Gate Guards	\$10,000 – Allowance
----------------------	-------------------------	----------------------

**END OF ITEM M-100**



**ITEM M-200**  
**MAINTENANCE AND PROTECTION OF TRAFFIC**

**CONTRACT DOCUMENTS**

I

**200-0.1** This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

**DESCRIPTION**

**200-1.1 GENERAL.** This work shall consist of maintaining aircraft and vehicular traffic and protecting the public from damage to person and property within the limits of and for the duration of the Contract.

The Contractor shall comply with all guidelines regarding construction safety set forth in FAA Advisory Circular 150/5370-2 (latest revision), *Operational Safety on Airports During Construction* and Special Provisions.

The following items are specifically included without limiting the generality implied by these Specifications and the Contract Drawings.

- Preparation of the Safety Plan Compliance Document with submission to the Engineer and Airport for review and implementation.
- Providing qualified flag persons, as required, at the locations shown on the plans or as directed by the Owner's representative.
- Providing qualified escorts for short duration subcontractors, as required, as described in the plans, specifications, or as directed by the Owner's representative.
- Provide Contractor Support services as described in Section M-300 ALCMS Modifications.
- Staged or phased construction.
- Off-peak construction periods, including both day and night shift work.
- Temporary construction lighting for night shift construction periods, if applicable.
- Locating and marking of existing underground lighting or other airfield circuits within the project work areas.
- Installation, maintenance and removal of temporary work zone (RSA) delineation markers, including the procurement and furnishing of stakes and cones.
- Installation, maintenance and removal of temporary or permanent barricades, warning signs, hazard markings and runway closure markings, including lighted runway closure markings. All barricades and signage shall be procured and furnished by the Contractor. The Contractor will maintain ownership of the barricades at the completion of the project. The Owner will supply the runway and taxiway closure markers for use, as applicable.
- Temporary alteration or decommissioning of any existing Runway or Taxiway lighting and signage and coordination with MHT Ops/FAA Tech Ops for NAVAIDs shutdowns, if required.
- Installation, maintenance, and removal of temporary lights and lighting circuits, including "jumpers" of circuits as required.

- Installation, maintenance, and removal of temporary guidance sign coverings.
- Installation, maintenance, and removal of temporary light coverings.
- Installation, maintenance, and removal of temporary lights and lighting.
- Testing and maintenance of existing, temporary, and new lighting circuitry.
- Installation, maintenance, and removal of any temporary pavement tapers, transitions or temporary accesses to any airport facilities, if applicable.
- Installation, maintenance, and removal of any temporary asphalt pavement tapers and/or transitions in accordance with FAA Advisory Circular 150/5370-13 - *Off-Peak Construction using Hot Mix Asphalt* (latest revision).
- Installation, maintenance, and removal of any temporary drainage, including, ditches, swales, piping and de-watering of work areas.
- Alteration, adjustment, maintenance of any drainage inlets, structures or systems necessary to maintain runway drainage during construction.
- Cleaning and maintenance of all areas within construction limits and haul routes or areas disturbed by the Contractor's operation via vacuum sweeper trucks.
- Restoration of all surfaces disturbed because of the Contractor's Operations, which are not otherwise paid for under a specific item.
- Provide temporary stake-mounted threshold lights and other edge lighting revisions, if required.
- Placement of temporary markings, including a black primer coat, prior to placing the temporary marking as shown on the plans, in accordance with FAA AC 150/5340-1 *Standards for Airport Markings* (latest revision), and meeting the requirements of Specification Section P-620, if required.
- Removal of temporary markings by approved techniques, as shown on the Plans, in accordance with FAA Advisory Circular 150/5340-1 *Standards for Airport Markings* (latest revision), and meeting the requirements of Specification Section P-620, if required.

## **METHOD OF MEASUREMENT**

**200-2.1** Payment for maintenance and protection of traffic will be made on a lump sum basis. The lump sum shall include all items required to satisfy this Specification.

## **BASIS OF PAYMENT**

**200-3.1** The lump sum price bid for maintenance and protection of traffic shall include all equipment, materials, and labor necessary to adequately and safely maintain and protect traffic. Progress payments will be made for this item in proportion to the total amount of contract work completed, less any deductions for unsatisfactory maintenance and protection of traffic.

In the event the contract completion date is extended, no additional payment will be made for maintenance and protection of traffic.

No payment will be made under maintenance and protection of traffic for each calendar day during which there are substantial deficiencies in compliance with the Specification requirements of any subsection of this Section as determined by the Resident Project Representative. The amount of such calendar day non-payment will be determined by dividing the lump sum amount bid for maintenance and protection of traffic

by the number of calendar days between the date the Contractor commences work and the date of completion as designated in this proposal, without regard to any extension of time.

If the Contractor fails to maintain and protect traffic adequately and safely for a period of four (4) hours, the Owner shall correct the adverse conditions by any means it deems appropriate and shall deduct the cost of the corrective work from any monies due the Contractor. The cost of this work shall be in addition to the liquidated damages and non-payment for maintenance and protection of traffic listed above.

However, where major non-conformance with the requirement of this Specification is noted by the Resident Project Representative (RPR) and prompt Contractor compliance is deemed not to be obtainable, all contract work may be stopped by direct order of the RPR regardless of whether corrections are made by the Owner as stated in the paragraph above.

Payment will be made under:

Project Item M-200-1                      Maintenance and Protection of Traffic - per Lump Sum

**END OF SECTION M-200**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM M-300**  
**MODIFICATIONS TO ALCMS EQUIPMENT**

**DESCRIPTION**

**300-1.1 GENERAL** This work shall include the modifications to the existing Airport Lighting Control and Monitoring System (ALCMS) and Touchscreen Panels located in the Air Traffic Control Tower and Airfield Lighting Vault to incorporate the reconfigured taxiway graphics for Taxiways A1 and A2 Hold Line Reconfiguration, primarily for the relocation of the in-pavement RGL circuits. This includes modifications to these circuits, all labor, programming, modifications to graphic screens, and all other work required to fully upgrade the existing airfield lighting circuits in the ALCMS.

All work done by the Contractor to assist the vendor with completion of this item shall be included for payment in this item, unless stated elsewhere herein. Contractor shall assist in completing all work to provide modifications to the ALCMS system.

**300-1.2 SHOP DRAWINGS.**

Contractor shall submit shop drawings for approval by the Engineer, prior to implementing any software changes or installing any equipment, if required. Proposed software changes shall be submitted to Airport Operations and the ATCT supervisor for approval independent of the Engineer. Contractor shall put his shop drawing check stamp on all shop drawings submitted for approval.

**300-1.3 AS BUILT DRAWINGS.**

The Contractor shall, at all times, maintain a complete accurate and up to date set of as built drawings. These as built drawings shall be available to the Engineer at all times for his review. At the completion of the contract, the Contractor shall submit two (2) clean, legible and complete sets of as built drawings and O&M documentation to the Airport prior to the final request for payment.

**300-1.4 CODES, PERMITS, FEES.**

a. The Contractor is presumed to be knowledgeable of national and local code requirements. If the Contractor believes any requirement of the drawings or specifications is not in conformance with code or other applicable requirements, the Contractor shall so notify the Engineer before the work is installed. The decision of the Engineer in interpreting the drawings and specifications and code requirements relating thereto for a specific application under this contract shall be considered final.

b. The Contractor shall give all necessary notices, obtain all permits, and pay all inspection and other fees required by governmental authorities having jurisdiction over the work under this contract. Receipt of all required approvals, clearances, and certificates by the Owner shall be a prerequisite to acceptance and final payment for the work.

**300-1.5 MATERIALS AND WORKMANSHIP.**

Materials furnished shall be new, shall be undamaged when installed, and shall conform to all established and applicable standards and test requirements of Underwriters Laboratories (U.L.), National Electrical Manufacturers Association (NEMA), and American National Standards Institute (ANSI), and the Institute of Electrical and Electronics Engineers (IEEE).

**300-1.6 PROJECT COORDINATION**

The ALCMS Manufacturer shall provide an experienced and qualified Engineering, Sales and Service staff to support the Contractor and airport throughout the installation and life of the system.

The project shall follow this basic generic cycle of events, but due to the nature of this particular upgrade,

all milestones may not be applicable:

	<b>Milestone</b>	<b>Description</b>
1.	Submittal	The ALCMS Manufacturer shall submit ALCMS equipment specifications to the Contractor.
2.	Submittal Review and Approval	Submittal is reviewed by the Contractor, Airport, and Engineer(s).
3.	Production Release	The ALCMS Manufacturer shall release approved system to manufacturing.
4.	Demo CD 35% Software Completion	The ALCMS Manufacturer shall send to the Contractor, Airport, and Engineers a Demo CD of the planned layout of the touchscreen modifications that will be used for the control of the ALCMS system.
5.	Production	System modifications are manufactured or engineered.
6.	Production Testing	System is tested by the ALCMS Manufacturer.
7.	Factory Acceptance Testing	System is available for Factory Acceptance Testing (FAT) witnessed by Airport/Owner. - NOT APPLICABLE
8.	Shipment of system	Approved system is shipped to installation site, if applicable.
9.	Installation	Contractor installs equipment and completes external wiring, if applicable.
10.	Commissioning	The ALCMS Manufacturer shall arrive at installation site to complete commissioning of system and verify Contractor installation and wiring.
11.	System Readiness Check	The ALCMS Manufacturer shall perform a system readiness check to verify proper operation of all equipment prior to cut over.
12.	System Cut-over	The ALCMS Manufacturer and Contractor shall cut over the new system and bring it on-line and operational.
13.	System Acceptance Testing	System is available for System Acceptance Testing (SAT) which shall be witnessed the by Airport/Owner and/or Engineer.
14.	Manuals / As-Built drawings	The ALCMS Manufacturer shall issue operator manuals, maintenance manuals and ATC manuals and final as-built drawings.
15.	On-Site or Virtual Training	The ALCMS Manufacturer shall complete on-site or virtual training of Operations/Maintenance, and ATC personnel.
16.	Final Owner Acceptance	Upon completion of all contractual requirements, system is accepted in writing by the Airport/Owner.
17.	Warranty and Support	The ALCMS Manufacturer shall provide warranty and support per the contractual requirements.

### **300-1.07 CONTRACTOR INSTALLATION REQUIREMENTS**

a. The installing contractor shall be responsible for the physical installation of all associated ALCMS components. At a minimum, this includes the Constant Current Regulators (CCRs) and Distributed Control and Monitoring Equipment (DCME) as applicable.

(1) The Contractor shall furnish, install, relocate, connect and test all equipment, equipment accessories, conduit cables, wires, buses, grounds and support necessary to insure a complete and operable electrical distribution facility for the airport lighting system as specified in the submittal package.

(2) The equipment installation and mounting shall comply with the requirements of the National Electrical Code and local code agency having jurisdiction.

### **300-1.08 WIRE AND CONNECTIONS**

- a. The Contractor shall make all necessary electrical connections at each location in accordance with the ALCMS manufacturer's wiring diagrams, as applicable.
- b. All wires called out in the drawings associated with equipment that is to be controlled or monitored should be pulled, terminated and dressed at the appropriate terminal blocks and at the associated equipment.
- c. The Contractor shall leave sufficient extra wire length on each control/monitoring lead to make future changes in connections at the terminal block.

### **300-1.09 MARKING AND LABELING**

All equipment, control wires, terminal blocks, etc., shall be tagged, marked or labeled as specified below:

- a. Wire Identification: The Contractor shall furnish and install labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks.
- b. Wire labels, if used, shall be of the self-sticking, pre-printed type and of the manufacturer's recommended size for the wire involved. Identification markings designated in the plans shall be followed.
- c. Tags, if used, shall be nonferrous metal or plastic. Each tag shall be securely tied to the proper wire by a nonmetallic cord or plastic wire tie.

### **300-1.10 INSTALLATION OF DATA CABLES**

- a. The Contractor shall install, terminate and test all data cables required for the project as shown on the Contract Drawings. This includes all of the following components: Data cables, terminal cabinets and jumper cables.
- b. All associated data cables shall be tested upon completion of the cable installation and termination of connectors.
- c. Tests shall include verification of point-point continuity of each wire.
- d. All test data shall be recorded and included in a test report that shall be submitted to the Airport / Owner for approval.
- e. Commissioning of the system shall not begin until all test reports are submitted and approved and a copy provided to ALCMS Manufacturer.

### **300-1.11 CONTRACTOR POWER-UP AND INITIAL TESTING**

The Contractor shall perform the following power-up and commissioning tasks:

- a. Power up all assemblies.
- b. Verify communication is established between all assemblies.
- c. Initiate lighting commands from Tower Touchscreen and verify proper control operations are being executed at the Vault assembly.
- d. Test monitoring feedback to verify proper wiring and operation.
- e. Inform ALCMS manufacturer in writing all mentioned power up tests are complete.

### **300-1.12 ALCMS MANUFACTURER PLC COMMISSIONING**

The ALCMS Manufacturer shall perform the following installation and commissioning tasks:

- a. Verify Contractor connections including power, control and monitoring.

- b. Verify proper labeling of equipment.
- c. Verify communication connections.
- d. Perform system testing including control, monitoring and diagnostics.
- e. Training on ALCMS related equipment.
- f. Perform System Acceptance Testing (SAT).

#### **300-1.13 SYSTEM ACCEPTANCE TEST (SAT)**

Following the final installation and commissioning of the system, the ALCMS Manufacturer shall perform a demonstration of the system performance. This demonstration shall include the following:

- a. Lighting control functions
- b. Monitoring functions
- c. Alarm functions
- d. Print and Display functions

The ALCMS Manufacturer shall develop a SAT test plan in accordance with the specifications and issue this to the Contractor for approval from the Airport and Engineer.

The SAT shall be witnessed by owner representatives, the Contractor and the Engineer.

#### **300-1.14 AS-INSTALLED DRAWINGS**

a. The ALCMS Manufacturer shall provide six (6) hard copies of As-Installed drawings after system acceptance. The As-Installed drawings shall include the following information:

- (1) System Block Diagram (1-line drawings)
- (2) System External Wiring Diagrams
- (3) Assembly Drawings
- (4) Assembly Wiring Diagrams

b. The As-Installed drawings shall be 11" X 17" in size and shall be spiral bound or supplied in 3-ring binders. The cover of each binder shall be labeled with all project-related information.

#### **300-1.15 ON-SITE OR VIRTUAL TRAINING**

a. The ALCMS manufacturer shall provide, to the Contractor and Owner, a final training course syllabus and training schedule thirty (30) days before the on-site or virtual training.

b. Any audio/video recordings of training classes described herein are the sole responsibility of the Contractor for the Owner's future use. Coordination of the video recording must be organized by the Contractor and approved by the Owner and Engineer.

c. All training sessions shall be held in a facility provided by the Airport for training performed on-site or virtually. For on-site or virtual training performed, the on-site facility should have tables, chairs, projection screen and sufficient space to lay out manuals and drawings. If the training is performed virtual, the Owner shall provide adequate internet connections for the on-site computer systems/projection/for the ALCMS manufacturer and the Contractor to use for the training.

d. The ALCMS manufacturer shall provide all required visual aids and presentations to be used for the training.



### **300-1.16 AIR TRAFFIC CONTROLLER TRAINING**

- a. The ALCMS manufacturer shall provide two (2), 1-hour User Training Class for Air Traffic Control (ATC) personnel.
- b. ATC Training coordinator should be present for both classes and shall be the responsible for training remaining personnel not able to attend these classes.
- c. This training shall include discussion and review of the following:
  - (1) PLC General System Overview
  - (2) Touchscreen Operations
  - (3) Using the Control System (GUI)
  - (4) Command and Control Sequences
- d. Training classes for ATC personnel should be limited to a maximum of 4 - 6 people per class.
- e. Air Traffic Control should designate a Training Coordinator that shall be responsible for scheduling and organizing on-site or virtual training for their personnel. In addition, this Coordinator shall be responsible for training other personnel that were absent or unable to attend the training sessions.
- f. Any additional training beyond contract requirements shall be the responsibility of the ATC Training Coordinator to complete.

### **300-1.17 MAINTENANCE TRAINING**

- a. The ALCMS manufacturer shall provide two (2), 1-hour Training Class for maintenance personnel. This training shall include discussion and review of the following:
  - (1) System Block Diagram
  - (2) System Assemblies and Wiring Diagrams
  - (3) Touchscreen Operation
  - (4) Graphical User Interface (GUI) Screens
  - (5) Implementing Airfield Lighting Changes
- b. Training classes for maintenance personnel should be limited to a maximum of 4 - 6 people per class.
- c. Maintenance should designate a Training Coordinator that shall be responsible for scheduling and organizing on-site or virtual training for their personnel. In addition, this Coordinator shall be responsible for training other personnel that were absent or unable to attend the training sessions.
- d. Any additional training beyond contract requirements shall be the responsibility of the training coordinator to complete.

### **300-1.18 OWNER SYSTEM ACCEPTANCE AND WARRANTY START DATE**

Upon successful completion of the SAT and on-site training, the Owner shall issue the ALCMS manufacturer a written notice of system acceptance within five (5) working days.

The date the final acceptance letter is received or five (5) days following successful completion of the SAT (whichever occurs first) represents the start of the warranty period. Please refer to the Warranty section for more information regarding the ALCMS warranty guarantee.

### **300-1.19 SYSTEM WARRANTY**

All equipment shall be warranted against defects in workmanship, hardware and software for a period of one (1) year from initial operation of the system but not more than eighteen (18) months from the manufacturer's shipment of the system.

During this time period the ALCMS manufacturer shall provide all parts, labor and technical support with the following conditions:

- a. The manufacturer shall correct by repair or replacement, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, provided further that Buyer gives manufacturer written notice of such defects after delivery of the goods to Buyer.
- b. The manufacturer may examine any goods upon which a claim is made in the same condition as when defect therein is discovered, and may require the return of the goods to establish any claim.
- c. The manufacturer's liability under no circumstances shall exceed the contract price of goods claimed to be defective.
- d. Any returns under this guarantee are to be on a transportation charge prepaid basis. For products not manufactured by, but sold by the manufacturer, warranty is limited to that extended by the original manufacturer.

### **300-1.20 SYSTEM SERVICE AND SUPPORT**

- a. The ALCMS Manufacturer shall provide technical assistance and support during the warranty period.

## **EQUIPMENT AND MATERIALS**

**300-2.1 GENERAL.** Contractor shall submit shop drawings for approval by the Engineer, prior to implementing any software changes. Proposed software changes shall be submitted to Airport Operations and the ATCT supervisor for approval independent of the Engineer. Contractor shall put his shop drawing check stamp on all shop drawings submitted for approval.

**300-2.2 EXISTING AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM (ALCMS)**  
The existing ALCMS, as manufactured by Liberty Airport Systems (currently d/b/a ADB-SAFEGATE Contact person: Galen Dixon 614-323-6242), shall be updated by the manufacturer to accurately reflect the new reconfiguration of airport taxiways in-pavement Runway Guard Lights for the hold lines. Consideration shall be given to the control of the airfield lighting system during the transition and provisions shall be made to operate the system manually during this time, if necessary.

No new Constant Current Regulators are to be installed under this project. Existing CCR circuits which are to be modified include:

1. Runway 17-35 In-pavement Runway Guard Lights

**300-2.3 CONSTANT CURRENT REGULATORS.** Re-use of existing Constant Current Regulators.

## **CONSTRUCTION METHODS**

### **300-3.1 AIRFIELD LIGHTING TOUCHSCREEN MODIFICATIONS.**

The existing ALCMS system consists of a touchscreen in the Air Traffic Control Tower, Airfield Lighting Vault and Airfield Operations. The system is PLC based and software controlled. The system will be updated at all locations by the system manufacturer under this Contract.

All work required by the Contractor to obtain temporary work badges and escorting duties for Liberty Airport Systems (currently d/b/a ADB-SAFEGATE) technicians associated with this work item shall be considered as work necessary to complete the installation.

### **300-3.2 CONTRACTOR SUPPORT.**

The Contractor shall support the manufacturer with the system commissioning. Effort to include escorting, badging, fees and any incidental items required to complete the work shall be part of the Section M-200-1 Item for Maintenance and Protection of Traffic. Although not anticipated, any payment for installing equipment or terminations by the Contractor work shall be considered as part of this Specification.

### **METHOD OF MEASUREMENT**

**300-4.1** Airfield Lighting Control and Monitoring System (ALCMS) Modifications furnished and installed, as required by the drawings and these specifications, to modify the ALCMS system for the hold line reconfigurations shall be measured for payment as part of this specification. The ALCMS modifications shall as outlined herein shall be part of a Lump Sum price from the ALCMS vendor/manufacturer, Liberty Airport Systems (currently d/b/a ADB-SAFEGATE). The ALCMS vendor/manufacturer's invoice will be the basis of measurement for the allowance without any additional mark-up by the Contractor.

Measurement for Contractor performed pre-installation work for vendor installed equipment, including installation of equipment to be monitored by ALCMS equipment will be based on the actual time worked, associated materials, and any allowable associated costs (i.e. allowed extra work markups in accordance with the Supplemental Provisions and General Conditions). It is anticipated that this effort may not be required or will be minimal since the equipment to be monitored has already been installed.

No Measurement for other Contractor performed work, include escorting, badging, fees, terminations (if applicable), and any incidentals required to complete the work to assist vendor/manufacturer with the system commissioning effort will be measured under this Section. There shall be no separate measurement for the Contractor's cost to coordinate and administer the scheduling with the ALCMS vendor/manufacturer and it shall be considered incidental to the overall project.

**300-4.2** As noted above, measurement shall not include any work by the Contractor to assist vendor with the system commissioning with above noted effort under paragraph 300-4.1 which will be paid for under Specification Section Item M-200-1 *Maintenance and Protection of Traffic*.

**300-4.3** There will be no work to install and commission new constant current regulators included for measurement under this item since no new constant current regulators are to be installed for this project.

### **BASIS OF PAYMENT**

**300-5.1** Payment shall be made at the Lump Sum invoice price from the ALCMS vendor/manufacturer under the Allowance amount for the complete and accepted ALCMS Modifications. The Lump Sum price shall be full compensation for all services and items included as designated in this allowance item, including preparation, assembly, delivery, transportation, and installation of materials and equipment, labor, equipment, tools, and incidentals necessary to complete this item. The ALCMS vendor/manufacturer's invoice will be paid as part of the allowance amount without any additional mark-up by the Contractor.

**300-5.2** Payment for any work by the Contractor to assist vendor with the system commissioning with above noted effort, outlined above in paragraphs 300-4.1 and 300-4.2, will be paid for under Specification Section Item M-200-1 *Maintenance and Protection of Traffic*.

Payment shall be made under:

Project Item M-300-1 Allowance - Modifications to ALCMS Equipment	\$15,000 Per Allowance
---	------------------------

### **END OF ITEM M-300**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-101**  
**PREPARATION/REMOVAL OF EXISTING PAVEMENTS**

**DESCRIPTION**

**101-1** This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

**EQUIPMENT AND MATERIALS**

**101-2** All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

**CONSTRUCTION**

**101-3.1 Removal of existing pavement.**

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

**a. Concrete pavement removal.** Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size of **2" diameter**. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Spall and underbreak repair shall be in accordance with the plans. Any underlying material that is to remain in place, shall be recompact and/or replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at the Contractor's expense.

**b. Asphalt pavement removal.** Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. If the material is to be wasted on the airport site, it shall be broken to a maximum size of **2 inches (mm)**.

**c. Repair or removal of Base, Subbase, and/or Subgrade.** All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

**101-3.2 Preparation of joints and cracks prior to overlay/surface treatment.** Remove all vegetation and debris from cracks to a minimum depth of 1 inch (25 mm). If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than 1/4 inch (6 mm) wide) with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch (3 mm), not to

exceed ¼ inch (6 mm). Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide (38 mm)), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

**Gradation**

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	90-100
No. 16 (1.18 mm)	65-90
No. 30 (600 µm)	40-60
No. 50 (300 µm)	25-42
No. 100 (150 µm)	15-30
No. 200 (75 µm)	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the RPR.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled to within +0 to -1/8 inches (+0 to -3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

#### **101-3.3 Removal of Foreign Substances/contaminates prior to overlay, seal-coat, or remarking.**

Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

Chemicals, high-pressure water, cold milling, rotary grinding, or sandblasting may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch (3 mm) deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense. No material shall be deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

#### **101-3.4 Concrete spall or failed asphaltic concrete pavement repair.**

**a. Repair of concrete spalls in areas to be overlaid with asphalt.** The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The perimeter of the repair shall be saw

cut a minimum of 2 inches (50 mm) outside the affected area and 2 inches (50 mm) deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches (100 mm) in depth. This method of repair applies only to pavement to be overlaid.

**b. Asphalt pavement repair.** The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. Materials and methods of construction shall comply with the applicable sections of these specifications.

**101-3.5 Cold milling.** Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed off Airport property. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

**a. Patching.** The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The RPR shall layout the area to be milled with a straightedge in increments of 1-foot (30 cm) widths. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall be repaired by the Contractor at the Contractor's Expense.

**b. Profiling, grade correction, or surface correction.** The milling machine shall have a minimum width of 7 feet (2 m) and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and -1/4 inch (+0 mm and -6mm) of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to remove the millings or cuttings from the pavement and load them into a truck. All millings shall be removed and disposed of off the airport.

**c. Clean-up.** The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property.

**101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment.** Existing asphalt pavements to be treated with a surface treatment shall be prepared as follows:

**a.** Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.

**b.** Repair joints and cracks in accordance with paragraph 101-3.2.

**c.** Remove oil or grease that has not penetrated the asphalt pavement by scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

**d.** Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

**101-3.7 Maintenance.** The Contractor shall perform all maintenance work necessary to keep the pavement

in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

**101-3.8 Preparation of Joints in Rigid Pavement prior to resealing.** Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.

**101-3.8.1 Removal of Existing Joint Sealant.** All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch (2 mm) from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry.

**101-3.8.2 Cleaning prior to sealing.** Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.

**101-3.8.3 Joint sealant.** Joint material and installation will be in accordance with Item P-605.

**101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing.** Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the pavement.

**101-3.9.1 Preparation of Crack.** Widen crack with router or random crack saw by removing a minimum of 1/16 inch (2 mm) from each side of crack. Immediately before sealing, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

**101-3.9.2 Removal of Existing Crack Sealant.** Existing sealants will be removed by routing or random crack saw. Following routing or sawing, any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

**101-3.9.3 Crack Sealant.** Crack sealant material and installation will be in accordance with Item P-605.

**101-3.9.4 Removal of Pipe and other Buried Structures.**

- a. **Removal of Existing Pipe Material.** Not used.
- b. **Removal of Inlets/Manholes.** Not used.

## **METHOD OF MEASUREMENT**

**101-4.1 Pavement removal.** The unit of measurement for pavement removal shall be the number of square yards (square meters) removed by the Contractor. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation shall be incidental to pavement removal.



**101-4.2 Cold milling.** The unit of measure for cold milling shall be a minimum 2 and up to 4.5 inches of milling per square yard (square meter). The location and average depth of the cold milling shall be as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.

#### **BASIS OF PAYMENT**

**101-5.1 Payment.** Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P 101-5.1	Not Used.
Item P-101-5.2	Not Used.
Item P-101-5.3	Not Used.
Item P-101-5.4	Not Used.
Item P-101-5.5	Not Used.
Item P-101-5.6	Cold Milling (2 – 4.5”) – per square yard (square meter)

#### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)	
AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements.
ASTM International (ASTM)	
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

#### **END OF ITEM P-101**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-152**  
**EXCAVATION, SUBGRADE, AND EMBANKMENT**

**DESCRIPTION**

**152-1.1** This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

**152-1.2 Classification.** All material excavated shall be classified as defined below:

**a. Unclassified excavation.** Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature.

**152-1.3 Unsuitable excavation.** Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material suitable for topsoil may be used on the embankment slope when approved by the RPR.

**CONSTRUCTION METHODS**

**152-2.1 General.** Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared or cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the RPR. All unsuitable material shall be disposed of in waste areas as shown on the plans. All waste areas shall be graded to allow positive drainage of the area and adjacent areas. The surface elevation of waste areas shall be specified on the plans or approved by the RPR.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the RPR notified per Section 70, paragraph 70-20. At the direction of the RPR, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches (100 mm), to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches (150 mm) of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the RPR, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

**a. Blasting.** Blasting shall not be allowed.

**152-2.2 Excavation.** No excavation shall be started until the work has been staked out by the Contractor and the RPR has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and RPR shall agree that the original ground lines shown on the original

topographic mapping are accurate, or agree to any adjustments made to the original ground lines.

Digital terrain model (DTM) files of the existing surfaces, finished surfaces and other various surfaces were used to develop the design plans.

Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder.

Volumetric quantities were calculated using design cross sections which were created for this project using the DTM files of the applicable design surfaces and generating End Area Volume Reports. Paper copies of design cross sections and a paper copy of the original topographic map will be issued to the successful bidder.

Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations. Prior to disturbing original grade, Contractor shall verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within 0.1 foot (30 mm) of the stated elevations for ground surfaces, or within 0.04 foot (12 mm) for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the RPR in writing at least two weeks before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the RPR. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes as shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

The grade shall be maintained so that the surface is well drained at all times.

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the RPR. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

**a. Selective grading.** When selective grading is indicated on the plans, the more suitable material designated by the RPR shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

**b. Undercutting.** Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches (300 mm) below the subgrade or to the depth specified by the RPR. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified.

Unsuitable materials shall be disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard (per cubic meter) for unclassified excavation. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans. Undercutting will be paid as unclassified excavation.

**c. Over-break.** Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the RPR. All over-break shall be graded or removed by the Contractor and disposed of as directed by the RPR. The RPR shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the RPR determines as avoidable. Unavoidable over-break will be classified as "Unclassified Excavation."

**d. Removal of utilities.** The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet (60 cm) below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the RPR. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

**152-2.3 Borrow excavation.** Borrow areas are not required.

**152-2.4 Drainage excavation.** Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the RPR. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

**152-2.5 Preparation of cut areas or areas where existing pavement has been removed.** In those areas on which a subbase or base course is to be placed, the top 12 inches (300 mm) of subgrade shall be compacted to not less than **one hundred percent (100%)** of maximum density for non-cohesive soils, and **ninety-five percent (95%)** of maximum density for cohesive soils as determined by **ASTM D1557**. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

**152-2.6 Preparation of embankment area.** All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (150 mm) and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (300 mm) and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

**152-2.7 Control Strip.** The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and

manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

**152-2.8 Formation of embankments.** The material shall be constructed in lifts as established in the control strip, but not less than 6 inches (150 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the RPR. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within  $\pm 2\%$  of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The RPR will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with D 1557. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the RPR for every 3,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the RPR.

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted to not less than **one hundred percent (100%)** of maximum density for non-cohesive soils, and **ninety-five percent (95%)** of maximum density for cohesive soils as determined by **ASTM D1557**. Under all areas to be paved, the embankments shall be compacted to a depth of **12 inches** and to a density of not less than **one hundred percent (100%)** of the maximum density as determined by **ASTM D1557**. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches (100 mm) which shall be prepared for a seedbed in accordance with Item T-901.

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM 6938 using

Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The RPR shall perform all density tests. If the specified density is not attained, the area represented by the test or as designated by the RPR shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches (100 mm) in their greatest dimensions will not be allowed in the top 12 inches (300 mm) of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the RPR and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the RPR.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet (60 cm) in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift shall not be constructed above an elevation 4 feet (1.2 m) below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in lifts, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

**152-2.9 Proof rolling.** The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. Before start of embankment and after compaction is completed, the subgrade area shall be proof rolled with either a 20 ton (18.1 metric ton) Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to at least 80 psi (0.551 MPa) or 35 ton Proof Roller with tires spaced not more than 32 inches (0.8 m) on-center with tires inflated to 125 psi (0.861 MPa) in the presence of the RPR. Apply a minimum of 40% coverage, or as specified by the RPR, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas is incidental to this item.

**152-2.10 Compaction requirements.** The subgrade under areas to be paved shall be compacted to a depth of **12 inches** (300 mm) and to a density of not less than **one-hundred percent (100%)** of the maximum dry density as determined by **ASTM D1557**. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of 12 inches (300 mm) and to a density of not less than ninety-five percent (95%) of the maximum density as determined by ASTM D698.

The material to be compacted shall be within  $\pm 2\%$  of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). When the material has greater than 30

percent retained on the  $\frac{3}{4}$  inch (19.0 mm) sieve, follow the procedures in AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles. Tests for moisture content and compaction will be taken at a minimum of **2,000 S.Y.** of subgrade. All quality assurance testing shall be done by the RPR.

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 within 12 months prior to its use on this contract. The gage shall be field standardized daily.

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the RPR and the finished subgrade shall be maintained.

**152-2.11 Finishing and protection of subgrade.** Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the RPR.

**152-2.12 Haul.** All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

**152-2.13 Surface Tolerances.** In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

- a. Smoothness.** The finished surface shall not vary more than  $\pm \frac{1}{2}$  inch (12 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.



- b. Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +/- 0.05 feet (15 mm) of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to be placed, grade shall not vary more than 0.10 feet (30 mm) from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

**152-2.14 Topsoil.** When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the RPR, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

## **METHOD OF MEASUREMENT**

**152-3.1** Measurement for payment specified by the cubic yard (cubic meter) shall be computed by the average end areas of design cross sections or the comparison of digital terrain model (DTM) surfaces for computation of neat line design quantities. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by cross-sections shown on the plans, subject to verification by the RPR.

**152-3.1** The quantity of unclassified excavation to be paid for shall be the number of cubic yards (cubic meters) measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

## **BASIS OF PAYMENT**

**152-4.1** Unclassified excavation payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-152-4.1	Unclassified Excavation - per cubic yard (cubic meter)
----------------	--

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180      Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM International (ASTM)

ASTM D698      Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))

ASTM D1556      Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D1557      Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2700 kN-m/m<sup>3</sup>))

ASTM D6938      Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2      Operational Safety on Airports During Construction Software

Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

U.S. Department of Transportation

FAA RD-76-66      Design and Construction of Airport Pavements on Expansive Soils

**END OF ITEM P-152**

**ITEM P-209**  
**CRUSHED AGGREGATE BASE COURSE**

**DESCRIPTION**

**209-1.1** This item consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans.

**MATERIALS**

**209-2.1 Crushed aggregate base.** Crushed aggregate shall consist of clean, sound, durable particles of crushed stone, or crushed gravel and shall be free from coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials or coatings. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate portion, defined as the portion passing the No. 4 (4.75 mm) sieve shall consist of fines from the coarse aggregate crushing operation. The fine aggregate shall be produced by crushing stone, or gravel that meet the coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in the following table.

**Crushed Aggregate Base Material Requirements**

<b>Material Test</b>	<b>Requirement</b>	<b>Standard</b>
<b>Coarse Aggregate</b>		
Resistance to Degradation	Loss: 45% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 98% with at least one fractured face <sup>1</sup>	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles <sup>2</sup>	ASTM D4791
Clay lumps and friable particles	Less than or equal to 3 percent	ASTM C142
<b>Fine Aggregate</b>		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

<sup>1</sup> The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

<sup>2</sup> A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

**209-2.2 Gradation requirements.** The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa.

### Gradation of Aggregate Base

Sieve Size	Design Range Percentage by Weight passing	Contractor's Final Gradation	Job Control Grading Band Tolerances <sup>1</sup> (Percent)
2 inch (50 mm)	100		0
1-1/2 inch (37.5 mm)	95-100		±5
1 inch (25.0 mm)	70-95		±8
3/4 inch (19.0 mm)	55-85		±8
No. 4 (4.75 mm)	30-60		±8
No. 40 <sup>2</sup> (425 µm)	10-30		±5
No. 200 <sup>2</sup> (75 µm)	0-5		±3

<sup>1</sup> The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

<sup>2</sup> The fraction of material passing the No 200 (75 µm) sieve shall not exceed two-thirds the fraction passing the No 40 (425 µm) sieve.

#### 209-2.3 Sampling and Testing.

**a. Aggregate base materials.** The Contractor shall take samples of the aggregate base in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 209-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

**b. Gradation requirements.** The Contractor shall take at least two (2) aggregate base samples per day in the presence of the Resident Project Representative (RPR) to check the final gradation. Sampling shall be per ASTM D75. Material shall meet the requirements in paragraph 209-2.2. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the RPR.

#### 209-2.4 Separation Geotextile. Not used.

### CONSTRUCTION METHODS

**209-3.1 Control strip.** The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved by the RPR.

**209-3.2 Preparing underlying subgrade and/or subbase.** The underlying subgrade and/or subbase shall be checked and accepted by the RPR before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with Item P-152, at the Contractor's expense, may be required by the RPR if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

**209-3.3 Production.** The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.5, the approved material may be transported directly to the placement.

**209-3.4 Placement.** The aggregate shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

The aggregate shall meet gradation and moisture requirements prior to compaction. The base course shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications at the Contractor's expense.

**209-3.5 Compaction.** Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade.

The field density of each compacted lift of material shall be at least **one-hundred percent (100%)** of the maximum density of laboratory specimens prepared from samples of the base material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with **ASTM D1557**. The moisture content of the material during placing operations shall be within  $\pm 2$  percentage points of the optimum moisture content as determined by **ASTM D6938**. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

**209-3.6 Weather limitations.** Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

**209-3.7 Maintenance.** The base course shall be maintained in a condition that will meet all specification requirements. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

**209-3.8 Surface tolerances.** After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and recompact to grade until the required smoothness and accuracy are obtained and approved by the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

**a. Smoothness.** The finished surface shall not vary more than 3/8-inch (9 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

**b. Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +0 and -1/2 inch (12 mm) of the specified grade.

**209-3.9 Acceptance sampling and testing.** Crushed aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each 1200 square yds (1000 m<sup>2</sup>). Sampling locations will be determined on a random basis per ASTM D3665

**a. Density.** The RPR shall perform all density.

Each area shall be accepted for density when the field density is at least **one-hundred percent (100%)** of the maximum density of laboratory specimens compacted and tested per **ASTM 1557**. The in-place field density shall be determined per ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompact and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

**b. Thickness.** Depth tests shall be made by test holes at least 3 inches (75 mm) in diameter that extend through the base. The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompact to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

## **METHOD OF MEASUREMENT**

**209-4.1** The quantity of crushed aggregate base course will be determined by measurement of the number of cubic yards (cubic meters) of material actually constructed and accepted by the RPR as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

## **BASIS OF PAYMENT**

**209-5.1** Payment shall be made at the contract unit price per cubic yard (cubic meter) for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209-5.1	Crushed Aggregate Base Course - per cubic yard (cubic meter)
----------------	--

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- $\mu\text{m}$ (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> (2700 kN-m/m <sup>3</sup> ))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4643	Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating
ASTM D4751	Standard Test Methods for Determining Apparent Opening Size of a Geotextile
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate

ASTM D6938                      Standard Test Method for In-Place Density and Water Content of Soil  
and Soil-Aggregate by Nuclear Methods (Shallow Depth)

ASTM D7928                      Standard Test Method for Particle-Size Distribution (Gradation) of Fine-  
Grained Soils Using the Sedimentation (Hydrometer) Analysis

American Association of State Highway and Transportation Officials (AASHTO)

M288                                Standard Specification for Geosynthetic Specification for Highway  
Applications

**END OF ITEM P-209**



**ITEM P-403**  
**ASPHALT MIX PAVEMENT SURFACE COURSE**

**DESCRIPTION**

**403-1.1** This item shall consist of pavement courses composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

**MATERIALS**

**403-2.1 Aggregate.** Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. Coarse aggregate is the material retained on the No. 4 (4.75 mm) sieve. Fine aggregate is the material passing the No. 4 (4.75 mm) sieve.

**a. Coarse aggregate.** Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

**Coarse Aggregate Material Requirements**

<b>Material Test</b>	<b>Requirement</b>	<b>Standard</b>
Resistance to Degradation	Loss: 40% maximum for surface, asphalt binder, and leveling course Loss: 50% maximum for base course	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Percentage of Fractured Particles	Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face <sup>1</sup>	ASTM D5821
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles with a value of 5:1 <sup>2</sup>	ASTM D4791
Bulk density of slag <sup>3</sup>	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

<sup>1</sup> The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

<sup>2</sup> A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

<sup>3</sup> Only required if slag is specified.

**b. Fine aggregate.** Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed

in the table below.

#### Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419
Natural Sand	15% maximum by weight of total aggregate	ASTM D1073

**c. Sampling.** ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

**403-2.2 Mineral filler.** Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

#### Mineral filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

**403-2.3 Asphalt binder.** Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) **76-28**.

#### Asphalt Binder PG Plus Test Requirements

Material Test	Requirement	Standard
Elastic Recovery	75% minimum	ASTM D6084 <sup>1</sup>

<sup>1</sup> Follow procedure B on RTFO aged binder.

**403-2.4 Anti-stripping agent.** Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

### COMPOSITION

**403-3.1 Composition of mixture.** The asphalt plant mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

**403-3.2 Job mix formula (JMF) laboratory.** The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF, and listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

**403-3.3 Job mix formula (JMF).** No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 403-3.2. The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. Samples shall be prepared and compacted using a Marshall compactor in accordance with ASTM D6926.

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

The JMF shall be submitted in writing by the Contractor at least **thirty (30)** days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

The submitted JMF shall be dated, and stamped or sealed by the responsible Professional Engineer of the laboratory and shall include the following items as a minimum:

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 403-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 403-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 403-2.1 and 403-2.2.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each course and fine aggregate.
- Percent natural sand.
- Percent fractured faces.
- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows or gyrations.
- Laboratory mixing and compaction temperatures.
- Supplier recommended mixing and compaction temperatures.
- Plot of the combined gradation on the 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.
- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

**Table 1. Asphalt Design Criteria**

Test Property	Value	Test Method
Number of blows/gyrations	75	
Air voids (%)	3.5	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
TSR <sup>1</sup>	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA) <sup>2,3</sup>	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

<sup>1</sup> Test specimens for TSR shall be compacted at  $7 \pm 1.0$  % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

<sup>2</sup> AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes

<sup>3</sup> Where APA not available, use Hamburg wheel test (AASHTO T 324) 10 mm@ 20,000 passes at 50°C.

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply, be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

**Table 2. Aggregate - Asphalt Pavements**

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25.0 mm)	--
3/4 inch (19.0 mm)	<b>100</b>
1/2 inch (12.5 mm)	<b>90-100</b>
3/8 inch (9.5 mm)	<b>72-88</b>
No. 4 (4.75 mm)	<b>53-73</b>
No. 8 (2.36 mm)	<b>38-60</b>
No. 16 (1.18 mm)	<b>26-48</b>
No. 30 (600 $\mu$ m)	<b>18-38</b>
No. 50 (300 $\mu$ m)	<b>11-27</b>
No. 100 (150 $\mu$ m)	<b>6-18</b>
No. 200 (75 $\mu$ m)	<b>3-6</b>
<b>Voids in Mineral Aggregate (VMA)<sup>1</sup></b>	<b>15</b>
<b>Asphalt Percent:</b>	
Stone or gravel	<b>5.0-7.5</b>
Slag	<b>6.5-9.5</b>
<b>Recommended Minimum Construction Lift Thickness</b>	<b>2 inch</b>

<sup>1</sup>To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

**403-3.4 Reclaimed Asphalt Pavement (RAP).** RAP shall not be used.

**403-3.5 Control strip.** A control strip is not required.

## CONSTRUCTION METHODS

**403-4.1 Weather limitations.** The asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the RPR, if requested; however, all other requirements including compaction shall be met.

**Table 4. Surface Temperature Limitations of Underlying Course**

Mat Thickness	Base Temperature (Minimum)	
	Degrees F	Degrees C
3 inches (7.5 cm) or greater	40	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

**403-4.2 Asphalt plant.** Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items:

**a. Inspection of plant.** The RPR, or RPR's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

**b. Storage bins and surge bins.** The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in storage and/or surge bins for a period greater than twelve (12) hours. If the RPR determines there is an excessive heat loss, segregation or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

**403-4.3 Aggregate stockpile management.** Aggregate stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

**403-4.4 Hauling equipment.** Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

**403-4.4.1 Material transfer vehicle (MTV).** A material transfer vehicle is not required.

**403-4.5 Asphalt pavers.** Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.11.

**403-4.6 Rollers.** The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

**403-4.6.1 Density device.** The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the density gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

**403-4.7 Preparation of asphalt binder.** The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of the unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F (175°C) when added to the aggregate.

**403-4.8 Preparation of mineral aggregate.** The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

**403-4.9 Preparation of asphalt mixture.** The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

**403-4.10 Application of Prime and Tack Coat.** Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

A prime coat in accordance with Item P-602 shall not be required for this project.

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

**403-4.11 Laydown plan, transporting, placing, and finishing.** Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2e before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of **12.5** feet (3.8 m) except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot (30 cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m). On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

**403-4.12 Compaction of asphalt mixture.** After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface

is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

**403-4.13 Joints.** The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid asphalt except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh asphalt against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C); or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. An asphalt tack coat or other product approved by the RPR shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

Cut back of all cold joints is required as specified above.

The Contractor may provide additional joint density QC by use of joint heaters at the Contractor's expense. Electrically powered infrared heating equipment should consist of one or more low-level radiant energy heaters to uniformly heat and soften the pavement joints. The heaters should be configured to uniformly heat an area up to 18 inches (0.5 m) in width and 3 inches (75 mm) in depth. Infrared equipment shall be thermostatically controlled to provide a uniform, consistent temperature increase throughout the layer being heated up to a maximum temperature range of 200°F to 300°F (93°C to 150°C).

Propane powered infrared heating equipment shall be attached to the paving machine and the output of infrared energy shall be in the one to six-micron range. Converters shall be arranged end to end directly over the joint to be heated in sufficient numbers to continuously produce, when in operation, a minimum of 240,000 BTU per hour. The joint heater shall be positioned not more than one inch (25 mm) above the pavement to be heated and in front of the paver screed and shall be fully adjustable. Heaters will be required to be in operation at all times.

The heaters shall be operated so they do not produce excessive heat when the units pass over new or previously paved material.

**403-4.14 Saw-cut grooving.** Saw-cut grooving is not required.

**403-4.15 Diamond grinding.** Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable



of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with a minimum of 55 to 60 blades per 12 inches (300 mm) of cutting head width; grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

**403-4.16 Nighttime Paving Requirements.** The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

### **CONTRACTOR QUALITY CONTROL (CQC)**

**403-5.1 General.** The Contractor is not required to develop a QCQP in accordance with Item C-100.

**403-5.2 Contractor quality control (QC) facilities.** The Contractor shall provide or contract for testing facilities. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

**403-5.3 Quality Control (QC) testing.** The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the QCQP.

**a. Asphalt content.** A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day will be determined by averaging the test results.

**b. Gradation.** Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444 and ASTM C136, and ASTM C117.

**c. Moisture content of aggregate.** The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

**d. Moisture content of asphalt.** The moisture content of the asphalt shall be determined once per lot in accordance with AASHTO T329 or ASTM D1461.

**e. Temperatures.** Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

**f. In-place density monitoring.** The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

**g. Smoothness for Contractor Quality Control.**

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) “straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using the FAA profile program, ProFAA, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement and between the start and stop of lanes place shall be evaluated separately for conformance with the plans.

**(1) Transverse measurements.** Transverse measurements shall be taken for each day’s production placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

**(2) Longitudinal measurements.** Longitudinal measurements shall be taken for each day’s production placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 403-4.15 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3) Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show area of each day’s placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor’s machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day’s production, production shall be stopped until corrective measures are implemented by the Contractor.

**h. Grade.** Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to the placement

of the first lift and then prior to and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically. The documentation will be provided by the Contractor to the RPR by the end of the following working day.

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 403-4.15.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus 1/2 inch and replacing with new material. Skin patching is not allowed.

**403-5.4 Sampling.** When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

**403-5.5 Control charts.** The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day shall be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

**a. Individual measurements.** Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the JMF target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

**Control Chart Limits for Individual Measurements**

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

**b. Range.** Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based

on a sample size of  $n = 2$ . Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for  $n = 3$  and by 1.27 for  $n = 4$ .

**Control Chart Limits Based on Range**  
( $n = 2$ )

Sieve	Suspension Limit
1/2 inch (12.5 mm)	11%
3/8 inch (9.5 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (300 $\mu\text{m}$ )	6%
No. 200 (75 $\mu\text{m}$ )	3.5%
Asphalt Content	0.8%

**c. Corrective action.** The Contractor shall indicate that appropriate action to be taken when the process is believed to be out of tolerance. The Contractor shall have a sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

**403-5.6 Quality control (QC) reports.** The Contractor shall maintain records and shall submit reports of QC activities daily.

**MATERIAL ACCEPTANCE**

**403-6.1. Quality Assurance Acceptance sampling and testing.** Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

**a. Quality Assurance (QA) testing laboratory.** The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation.

**b. Lot Size.** A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

Where more than one plant is simultaneously producing asphalt for the job, the lot sizes will apply separately for each plant.

**c. Asphalt air voids.** Plant-produced asphalt will be tested for air voids on a subplot basis.

**(1) Sampling.** Material from each subplot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to maintain the material at or above the compaction temperature as specified in the JMF.

**(2) Testing.** Air voids will be determined for each subplot in accordance with ASTM D3203 for a set of three compacted specimens prepared in accordance with ASTM D6926.

**d. In-place asphalt mat and joint density.** Each subplot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

**(1) Sampling.** The Contractor will cut minimum 5 inches (125 mm) diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

**(2) Bond.** Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

**(3) Thickness.** Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

**(4) Mat density.** One core shall be taken from each subplot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the TMD for that subplot.

**(5) Joint density.** One core centered over the longitudinal joint shall be taken for each subplot which contains a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

#### **403-6.2 Acceptance criteria.**

**a. General.** Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, and grade.

**b. Air voids.** Acceptance of each lot of plant produced material for air voids will be based upon the average air void from the sublots. If the average air voids of the lot are equal to or greater than 2% and equal to or less than 5%, then the lot will be acceptable. If the average is below 2% or greater than 5%, the lot shall be removed and replaced at the Contractor's expense.

**c. Mat density.** Acceptance of each lot of plant produced material for mat density will be based on the average of all of the densities taken from the sublots. If the average mat density of the lot so established equals or exceeds 94%, the lot will be acceptable. If the average mat density of the lot is below 94%, the lot shall be removed and replaced at the Contractor's expense.

**d. Joint density.** Acceptance of each lot of plant produced asphalt for joint density will be based on the average of all of the joint densities taken from the sublots. If the average joint density of the lot so established equals or exceeds 92%, the lot will be acceptable. If the average joint density of the lot is less than 92%, the Contractor shall stop production and evaluate the method of compacting joints. Production may resume once the reason for poor compaction has been determined and appropriate measures have been

taken to ensure proper compaction.

**e. Grade.** The final finished surface of the pavement of the completed project shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch (12 mm) vertically.

Cross-sections of the pavement shall be taken at a minimum 50-foot (15-m) longitudinal spacing and at all longitudinal grade breaks. Minimum cross-section grade points shall include grade at centerline, and edge of taxiway pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the subplot shall not be more than 95%.

**f. Profilograph roughness for QA Acceptance.** No final profilograph shall be required for this project.

#### **403-6.3 Resampling Pavement for Mat Density.**

**a. General.** Resampling of a lot of pavement will only be allowed for mat density and then, only if the Contractor requests same in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 403-6.1. Only one resampling per lot will be permitted.

(1) A redefined mat density will be calculated for the resampled lot. The number of tests used to calculate the redefined mat density will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

**b. Payment for resampled lots.** The redefined mat density for a resampled lot will be used to evaluate the acceptance of that lot in accordance with paragraph 403-6.2.

**c. Outliers.** Check for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and density determined using the remaining test values.

### **METHOD OF MEASUREMENT**

**403-7.1 Measurement.** Plant mix asphalt mix pavement shall be measured by the number of tons (kg) of asphalt pavement used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

### **BASIS OF PAYMENT**

**403-8.1 Payment.** Payment for a lot of asphalt mixture meeting all acceptance criteria as specified in paragraph 403-6.2 shall be made at the contract unit price per ton (kg) for asphalt. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-403-8.1            Asphalt Mixture Surface Course - per ton (kg)

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D1074	Standard Test Method for Compressive Strength of Bituminous Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4125	Standard Test Methods for Asphalt Content of Bituminous mixtures by the Nuclear Method
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5581	Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen)
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6307	Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyratory Compactor
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures



ASTM D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E2133	Standard Test Method for Using a Rolling Inclinator to Measure Longitudinal and Transverse Profiles of a Traveled Surface
American Association of State Highway and Transportation Officials (AASHTO)	
AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
AASHTO T 340	Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)
Asphalt Institute (AI)	
MS-2	Mix Design Manual, 7th Edition
MS-26	Asphalt Binder Handbook AI State Binder Specification Database
FAA Orders	
5300.1	Modifications to Agency Airport Design, Construction, and Equipment Standards
Federal Highway Administration (FHWA)	
Long Term Pavement Performance Binder program	
Software	
FAARFIELD	

**END OF ITEM P-403**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-603**  
**EMULSIFIED ASPHALT TACK COAT**

**DESCRIPTION**

**603-1.1** This item shall consist of preparing and treating an asphalt or concrete surface with asphalt material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

**MATERIALS**

**603-2.1 Asphalt materials.** The asphalt material shall be an emulsified asphalt as specified in ASTM D3628 as an asphalt application for tack coat appropriate to local conditions. The emulsified asphalt shall not be diluted. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Resident Project Representative (RPR) before the asphalt material is applied for review and acceptance. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

**CONSTRUCTION METHODS**

**603-3.1 Weather limitations.** The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F (10°C) or above; the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

**603-3.2 Equipment.** The Contractor shall provide equipment for heating and applying the emulsified asphalt material. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven (700) feet per minute (213 m per minute).

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot (3.7-m) spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

A power broom and/or power blower suitable for cleaning the surfaces to which the asphalt tack coat is to be applied shall be provided.

**603-3.3 Application of emulsified asphalt material.** The emulsified asphalt shall not be diluted. Immediately before applying the emulsified asphalt tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material. The emulsified asphalt material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in the table below. The type of asphalt material and application rate shall be approved by the RPR prior to application.

#### **Emulsified Asphalt**

<b>Surface Type</b>	<b>Residual Rate, gal/SY (L/square meter)</b>	<b>Emulsion Application Bar Rate, gal/SY (L/square meter)</b>
<b>New asphalt</b>	0.02-0.05 (0.09-0.23)	0.03-0.07 (0.13-0.32)
<b>Existing asphalt</b>	0.04-0.07 (0.18-0.32)	0.06-0.11 (0.27-0.50)
<b>Milled Surface</b>	0.04-0.08 (0.18-0.36)	.06-0.12 (0.27-0.54)
<b>Concrete</b>	0.03-0.05 (0.13-0.23)	0.05-0.08 (0.23-0.36)

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the RPR. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

**603-3.4 Freight and waybills** The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the RPR certified waybills and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

### **METHOD OF MEASUREMENT**

**603-4.1** The emulsified asphalt material for tack coat shall be measured by the gallon (liter). Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D1250. The emulsified asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of emulsified asphalt material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

### **BASIS OF PAYMENT**

**603.5-1** Payment shall be made at the contract unit price per gallon (liter) of emulsified asphalt material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603-5.1            Emulsified Asphalt Tack Coat - per gallon (liter)

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2995	Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

**END ITEM P-603**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-605**  
**JOINT SEALANTS FOR PAVEMENTS**

**DESCRIPTION**

**605-1.1** This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

**MATERIALS**

**605-2.1 Joint sealants.** Joint sealant materials shall meet the requirements of **ASTM D6690** *Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements*.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

**605-2.2 Backer rod.** The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be  $25\% \pm 5\%$  larger in diameter than the nominal width of the joint.

**605-2.3 Bond breaking tapes.** Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F (3°C) greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch (3 mm) wider than the nominal width of the joint and shall not bond to the joint sealant.

**CONSTRUCTION METHODS**

**605-3.1 Time of application.** Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F (10°C) and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

When used with Item P-606, such as light can installation, Item P-605 shall not be applied until the P-606 has fully cured.

**605-3.2 Equipment.** Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, **ten (10)** days prior to use on the project.

**a. Tractor-mounted routing tool.** Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

**b. Concrete saw.** Provide a self-propelled power saw, with water-cooled diamond or abrasive saw

blades, for cutting joints to the depths and widths specified.

**c. Sandblasting equipment.** Sandblasting is not allowed.

**d. Waterblasting equipment.** Waterblasting is not allowed.

**e. Hand tools.** Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

**f. Hot-poured sealing equipment.** The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

**g. Cold-applied, single-component sealing equipment.** The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

**605-3.3 Preparation of joints.** Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

**a. Sawing.** All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

**b. Sealing.** Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment and/or concrete saw as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch (12 mm) from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches (75 mm) from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

**c. Backer Rod.** When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

**d. Bond-breaking tape.** Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

**605-3.4 Installation of sealants.** Joints shall be inspected for proper width, depth, alignment, and



preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet (15 m) ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch (6 mm)  $\pm$  1/16 inch (2 mm) below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

**605-3.5 Inspection.** The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

**605-3.6 Clean-up.** Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

## **METHOD OF MEASUREMENT**

**605-4.1** Joint sealing material shall be measured by the linear foot (meter) of sealant in place, completed, and accepted.

## **BASIS OF PAYMENT**

**605-5.1** Payment for joint sealing material shall be made at the contract unit price per linear foot (meter). The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-5.1	Joint Sealing Filler, per linear foot (meter)
----------------	---

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt

### Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
----------------	---

**END ITEM P-605**

**ITEM P-606**  
**ADHESIVE COMPOUNDS, TWO-COMPONENT**  
**FOR SEALING WIRE AND LIGHTS IN PAVEMENT**

**DESCRIPTION**

**606-1.1** This specification covers two types of material; a liquid suitable for sealing electrical wire in saw cuts in pavement and for sealing light fixtures or bases in pavement, and a paste suitable for embedding light fixtures in the pavement. Both types of material are two-component filled formulas with the characteristics specified in paragraph 606-2.4. Materials supplied for use with asphalt and/or concrete pavements must be formulated so they are compatible with the asphalt and/or concrete.

**MATERIALS**

**606-2.1 Curing.** When pre-warmed to 77°F (25°C), mixed, and placed in accordance with manufacturer's directions, the materials shall cure at temperatures of 45°F (7°C) or above without the application of external heat.

**606-2.2 Storage.** The adhesive components shall not be stored at temperatures over 86°F (30°C), unless otherwise specified by the manufacturer.

**606-2.3 Caution.** Installation and use shall be in accordance with the manufacturer's recommended procedures. Avoid prolonged or repeated contact with skin. In case of contact, wash with soap and flush with water. If taken internally, call doctor. Keep away from heat or flame. Avoid vapor. Use in well-ventilated areas. Keep in cool place. Keep away from children.

**606-2.4 Characteristics.** When mixed and cured in accordance with the manufacturer's directions, the materials shall have the following properties shown in Table 1.

**Table 1. Property Requirements**

Physical or Electrical Property	Minimum	Maximum	ASTM Method
<u>Tensile</u>			
Portland cement concrete	1,000 psi (70 kg/sq cm)		D 638
Asphalt concrete	500 psi (35 kg/sq cm)		
<u>Elongation</u>			
Portland cement concrete		See note <sup>1</sup>	D 638
Asphalt concrete	50%		D 638
Coef. of cub. exp. cu. cm/cu. cm/°C	0.00090	0.00120	D 1168
Coef. of lin. exp. cm/cm/°C	0.000030	0.000040	D 1168
Dielectric strength, short time test	350 volts/mil.		D 149
Arc resistance	125 sec		

Physical or Electrical Property	Minimum	Maximum	ASTM Method
<u>Pull-off</u>			
Adhesion to steel	1,000 psi (70 kg/sq cm)		
Adhesion to Portland cement concrete	200 psi (14 kg/sq cm)		
Adhesion to asphalt concrete	No test available.		
Adhesion to aluminum	250 psi		

<sup>1</sup> 20% or more (without filler) for formulations to be supplied for areas subject to freezing.

## SAMPLING, INSPECTION, AND TEST PROCEDURES

**606-3.1 Tensile properties.** Tests for tensile strength and elongation shall be conducted in accordance with ASTM D638.

**606-3.2 Expansion.** Tests for coefficients of linear and cubical expansion shall be conducted in accordance with, Method B, except that mercury shall be used instead of glycerine. The test specimen shall be mixed in the proportions specified by the manufacturer, and cured in a glass tub approximately 2 inch (50 mm) long by 3/8 inch (9 mm) in diameter. The interior of the tube shall be precoated with a silicone mold release agent. The hardened sample shall be removed from the tube and aged at room temperature for one (1) week before conducting the test. The test temperature range shall be from 35°F (2°C) to 140°F (60°C).

**606-3.3 Test for dielectric strength.** Test for dielectric strength shall be conducted in accordance with ASTM D149 for sealing compounds to be furnished for sealing electrical wires in pavement.

**606-3.4 Test for arc resistance.** Test for arc resistance shall be conducted for sealing compounds to be furnished for sealing electrical wires in pavement.

**606-3.5 Test for adhesion to steel.** The ends of two smooth, clean, steel specimens of convenient size (1 inch by 1 inch by 6 inch) (25 mm by 25 mm by 150 mm) would be satisfactory when bonded together with adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure on a Riehle (or similar) tensile tester. The thickness of adhesive to be tested shall be 1/4 inch (6 mm).

### 606-3.6 Adhesion to Portland cement concrete

**a. Concrete test block preparation.** The aggregate grading shall be as shown in Table 2.

The coarse aggregate shall consist of crushed rock having a minimum of 75% of the particles with at least one fractured face and having a water absorption of not more than 1.5%. The fine aggregate shall consist of crushed sand manufactured from the same parent rock as the coarse aggregate. The concrete shall have a water-cement ratio of 5.5 gallons (21 liters) of water per bag of cement, a cement factor of 6,  $\pm 0.5$ , bags of cement per cubic yard (0.76 cubic meter) of concrete, and a slump of 2-1/2 inch (60 mm),  $\pm 1/2$  inch (60 mm  $\pm 12$  mm). The ratio of fine aggregate to total aggregate shall be approximately 40% by solid volume. The air content shall be 5.0%,  $\pm 0.5\%$ , and it shall be obtained by the addition to the batch of an air-entraining admixture such as Vinsol® resin. The mold shall be of metal and shall be provided with a metal base plate.

Means shall be provided for securing the base plate to the mold. The assembled mold and base plate shall be watertight and shall be oiled with mineral oil before use. The inside measurement of the mold shall be such that several one inch (25 mm) by 2-inch (75 mm) by 3-inch (25 mm by 50 mm by 75 mm) test

blocks can be cut from the specimen with a concrete saw having a diamond blade. The concrete shall be prepared and cured in accordance with ASTM C192.

**Table 2. Aggregate for Bond Test Blocks**

Type	Sieve Size	Percent Passing
Coarse Aggregate	3/4 inch (19.0 mm)	97 to 100
	1/2 inch (12.5 mm)	63 to 69
	3/8 inch (9.5 mm)	30 to 36
	No. 4 (4.75 mm)	0 to 3
Fine Aggregate	No. 4 (4.75 mm)	100
	No. 8 (2.36 mm)	82 to 88
	No. 16 (1.18 mm)	60 to 70
	No. 30 (600 µm)	40 to 50
	No. 50 (300 µm)	16 to 26
	No. 100 (150 µm)	5 to 9

**b. Bond test.** Prior to use, oven-dry the test blocks to constant weight at a temperature of 220°F to 230°F (104°C to 110°C), cool to room temperature, 73.4°F ±3°F (23°C ±1.6°C), in a desiccator, and clean the surface of the blocks of film or powder by vigorous brushing with a stiff-bristled fiber brush. Two test blocks shall be bonded together on the one inch by 3 inch (25 mm by 75 mm) sawed face with the adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure in a Riehle (or similar) tensile tester. The thickness of the adhesive to be tested shall be 1/4 inch (6 mm).

**606-3.7 Compatibility with asphalt mix.** Test for compatibility with asphalt in accordance with ASTM D5329.

**606-3.8 Adhesive compounds - Contractor's responsibility.** The Contractor shall furnish the vendor's certified test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with asphalt concrete pavements. The report shall be provided to and accepted by the Resident Project Representative (RPR) before use of the material. In addition, the Contractor shall obtain a statement from the supplier or manufacturer that guarantees the material for one year. The supplier or manufacturer shall furnish evidence that the material has performed satisfactorily on other projects.

**606-3.9 Application.** Adhesive shall be applied on a dry, clean surface, free of grease, dust, and other loose particles. The method of mixing and application shall be in strict accordance with the manufacturer's recommendations. When used with Item P-605, such as light can installation, Item P-605 shall not be applied until the Item P-606 has fully cured.

## **METHOD OF MEASUREMENT**

**606-4.1** The adhesive compound shall be measured by the gallon (l) of adhesive as specified, in place, complete and accepted. When required in the installation of an in-runway lighting system or portion thereof, no measurement will be made for direct payment of adhesive, as the cost of furnishing and installing shall be considered as a subsidiary obligation in the completion of the installation.

## **BASIS OF PAYMENT**

**606-5.1** Payment shall be made, where applicable, at the contract unit price per gallon (l) for the adhesive. This price shall be full compensation for furnishing all materials, and for all preparation, delivering, and

application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

No separate measurement or payment shall be made for materials used for in-pavement lighting systems.

For other applications:

Item P-606-5.1            Adhesive Compound - per gallon (l) – Not Used.

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM D149	Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D5329	Standard Test Methods for Sealants and Fillers, Hot-applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements

**END OF ITEM P-606**

**ITEM P-608**  
**EMULSIFIED ASPHALT SEAL COAT**

**DESCRIPTION**

**608-1.1** This item shall consist of the application of a emulsified asphalt surface treatment composed of an emulsion of natural and refined asphalt materials, water and a polymer additive, for taxiways and runways with the application of a suitable aggregate to maintain adequate surface friction; and airfield secondary and tertiary pavements including low-speed taxiways, shoulders, overruns, roads, parking areas, and other general applications with or without aggregate applied as designated on the plans. The terms seal coat, asphalt sealer, and asphalt material are interchangeable throughout this specification. The term emulsified asphalt means an emulsion of natural and refined asphalt materials.

**MATERIALS**

**608-2.1 Aggregate.** The aggregate material shall be a dry, clean, dust and dirt free, sound, durable, angular shaped manufactured specialty sand, such as that used as an abrasive, with a Mohs hardness of 6 to 8. The Contractor shall submit the specialty sand manufacturer's technical data and a manufacturer's Certificate of Analysis (COA) indicating that the specialty sand meets the requirements of the specification to the RPR prior to start of construction. The sand must be approved for use by the RPR and shall meet the following gradation limits when tested in accordance with ASTM C136 and ASTM C117:

**Aggregate Material Gradation Requirements<sup>1</sup>**

<b>Sieve Designation (square openings)</b>	<b>Individual Percentage Retained by Weight</b>
No. 10 (2.00 mm)	0
No. 14 (1.41 mm)	0-4
No. 16 (1.18 mm)	0-8
No. 20 (850 µm)	0-35
No. 30 (600 µm)	20-50
No. 40 (425 µm)	10-45
No. 50 (300 µm)	0-20
No. 70 (212 µm)	0-5
No. 100 (150 µm)	0-2
No. 200 (75 µm)	0-2

<sup>1</sup> Locally available sand or abrasive material that is slightly outside of the gradation requirements may be approved by the RPR with concurrence by the seal coat manufacturer for the use of locally available sand or abrasive material. The RPR and manufacturer's field representative should verify acceptance during application of Control strips indicated under paragraph 608-3.2.

The Contractor shall provide a certification showing particle size analysis and properties of the material delivered for use on the project. The Contractor's certification may be subject to verification by testing the material delivered for use on the project.

**608-2.2 Asphalt Emulsion.** The asphalt emulsion shall meet the properties in the following table:

### Concentrated Asphalt Emulsion Properties

Properties	Specification	Limits
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	20 – 100 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	57% minimum
Sieve Test	ASTM D6933	0.1% maximum
24-hour Stability	ASTM D6930	1% maximum
5-day Settlement Test	ASTM D6930	5.0% maximum
Particle Charge <sup>1</sup>	ASTM D7402	Positive 6.5 maximum pH

<sup>1</sup> pH may be used in lieu of the particle charge test which is sometimes inconclusive in slow setting, asphalt emulsions.

The asphalt material base residue shall contain not less than 20% gilsonite, or uintaite and shall not contain any tall oil pitch or coal tar material and shall contain no less than one percent (1%) polymer.

### Tests on Residue from Distillation or Evaporation

Properties	Specification	Limits
Viscosity at 275°F (135°C)	ASTM D4402	1750 cts maximum
Solubility in 1, 1, 1 trichloroethylene	ASTM D2042	97.5% minimum
Penetration	ASTM D5	50 dmm maximum
Asphaltenes	ASTM D2007	15% minimum
Saturates	ASTM D2007	15% maximum
Polar Compounds	ASTM D2007	25% minimum
Aromatics	ASTM D2007	15% minimum

The asphalt emulsion, when diluted in the volumetric proportion of one part concentrated asphalt material to one part hot water shall have the following properties:

### One-to-One Dilution Emulsion Properties

Properties	Specification	Limits
<b>In Ready-to-Apply Form, one part concentrate to one part water, by volume</b>		
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	28.5% minimum
Pumping Stability <sup>1</sup>		Pass

<sup>1</sup> Pumping stability is tested by pumping one pint (475 ml) of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F (25°C), through a 1/4-inch (6 mm) gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the emulsified asphalt delivered to the project. If the asphalt emulsion is diluted at other than the manufacturer's facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties.

The COA shall be provided to and approved by the RPR before the emulsified asphalt is applied. The furnishing of the vendor's certified test report for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.



The asphalt material storage and handling temperature shall be between 50°F - 160°F (10°C - 70°C) and the material shall be protected from freezing, or whenever outside temperature drops below 40°F (4°C) for prolonged time periods.

Contractor shall provide a list of airport pavement projects, exposed to similar climate conditions, where this product has been successfully applied within at least 5 years of the project.

**608-2.3 Water.** Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use. Water used in making and diluting the emulsion shall be potable, with a maximum hardness of 90ppm calcium and 15ppm magnesium; deleterious iron, sulfates, and phosphates maximum 7ppm, and less than 1ppm of organic byproducts. Water shall be a minimum of 140°F (60°C) prior to adding to emulsion.

**608-2.4 Polymer.** The polymer shall meet the properties in the following table:

**Polymer Properties**

<b>Properties</b>	<b>Limits</b>
Solids Content	47% to 65%, Percent by Weight
Weight	8.0 to 9.0 pounds/gallon (1.07 to 1.17 kg/L)
pH	3.0 to 8.0
Particle Charge	Nonionic/Cationic
Mechanical Stability	Excellent
Film Forming Temperature, °C	+5°C, minimum
Tg, °C	22°C, maximum

The manufacturer shall provide a copy of the Certificate of Analysis (COA) for the polymer used in the seal coat; and the Contractor shall include the COA with the emulsified asphalt COA when submitting to the RPR.

**608-2.5 Seal Coat with Aggregate.** The Contractor shall submit friction test data from no less than one of the airport projects identified under 608-2.2. The test data must be from the same project and include technical details on application rates, aggregate rates, and point of contact at the airport to confirm use and success of sealer with aggregate.

Friction test data in accordance with AC 150/5320-12, at 40 or 60 mph (65 or 95 km/h) wet, must include as a minimum; the friction value prior to sealant application; two values, between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value between 180 days and 360 days after the application. The results of the tests between 24 and 96 hours shall indicate friction is increasing at a rate to obtain similar friction value of the pavement surface prior to application, and the long-term test shall indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

Seal coat material submittal without required friction performance will not be approved. Friction tests performed on this project cannot be used as a substitute of this requirement.

## **COMPOSITION AND APPLICATION RATE**

**608-3.1 Application Rate.** The approximate amounts of materials per square yard (square meter) for the asphalt surface treatment shall be as provided in the table for the treatment area(s) at the specified dilution rate(s) as noted on the plans. The actual application rates will vary within the range specified to suit field conditions and will be recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation.

### Application Rate

Dilution Rate	Quantity of Emulsion gal/yd <sup>2</sup> (l/m <sup>2</sup> )	Quantity of Aggregate lb/yd <sup>2</sup> (kg/m <sup>2</sup> )
1:1	0.10-0.17 (0.45-0.77)	0.20-0.50 (0.11-0.27)

**608-3.2 Control areas and control strips.** Prior to full application, the control strip must be accepted by the RPR. The surface preparation, personnel, equipment, and method of operation used on the test area(s) and control strip(s) shall be the same as used on the remainder of the work.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying control areas and/or control strips to determine the appropriate application rate of both emulsion and aggregate to be approved by the RPR.

A test area(s) and control strip(s) shall be applied for each differing asphalt pavement surface identified in the project. The test area(s) and control strip(s) shall be used to determine the material application rate(s) of both emulsion and sand prior to full production.

**a. For taxiway, taxilane and apron surfaces.** Prior to full application, the Contractor shall place test areas at varying application rates as recommended by the Contractor's manufacturer's representative to determine appropriate application rate(s). The test areas will be located on representative section(s) of the pavement to receive the asphalt surface treatment designated by the RPR.

**b. For runway and high-speed exit taxiway surfaces.** Prior to full application, the Contractor shall place a series of control strips a minimum of 300 feet (90 m) long by 12 feet (3.6 m) wide, or width of anticipated application, whichever is greater, at varying application rates as recommended by the manufacturer's representative and acceptable to the RPR to determine appropriate application rate(s). The control strips should be separated by a minimum of 200 feet between control strips. The area to be tested will be located on a representative section of the pavement to receive the asphalt surface treatment designated by the RPR. The control strips should be placed under similar field conditions as anticipated for the actual application. The skid resistance of the existing pavement shall be determined for each control strip with a continuous friction measuring equipment (CFME). The skid resistance of existing pavement can be immediately adjacent to the control strip or at the same location as the control strip if testing prior to application. The Contractor may begin testing the skid resistance of runway and high-speed exit taxiway control strips after application of the asphalt surface treatment has fully cured, generally 8 to 36 hours after application of the control strips depending on site and environmental conditions. Aircraft shall not be permitted on the runway or high speed exit taxiway control strips until such time as the Contractor validates that its surface friction meets the maintenance planning friction levels in AC 150/5320-12, Table 3-2 when tested at speeds of 40 and 60 mph (65 and 95 km/h) wet with approved CFME.

If the control strip should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment shall be made. Additional control strips shall be placed and additional skid resistance tests performed and evaluated. Full production shall not begin without the RPR's approval of an appropriate application rate(s). Acceptable control strips shall be paid for in accordance with paragraph 608-8.1.

### CONSTRUCTION METHODS

**608-4.1 Worker safety.** The Contractor shall obtain a Safety Data Sheet (SDS) for both the asphalt emulsion product and sand and require workmen to follow the manufacturer's recommended safety precautions.

**608-4.2 Weather limitations.** The asphalt emulsion shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. No material shall be applied in strong winds that interfere with the uniform application of the material(s), or when dust or sand is blowing or when rain is anticipated within eight (8) hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be at, or above 60°F (16°C) and rising. Seal coat shall not be applied when pavement temperatures are expected to exceed 130°F within the subsequent 72 hours if traffic will be opened on pavement within those 72 hours. During application, account for wind drift. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the emulsion. Should emulsion get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the RPR, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

**608-4.3 Equipment and tools.** The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

**a. Pressure distributor.** The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven hundred (700) feet per minute (213 m per minute). The equipment will be tested under pressure for leaks and to ensure proper set-up before use. The Contractor will provide verification of truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application per nozzle manufacturer, spray-bar height and pressure and pump speed appropriate for the viscosity and temperature of sealer material, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a 12-foot (3.7-m), minimum, spray bar with individual nozzle control. The distributor truck shall be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard (0.15 to 0.80 liters per square meter). These rates shall be computer-controlled rather than mechanical. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy.

The distributor truck shall effectively heat and mix the material to the required temperature prior to application in accordance with the manufacturer's recommendations.

The distributor shall be equipped with a hand sprayer to spray the emulsion in areas not accessible to the distributor truck.

**b. Aggregate spreader.** The asphalt distributor truck will be equipped with an aggregate spreader mounted to the distributor truck that can apply sand to the emulsion in a single pass operation without driving through wet emulsion. The aggregate spreader shall be equipped with a variable control system capable of uniformly distributing the sand at the specified rate at varying application widths and speeds. The aggregate spreader must be adjusted to produce an even and accurate application of specified aggregate. Prior to any seal coat application, the aggregate spreader will be calibrated onsite to ensure acceptable uniformity of spread. The RPR will observe the calibration and verify the results. The aggregate spreader will be re-calibrated each time the aggregate rate is changed either during the application of test strips or production. The Contractor may consult the seal coat manufacturer representative for procedure and guidance. The sander shall have a minimum hopper capacity of 3,000 pounds (1361 kg) of sand. Push-type hand sanders will be allowed for use around lights, signs and other obstructions, if necessary.

**c. Power broom/blower.** A power broom and/or blower shall be provided for removing loose material

from the surface to be treated.

**d. Equipment calibration.** Asphalt distributors must be calibrated within the same construction season in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

**608-4.4 Preparation of asphalt pavement surfaces.** Clean pavement surface immediately prior to placing the seal coat so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease from the asphalt pavement by scrubbing with a detergent, washing thoroughly with clean water, and then treat these areas with a spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with Item P-101, paragraph 101-3.6.

**a. New asphalt pavement surfaces.** Allow new asphalt pavement surfaces to cure so that there is no concentration of oils on the surface.

Perform a water-break-free test to confirm that the surface oils have degraded and dissipated. (Cast approximately one gallon (4 liters) of clean water out over the surface. The water should sheet out and wet the surface uniformly without crawling or showing oil rings.) If signs of crawling or oil rings are apparent on the pavement surface, additional time must be allowed for additional curing and retesting of the pavement surface prior to treatment.

**608-4.5 Emulsion mixing.** The application emulsion shall be obtained by blending asphalt material concentrate, water and polymer, if specified. Always add heated water to the asphalt material concentrate, never add asphalt material concentrate to heated water. Mix one part heated water to one part asphalt material concentrate, by volume.

Add 1% polymer, by volume, to the emulsion mix. If the polymer is added to the emulsion mix at the plant, submit weight scale tickets to the RPR. As an option, the polymer may be added to the emulsion mix at the job site provided the polymer is added slowly while the asphalt distributor truck circulating pump is running. The mix must be agitated for a minimum of 15 minutes or until the polymer is mixed to the satisfaction of the RPR.

**608-4.6 Application of asphalt emulsion.** The asphalt emulsion shall be applied using a pressure distributor upon the properly prepared, clean and dry surface at the application rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated treatment area. The asphalt emulsion should be applied at a temperature between 130°F (54°C) and 160°F (70°C) or in accordance with the manufacturer's recommendation.

If low spots and depressions greater than 1/2 inch (12 mm) in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be lightly broomed with a broom or brush type squeegee until the pavement surface is free of any pools of excess material.

During all applications, the surfaces of adjacent structures shall be protected to prevent their being spattered or marred.

**608-4.7 Application of aggregate material.** Immediately following the application of the asphalt emulsion, friction sand at the rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated application area, shall be spread uniformly over the asphalt emulsion in a single-pass operation simultaneous with the sealer application. The aggregate shall be spread to the same width of application as the asphalt material and shall not be applied in such thickness as to cause blanketing.

Sprinkling of additional aggregate material, and spraying additional asphalt material over areas that show up having insufficient cover or bitumen, shall be done by hand whenever necessary. In areas where hand work is necessitated, the sand shall be applied before the sealant begins to break.

Minimize aggregate from being broadcast and accumulating on the untreated pavement adjacent to an application pass. Prior to the next application pass, the Contractor shall clean areas of excess or loose aggregate and remove from project site.

### **QUALITY CONTROL (QC)**

**608-5.1 Manufacturer's representation.** The manufacturer's representative knowledgeable of the material, procedures, and equipment described in the specification is responsible to assist the Contractor and RPR in determining the appropriate application rates of the emulsion and aggregate, as well as recommendations for proper preparation and start-up of seal coat application. Documentation of the manufacturer representative's experience and knowledge for applying the seal coat product shall be furnished to the RPR a minimum of 10 work days prior to placement of the control strips. The cost of the manufacturer's representative shall be included in the Contractor's bid price.

**608-5.2 Contractor qualifications.** The Contractor shall provide documentation to the RPR that the seal coat Contractor is qualified to apply the seal coat, including personnel, and equipment, and has made at least three (3) applications similar to this project in the past two (2) years.

### **MATERIAL ACCEPTANCE**

**608-6.1 Application rate.** The rate of application of the asphalt emulsion shall be verified at least twice per day.

**608-6.2 Friction tests.** Friction tests in accordance with AC 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces, shall be performed on all runway and high-speed taxiways that received a seal coat. Each test includes performing friction tests at 40 mph and 60 mph (65 or 95 km/h) both wet, 15 feet (4.5 m) to each side of runway centerline with approved continuous friction measuring equipment (CFME). The Contractor shall coordinate testing with the RPR and provide the RPR a written report of friction test results. The RPR shall be present for testing.

### **METHOD OF MEASUREMENT**

**608-7.1 Asphalt surface treatment.** The quantity of asphalt surface treatment shall be measured by the square yards of material applied in accordance with the plans and specifications and accepted by the RPR. The Contractor must furnish the RPR with the certified weigh bills when materials are received for the asphalt material used under this contract. The Contractor must not remove material from the tank car or storage tank until initial amounts and temperature measurements have been verified.

### **BASIS OF PAYMENT**

**608-8.1** Payment shall be made at the contract unit price per square yard for the asphalt surface treatment applied and accepted by the RPR, and the contract unit price per lump sum for runway friction testing. This price shall be full compensation for all surface preparation, furnishing all materials, delivery and application of these materials, for all labor, equipment, tools, and incidentals necessary to complete the item, and any costs associated with furnishing a qualified manufacturer's representative to assist with control strips.

Payment will be made under:

Item P-608-8.1            Asphalt Surface Treatment – per square yard

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM C117	Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D5	Standard Test Method for Penetration of Asphalt Materials
ASTM D244	Standard Test Methods and Practices for Emulsified Asphalts
ASTM D2007	Standard Test Method for Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method
ASTM D2042	Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
ASTM D2995	Standard Practice for Estimating Application Rate of Bituminous Distributors
ASTM D4402	Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D5340	Standard Test Method for Airport Pavement Condition Index Surveys

### Advisory Circulars (AC)

AC 150/5320-12	Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces
AC 150/5320-17	Airfield Pavement Surface Evaluation and Rating (PASER) Manuals
AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements

**END OF ITEM P-608**

**ITEM P-610**  
**CONCRETE FOR MISCELLANEOUS STRUCTURES**

**DESCRIPTION**

**610-1.1** This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

**MATERIALS**

**610-2.1 General.** Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

**a. Reactivity.** Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

**610-2.2 Coarse aggregate.** The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

**Coarse Aggregate Grading Requirements**

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch (37.5 mm)	467 or 4 and 67
1 inch (25 mm)	57
3/4 inch (19 mm)	67
1/2 inch (12.5 mm)	7

**610-2.2.1 Coarse Aggregate susceptibility to durability (D) cracking.** Not used.

**610-2.3 Fine aggregate.** The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

**610-2.4 Cement.** Cement shall conform to the requirements of **C150 Type Type I or II.**

The chemical requirements for all cement types specified should meet suitable criteria for deleterious activity. Low alkali cements (less than 0.6% equivalent alkalies). Total Alkalies (Na<sub>2</sub>O and K<sub>2</sub>O) of the cement secured for the production of concrete shall be independently verified in accordance with ASTM C114 or ASTM C1365.

**610-2.5 Cementitious materials.**

**a. Fly ash.** Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

**b. Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

**610-2.6 Water.** Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

**610-2.7 Admixtures.** The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

**a. Air-entraining admixtures.** Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

**b. Water-reducing admixtures.** Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

**c. Other chemical admixtures.** The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

**610-2.8 Premolded joint material.** Premolded joint material for expansion joints shall meet the requirements of ASTM D1751.

**610-2.9 Joint filler.** The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.



**610-2.10 Steel reinforcement.** Reinforcing shall consist of Reinforcing Steel conforming to the requirements of ASTM A615, ASTM A706, ASTM A775, and ASTM A934.

**610-2.11 Materials for curing concrete.** Curing materials shall conform to one of the following:

**Materials for Curing**

<b>Waterproof paper</b>	<b>ASTM C171</b>
<b>Clear or white Polyethylene Sheeting</b>	<b>ASTM C171</b>
<b>White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B</b>	<b>ASTM C309</b>

**CONSTRUCTION METHODS**

**610-3.1 General.** The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

**610-3.2 Concrete Mixture.** The concrete shall develop a compressive strength of 4000 psi (28 MPa) in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard (280 kg per cubic meter). The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches (100 mm) as determined by ASTM C143.

**610-3.3 Mixing.** Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F (10°C) nor more than 100°F (38°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

**610-3.4 Forms.** Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

**610-3.5 Placing reinforcement.** All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

**610-3.6 Embedded items.** Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

**610-3.7 Concrete Consistency.** The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

**610-3.8 Placing concrete.** All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet (1.5 m). Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

**610-3.9 Vibration.** Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

**610-3.10 Joints.** Joints shall be constructed as indicated on the plans.

**610-3.11 Finishing.** All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

**610-3.12 Curing and protection.** All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

**610-3.13 Cold weather placing.** When concrete is placed at temperatures below 40°F (4°C), follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

**610-3.14 Hot weather placing.** When concrete is placed in hot weather greater than 85°F (30 °C), follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

## **QUALITY ASSURANCE (QA)**

**610-4.1 Quality Assurance sampling and testing.** Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

**610-4.2 Defective work.** Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

#### **METHOD OF MEASUREMENT**

**610-5.1** Concrete shall be considered incidental and no separate measurement shall be made.

#### **BASIS OF PAYMENT**

**610-6.1** Concrete shall be considered incidental and no separate payment shall be made. The installation shall include full compensation for furnishing all materials including reinforcement and embedded items and for all preparation, delivery, installation, and curing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-610-6.1	Concrete, incidental to other work items
----------------	--

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

American Concrete Institute (ACI)

ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

**END OF ITEM P-610**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-620**  
**RUNWAY AND TAXIWAY MARKING**

**DESCRIPTION**

**620-1.1** This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

**MATERIALS**

**620-2.1 Materials acceptance.** The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

**620-2.2 Marking materials.**

**Table 1. Marking Materials**

<b>Paint<sup>1</sup></b>				<b>Glass Beads<sup>2</sup></b>	
<b>Type</b>	<b>Color</b>	<b>Fed Std. 595 Number</b>	<b>Application Rate Maximum</b>	<b>Type</b>	<b>Application Rate Minimum</b>
Waterborne Type II	White <sup>3</sup>	37925	115 ft <sup>2</sup> /gal	Type I, Gradation A	7 lb/gal
Waterborne Type II	White <sup>4</sup>	37925	115 ft <sup>2</sup> /gal	Type III	10 lb/gal
Waterborne Type II	Yellow	33538 or 33655	115 ft <sup>2</sup> /gal	Type I, Gradation A	7 lb/gal
Waterborne Type II	Red	31136	115 ft <sup>2</sup> /gal	Type I, Gradation A	5 lb/gal
Waterborne Type II	Black	37038	115 ft <sup>2</sup> /gal	No Beads	No Beads
Waterborne Type II	Green	34108	115 ft <sup>2</sup> /gal	No Beads	No Beads
Waterborne Type II	Pink	1 part 31136 to 2 parts 37925	Not Used	Not Used	Not Used

<sup>1</sup> See paragraph 620-2.2a

<sup>2</sup> See paragraph 620-2.2b

<sup>3</sup> General application of White Paint

<sup>4</sup> Application of White Paint in Designators for Surface Painted Hold Markings

**a. Paint.** Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595 (see Table 1).

**Waterborne.** Paint shall meet the requirements of Federal Specification TT-P-1952F, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

Waterborne black paint should be used to outline a border at least 6 inches (150 mm) wide around markings on all light-colored pavements.

An initial application of pavement markings are required after paving operations are complete. The waterborne paint materials for temporary markings at 100% of the specified application rates.

Prior to reopening pavements, the RPR to verify that all markings comply with Part 139 requirements. Temporary markings not in compliance with AC 150/5340-1 will require a NOTAM regarding any non-standard marking be issued. For example, temporary markings without beads.

**b. Reflective media.** Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type I, Gradation A, except white paint for Surface Painted Hold Signs shall use Type III.

Glass beads for red and pink paint shall meet the requirements for Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Type III glass beads shall not be used in red and pink paint.

## CONSTRUCTION METHODS

**620-3.1 Weather limitations.** Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

**620-3.2 Equipment.** Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

**620-3.3 Preparation of surfaces.** Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminants that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water



shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

**a. Preparation of new pavement surfaces.** The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

**b. Preparation of pavement to remove existing markings.** Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

**c. Preparation of pavement markings prior to remarking.** Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

**620-3.4 Layout of markings.** The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

**620-3.5 Application.** A period of 30 days shall elapse between placement of surface course or seal coat and the final application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

**Marking Dimensions and Spacing Tolerance**

<b>Dimension and Spacing</b>	<b>Tolerance</b>
36 inch (910 mm) or less	±1/2 inch (12 mm)
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch (25 mm)
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch (50 mm)
greater than 60 feet (18.3 m)	±3 inch (76 mm)

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

**620-3.6 Application--preformed thermoplastic airport pavement markings.** Preformed thermoplastic pavement markings not used.

**620-3.7 Control strip.** Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

**620-3.8 Retro-reflectance.** Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 readings shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

**Minimum Retro-Reflectance Values**

Material	Retro-reflectance mcd/m <sup>2</sup> /lux		
	White	Yellow	Red
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than <sup>1</sup>	100	75	10

<sup>1</sup> Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance

**620-3.9 Protection and cleanup.** After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

## **METHOD OF MEASUREMENT**

**620-4.1a** The quantity of surface preparation shall be measured by the number of square feet (square meters) for each type of surface preparation specified in paragraph 620-3.3.

**620-4.1b** The quantity of markings shall be paid for shall be measured by the number of square feet (square meters) of painting.

**620-4.1c** The quantity of reflective media shall be paid for by the number of pounds (km) of reflective media.

**620-4.1d** Temporary markings not required.

## **BASIS OF PAYMENT**

**620-5.1** This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

**620-5.1a** Payment for surface preparation shall be made at the contract price for the number of square feet (square meters) for each type of surface preparation specified in paragraph 620-3.3.

**620-5.2b** Payment for markings shall be made at the contract price by the number of square feet (square meters) of painting.

**620-5.3c** Payment for reflective media shall be made at the contract unit price for the number of pounds (km) of reflective media.

**620-5.4d** Payment for temporary markings shall be made at the contract price for the number of square feet (square meters) of painting. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item. Temporary markings not required.

Payment will be made under:

Item P-620-5.1a	Surface Preparation per square foot (square meter)
Item P-620-5.2b	Marking per square foot (square meter)
Item P-620-5.3c	Reflective Media per pound (km)
Item P-620-5.4d	Temporary runway and taxiway marking per square foot. – Not Used.

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### **ASTM International (ASTM)**

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer

ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
------------	---

ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
-----------	---

Code of Federal Regulations (CFR)

40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
---	--

29 CFR Part 1910.1200 Hazard Communication	
--	--

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
---------------------	--

FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
---------------------	---

FED STD 595	Colors used in Government Procurement
-------------	---------------------------------------

Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based
-----------	-------------------------------

Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
---------------	--------------------------------

AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces
----------------	--

**END OF ITEM P-620**

**ITEM T-901  
SEEDING**

**DESCRIPTION**

**901-1.1** This item shall consist of soil preparation, seeding, fertilizing, and liming the areas shown on the plans or as directed by the RPR in accordance with these specifications.

**MATERIALS**

**901-2.1 Seed.** The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the RPR duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be the USDA recommended MAA (Maryland Aviation Administration) seed mixture due to it not being a wildlife attractant and applied as follows:

<b>Seed</b>	<b>Minimum Seed Purity (Percent)</b>	<b>Minimum Germination (Percent)</b>	<b>Rate of Application lb./acre</b>	<b>Rate of Application lb./1000 SF</b>
Predator Hard Fescue	98	90	131.25 (75%)	3.0 (75%)
Seven Seas Chewing Fescue	98	90	35 (20%)	0.8 (20%)
Wildhorse Kentucky Blue Grass	90	80	8.75 (5%)	0.2 (5%)
<b>TOTAL</b>			<b>175 lbs/acre</b>	<b>4 lbs/1000 SF</b>

Seeding shall be performed during the period between April 1 and June 1 and August 15 and October 14 inclusive, unless otherwise approved by the RPR.

**901-2.2 Lime.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 (850 µm) mesh sieve and 50% will pass through a No. 100 (150 µm) mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate shown in Table 1. All liming materials shall conform to the requirements of ASTM C602.

**Table 1 – Supplemental Lime**

Existing Soil pH	Limestone to be Added	
	Tons/Acre	Pounds/1000 SF
4.0 – 4.4	3	138
4.5 – 4.9	2	92
5.0 – 5.4	1	46

**901-2.3 Fertilizer.** Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

- A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
- A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
- A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be commercial fertilizer and shall be spread at the rate as shown in Table 2.

**Table 2 – Fertilizer Application Information**

Percent of Nutrients		Minimum Application Rate (Lbs per 1000 Sq. Ft.)	Measurement Factor
Initial	Refertilization		
10-10-10		20.0	1.0
15-15-15		13.4	1.5
19-19-19		10.5	1.9
	10-3-6	20.0	1.0
	12-2-8	16.7	1.2
	12-4-8	16.7	1.2

**901-2.4 Soil for repairs.** The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the RPR before being placed.

## CONSTRUCTION METHODS

**901-3.1 Advance preparation and cleanup.** After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches (125 mm) as a result of grading operations and, if immediately prior to seeding, the top 3 inches (75 mm) of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches (125 mm). Clods shall be broken and the top 3 inches (75 mm) of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

### **901-3.2 Dry application method.**

**a. Liming.** Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top 3 inches (75 mm) of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.

**b. Fertilizing.** Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

**c. Seeding.** Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

**d. Rolling.** After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot (60 to 97 kg per meter) of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot (223 to 298 kg per meter) of width for sandy or light soils.

### **901-3.3 Wet application method.**

**a. General.** The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

**b. Spraying equipment.** The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons (190 liters) over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons (380 liters) per minute at a pressure of 100 lb / sq inches (690 kPa). The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch (16 mm) solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating

line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet (6 to 30 m). One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet (15 m) in length shall be provided to which the nozzles may be connected.

**c. Mixtures.** Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds (100 kg) of lime shall be added to and mixed with each 100 gallons (380 liters) of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds (100 kg) of these combined solids shall be added to and mixed with each 100 gallons (380 liters) of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. The Contractor shall identify to the RPR all sources of water at least two (2) weeks prior to use. The RPR may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the RPR following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

**d. Spraying.** Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches (75 mm), after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the RPR, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

**901-3.4 Maintenance of seeded areas.** The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the RPR. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the RPR. A grass stand shall be considered adequate when bare spots are one square foot (0.01 sq m) or less, randomly dispersed, and do not exceed 3% of the area seeded.



## **METHOD OF MEASUREMENT**

**901-4.1** The quantity of seeding to be paid for shall be the number of units 1,000 square feet (sq m) measured on the ground surface, completed and accepted.

## **BASIS OF PAYMENT**

**901-5.1** Payment shall be made at the contract unit price per 1,000 square feet (sq m) or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901-5.1                      Seeding - per 1,000 square feet (sq m)

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C602                      Standard Specification for Agricultural Liming Materials

Federal Specifications (FED SPEC)

FED SPEC                      JJJ-S-181, Federal Specification, Seeds, Agricultural

Advisory Circulars (AC)

AC 150/5200-33                      Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

**END OF ITEM T-901**

THIS PAGE INTENTIONALLY LEFT BLANK

## **ITEM T-905 TOPSOIL**

### **DESCRIPTION**

**905-1.1** This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the RPR.

### **MATERIALS**

**905-2.1 Topsoil.** Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches (50 mm) or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh (75  $\mu$ m) sieve as determined by the wash test in accordance with ASTM C117.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

**905-2.2 Inspection and tests.** Within 10 days following acceptance of the bid, the RPR shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

### **CONSTRUCTION METHODS**

**905-3.1 General.** Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the RPR before the various operations are started.

**905-3.2 Preparing the ground surface.** Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the RPR, to a minimum depth of 2 inches (50 mm) to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm) in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary

moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

**905-3.3 Obtaining topsoil.** Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the RPR. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the RPR. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the RPR. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoil purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the RPR. The Contractor shall notify the RPR sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

**905-3.4 Placing topsoil.** The topsoil shall be evenly spread on the prepared areas to a uniform depth of 2 inches (50 mm) after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches (50 mm) or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the RPR. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

## **METHOD OF MEASUREMENT**

**905-4.1** Topsoil obtained on the site shall be measured by the number of cubic yards (cubic meters) of topsoil measured in its original position and stripped or excavated. Topsoil stockpiled by others and removed for topsoil by the Contractor shall be measured by the number of cubic yards (cubic meters) of topsoil measured in the stockpile. Topsoil shall be measured by volume in cubic yards (cubic meters) computed by the method of end areas.

**905-4.2** Topsoil obtained off the site shall be measured by the number of cubic yards (cubic meters) of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards (meters) computed by the method of end areas.

## **BASIS OF PAYMENT**

**905-5.1** Payment will be made at the contract unit price per cubic yard (cubic meter) for topsoil (obtained on the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**905-5.2** Payment will be made at the contract unit price per cubic yard (cubic meter) for topsoil (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-905-5.1	Topsoil (Obtained on Site or Removed from Stockpile – Not Used
Item T-905-5.2	Topsoil (Furnished from Off the Site) - per cubic yard (cubic meter)

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117	Materials Finer than 75 $\mu\text{m}$ (No. 200) Sieve in Mineral Aggregates by Washing
-----------	--

Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports
----------------	--

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

**END OF ITEM T-905**

THIS PAGE INTENTIONALLY LEFT BLANK

## **ITEM T-908 MULCHING**

### **DESCRIPTION**

**908-1.1** This item shall consist of furnishing, hauling, placing, and securing mulch on surfaces indicated on the plans or designated by the RPR.

### **MATERIALS**

**908-2.1 Mulch material.** Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Mulch shall be free from noxious weeds, mold, and other deleterious materials. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding, or to surrounding farm land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

**a. Hay.** Hay shall be native hay in an air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Hay shall be sterile, containing no fertile seed.

**b. Straw.** Straw shall be the stalks from threshed plant residue of oats, wheat, barley, rye, or rice from which grain has been removed. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Straw shall contain no fertile seed.

**c. Manufactured mulch.** Cellulose-fiber or wood-pulp mulch shall be products commercially available for use in spray applications.

**d. Asphalt binder.** Asphalt binder material shall conform to the requirements of ASTM D977, Type SS-1 or RS-1.

**908-2.2 Inspection.** The RPR shall be notified of sources and quantities of mulch materials available and the Contractor shall furnish him with representative samples of the materials to be used 30 days before delivery to the project. These samples may be used as standards with the approval of the RPR and any materials brought on the site that do not meet these standards shall be rejected.

### **CONSTRUCTION METHODS**

**908-3.1 Mulching.** Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the area shown on the plans or designated by the RPR. Straw or hay shall be spread over the surface to a uniform thickness at the rate of 2 to 3 tons per acre (1800 - 2700 kg per acre) to provide a loose depth of not less than 1-1/2 inches (38 cm) nor more than 3 inches (75 mm). Other organic material shall be spread at the rate directed by the RPR. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95% of the mulch in place on the slope shall be 6 inches (150 mm) or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than one inch (25 mm) nor more than 2 inches (50 mm).

**908-3.2 Securing mulch.** The mulch shall be held in place by light discing, a very thin covering of topsoil,

pins, stakes, wire mesh, asphalt binder, or other adhesive material approved by the RPR. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied. When an application of asphalt binder material is used to secure the mulch, the Contractor must take every precaution to guard against damaging or disfiguring structures or property on or adjacent to the areas worked and will be held responsible for any such damage resulting from the operation.

If the “peg and string” method is used, the mulch shall be secured by the use of stakes or wire pins driven into the ground on 5-foot (1.5-m) centers or less. Binder twine shall be strung between adjacent stakes in straight lines and crisscrossed diagonally over the mulch, after which the stakes shall be firmly driven nearly flush to the ground to draw the twine down tight onto the mulch.

### **908-3.3 Care and repair.**

**a.** The Contractor shall care for the mulched areas until final acceptance of the project. Care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the RPR, and erecting any barricades that may be shown on the plans before or immediately after mulching has been completed on the designated areas.

**b.** The Contractor shall be required to repair or replace any mulch that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the RPR, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor.

**c.** If the “asphalt spray” method is used, all mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons (32 liters) per 1,000 square feet (100 sq m), or as directed by the RPR, with a minimum of 6 gallons (24 liters) and a maximum of 10 gallons (40 liters) per 1,000 square feet (100 sq m) depending on the type of mulch and the effectiveness of the binder securing it. Asphalt binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope. An approved spray nozzle shall be used. The nozzle shall be operated at a distance of not less than 4 feet (1.2 m) from the surface of the mulch and uniform distribution of the asphalt material shall be required. A pump or an air compressor of adequate capacity shall be used to ensure uniform distribution of the asphalt material.

**d.** If the “asphalt mix” method is used, the mulch shall be applied by blowing, and the asphalt binder material shall be sprayed into the mulch as it leaves the blower. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons (32 liters) per 1,000 square feet (100 sq m) or as directed by the RPR, with a minimum of 6 gallons (24 liters) and a maximum of 10 gallons (40 liters) per 1,000 square feet (100 sq m) depending on the type of mulch and the effectiveness of the binder securing it.

## **METHOD OF MEASUREMENT**

**908-4.1** Mulching shall be measured in square yards (square meters) on the basis of the actual surface area acceptably mulched.

## **BASIS OF PAYMENT**

**908-5.1** Payment will be made at the contract unit price per square yard (square meter) for mulching. The price shall be full compensation for furnishing all materials and for placing and anchoring the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-908-5.1	Mulching - per square yard (square meter)
----------------	---



## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D977                      Standard Specification for Emulsified Asphalt

Advisory Circulars (AC)

AC 150/5200-33              Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

**END OF ITEM T-908**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM L-108**  
**UNDERGROUND POWER CABLE FOR AIRPORTS**

**DESCRIPTION**

**108-1.1** This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

**EQUIPMENT AND MATERIALS**

**108-2.1 General.**

**a.** Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

**b.** All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the RPR.

**c.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

**d.** All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

**e.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format. The RPR reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

**f.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation

Resistance Test.

**108-2.2 Cable.** Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

**108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods).** Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare copper wire. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be copper or copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 8 feet (2.4 m) long and 5/8 inch (16 mm) in diameter.

**108-2.4 Cable connections.** In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

**a. The cast splice.** A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable.

**b. The field-attached plug-in splice.** Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be

in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

**c. The factory-molded plug-in splice.** Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

**d. The taped or heat-shrink splice.** Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

**108-2.5 Splicer qualifications.** Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

**108-2.6 Concrete.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**108-2.7 Flowable backfill.** Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

**108-2.8 Cable identification tags.** Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

**108-2.9 Tape.** Electrical tapes shall be Scotch<sup>TM</sup> Electrical Tapes –Scotch<sup>TM</sup> 88 (1-1/2 inch (38 mm) wide) and Scotch<sup>TM</sup> 130C<sup>®</sup> linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M<sup>TM</sup>), or an approved equivalent.

**108-2.10 Electrical coating.** Electrical coating shall be Scotchkote<sup>TM</sup> as manufactured by 3M<sup>TM</sup>, or an approved equivalent.

**108-2.11 Existing circuits.** Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the

circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

**108-2.12 Detectable warning tape.** Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

## CONSTRUCTION METHODS

**108-3.1 General.** The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

**108-3.2 Installation in duct banks or conduits.** This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the RPR, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

**108-3.3 Installation of direct-buried cable in trenches.** Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

**a. Trenching.** Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

- When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.
- Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill material may alternatively be used.

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

**b. Backfilling.** After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall encompass all cables ; be 3 inches (75 mm) deep, loose measurement; and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25.0 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent material. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfilled with controlled low strength material (CLSM) in accordance with P-153.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the RPR. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the



color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inches (200 mm) minimum below finished grade.

**c. Restoration.** Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the topsoiling, fertilizing, liming, seeding, and mulching as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfilled with controlled low strength material (CLSM) in accordance with P-153. Restoration shall be considered incidental to the pay item of which it is a component part.

**108-3.4 Cable markers for direct-buried cable.** The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep. Stencils shall be used for cable marker lettering; no hand lettering shall be permitted.

At the location of each underground cable connection/splice, except at lighting units, or isolation transformers, a concrete marker slab shall be installed to mark the location of the connection/splice. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the RPR. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the RPR. Furnishing and installation of cable markers is incidental to the respective cable pay item.

**108-3.5 Splicing.** Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

**a. Cast splices.** These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the RPR.

**b. Field-attached plug-in splices.** These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint or (3) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

**c. Factory-molded plug-in splices.** These shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) Wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint. (2) Covered with heat shrinkable

tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint. or (3) On connector kits so equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

**d. Taped or heat-shrink splices.** A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping, wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. The manufacturer's recommendation for stretching tape during splicing shall be followed. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminants prior to application.

**e. Assembly.** Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

**108-3.6 Bare counterpoise wire installation for lightning protection and grounding.** If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

**a. Equipotential.** The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches

(300 mm) maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

**b. Isolation.** Not used.

**c. Common Installation requirements.** When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

**d. Parallel Voltage Systems.** Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

**108-3.7 Counterpoise installation above multiple conduits and duct banks.** Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of

vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

**108-3.8 Counterpoise installation at existing duct banks.** When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

**108-3.9 Exothermic bonding.** Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

- a. All slag shall be removed from welds.
- b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.
- c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

**108-3.10 Testing.** The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

- a. Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.
- b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

- c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.
- d. That all affected circuits (existing and new) are free from unspecified grounds.
- e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 50 megohms. Verify continuity of all series airfield lighting circuits prior to energization.
- f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits

or circuit segments is not less than 100 megohms.

**g.** That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

**h.** That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

**i.** That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

## **METHOD OF MEASUREMENT**

**108-4.1** The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

**108-4.2** Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack. Cable and counterpoise slack is considered incidental to this item and is included in the Contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack.

**108-4.3** No separate payment will be made for ground rods.

## **BASIS OF PAYMENT**

**108-5.1** Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the RPR. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit - per linear foot (meter)
Item L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above the Duct Bank or Conduit, Including Connections/Terminations - per linear foot (meter)

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

### Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

### ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

### Mil Spec

MIL-PRF-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

### National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems

### American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
------------------	---

### Federal Aviation Administration Standard

FAA STD-019E	Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment
--------------	--

**END OF ITEM L-108**

**ITEM L-110**  
**AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS**

**DESCRIPTION**

**110-1.1** This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits and removal of existing duct banks. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

**EQUIPMENT AND MATERIALS**

**110-2.1 General.**

**a.** All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

**b.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

**c.** All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

**d.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

**e.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**110-2.2 Steel conduit.** Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other

similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

**110-2.3 Plastic conduit.** Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I—Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II—Schedule 40 PVC suitable for either above ground or underground use.

c. Type III — Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III —HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

**110-2.4 Split conduit.** Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

**110-2.5 Conduit spacers.** Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

**110-2.6 Concrete.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**110-2.7 Precast concrete structures.** Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

**110-2.8 Flowable backfill.** Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

**110-2.9 Detectable warning tape.** Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.



## CONSTRUCTION METHODS

**110-3.1 General.** The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill may alternatively be used.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

- a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

- b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable. In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

**110-3.2 Duct banks.** Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans,

all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

**110-3.3 Conduits without concrete encasement.** Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6.3 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6

inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

**110-3.4 Markers.** The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

**110-3.5 Backfilling for conduits.** For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

**110-3.6 Backfilling for duct banks.** After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

**110-3.7 Restoration.** Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include topsoiling, fertilizing, liming, seeding, and mulching shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

**110-3.8 Ownership of removed cable.** The Contractor shall obtain ownership of removed cable and shall properly disposed of the cable materials off the Airport site.

#### **METHOD OF MEASUREMENT**

**110-4.1** Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

#### **BASIS OF PAYMENT**

**110-5.1** Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Concrete Encased Electrical Conduit, 1-Way-2-inch - per linear foot (meter)
Item L-110-5.2	Non-Encased Electrical Conduit, 1-Way-2-inch - per linear foot (meter)
Item L-110-5.3	Removal of Existing Cable in Electrical Conduit/Duct to be Abandoned - per linear foot (meter)

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

### ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
-----------	--

### National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
---------	--------------------------------

### Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

**END OF ITEM L-110**

**ITEM L-125**  
**INSTALLATION OF AIRPORT LIGHTING SYSTEMS**

**DESCRIPTION**

**125-1.1** This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

**EQUIPMENT AND MATERIALS**

**125-2.1 General.**

**a.** Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not perform as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

**b.** Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

**c.** All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

**d.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR's opinion, does not meet the system design and the standards and codes, specified herein.

**e.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. All LED light fixtures, with the exception of obstruction lighting (AC 150/5345-43) must be warranted by the manufacturer for a minimum of 4 years after date of installation inclusive of all electronics. Obstruction lighting warranty is set by the individual manufacturer.

**125-2.2 Conduit/Duct.** Conduit shall conform to Specification Item L-110 Airport Underground Electrical Duct Banks and Conduits.

**125-2.3 Cable and Counterpoise.** Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

**125-2.4 Tape.** Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

**125-2.5 Cable Connections.** Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

**125-2.6 Retroreflective Markers.** Not required.

**125-2.7 Runway and Taxiway Lights.** Runway and taxiway lights shall conform to the requirements of AC 150/5345-46. Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

#### **Lights**

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-852G(L)	2	1	3		L-868	Yellow	L-830	See Notes 1,2,3 below

**Note 1: Provide fixture with arctic kit**

**Note 2: Provide fixture with one (1) L-823 cord set**

**Note 3: Provide snow plow ring compatible with fixture**

**125-2.8 Runway and Taxiway Signs.** Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44.

#### **Signs**

Type	Size	Style	Class	Mode	Notes
L-858Y(L)					NONE
L-858R(L)					NONE
L-858L(L)					NONE

**NO New Signs for this project. Only relocation of existing sign panels between existing signs.**

**125-2.9 Runway End Identifier Light (REIL).** Not required.

**125-2.10 Precision Approach Path Indicator (PAPI).** Not required.

**125-2.11 Circuit Selector Cabinet.** Not required.

**125-2.12 Light Base and Transformer Housings.** Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Light Duty Light bases shall be Type L-867, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Aircraft and Heavy Vehicle Loading Light bases shall be Type L-868, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

**125-2.13 Isolation Transformers.** Isolation Transformers shall be Type L-830, size as required for each



installation. Transformer shall conform to AC 150/5345-47.

## **INSTALLATION**

**125-3.1 Installation.** The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

The Contractor shall salvage all specified removed equipment, not being relocated, to the Owner as noted on the plans.

**125-3.2 Testing.** All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

**125-3.3 Shipping and Storage.** Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the RPR, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer's recommendations.

**125-3.4 Elevated and In-pavement Lights.** Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

## **METHOD OF MEASUREMENT**

**125-4.1** Runway and taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR. Guidance sign panel relocations will be measured by the number of each installed as completed units, in place, ready for operation, and accepted by the RPR.

## **BASIS OF PAYMENT**

**125-5.1** Payment will be made at the Contract unit price for each complete runway or taxiway light or guidance sign panel relocation installed by the Contractor and accepted by the RPR. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item L-125-5.1	Install L-852G(L) In-Pavement Runway Guard Light – per each
Item L-125-5.2	Relocate Existing Elevated L-804(L) Runway Guard Light – per each
Item L-125-5.3	Relocate Existing Airfield Guidance Sign Panels – per each
Item L-125-5.4	Remove Airfield Guidance Sign & Foundation – per each
Item L-125-5.5	Remove Existing L-852G(L) In-Pavement Runway Guard Light – per each
Item L-125-5.6	Relocate Existing L-852C(L) In-Pavement Taxiway Centerline Light – per each
Item L-125-5.7	Install New L-867 Type 1A, Size B Light Base Junction Can – per each

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series to Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program

#### Engineering Brief (EB)

EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures
-----------	---

**END OF ITEM L-125**

**TECHNICAL SPECIFICATIONS**  
**SCHEDULES B & C – TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’**

THIS PAGE INTENTIONALLY LEFT BLANK

TECHNICAL SPECIFICATIONS  
SCHEDULES B & C – TAXIWAY ‘H’ RECONFIGURATION TO TAXIWAY ‘K’  
TABLE OF CONTENTS

G-001	Special Work Requirements .....
M-100	Gate Guard Allowance.....
M-200	Maintenance and Protection of Traffic .....
M-300	Modifications to ALCMS Equipment Allowance .....
M-400	Field Data Collection for GIS Survey Conversion .....
M-500	Engineer’s Field Office.....
M-600	Construction Access Modifications .....
C-100	Contractor Quality Control Program .....
C-102	Temporary Air and Water Pollution, Soil Erosion, and Siltation Control .....
C-105	Mobilization.....
C-110	Method of Estimating Percentage of Materials Within Specification Limits (PWL) .....
P-101	Preparation/Removal of Existing Pavement .....
P-152	Excavation, Subgrade and Embankment .....
P-154	Subbase Course.....
P-209	Crushed Aggregate Base Course .....
P-401	Asphalt Pavement Mix.....
P-403	Asphalt Pavement Mix – Base Course.....
P-603	Emulsified Asphalt Tack Coat .....
P-605	Joint Sealants for Pavement .....
P-606	Adhesive Components, Two-Component for Sealing Wire and Lights in Pavement.....
P-608	Emulsified Asphalt Seal Coat .....
P-610	Concrete for Miscellaneous Structures .....
P-620	Runway and Taxiway Marking.....
F-162	Chain Link Fence.....
D-701	Pipe for Storm Drains and Culverts .....
D-705	Pipe Underdrains for Airports.....
D-751	Manholes, Catch Basins, Inlets and Inspection Holes .....
T-901	Seeding.....
T-905	Topsoil .....
T-908	Mulching.....

L-107	Airport Wind Cones .....
L-108	Underground Power Cable for Airports .....
L-109	Airport Transformer Vault and Vault Equipment .....
L-110	Airport Underground Electrical Duct Banks and Conduits .....
L-115	Electrical Manholes and Junction Structures .....
L-125	Installation of Airport Lighting Systems .....

Latest Revision: FAA Standard Specifications taken from AC 150/5370-10H dated 12/21/2018

## ITEM G-001 SPECIAL WORK REQUIREMENTS

### GENERAL

**001-1.1 General.** The purpose of these requirements is to ensure that the contract work does not damage private property or create any hazard to aircraft operations, and to bring to the Contractor's attention special coordination that the Contractor should be aware of that may be unique to airfield construction or unique to the Owner's Facility. It is Contractor's responsibility to conduct all work in strict accordance with the requirements set forth herein and to fully cooperate with the Resident Project Representative (RPR) in every way necessary to fulfill the purposes of these requirements as set forth above.

**001-1.2 Work Limitations.** All work shall be performed during the [hours of 6 AM to 6 PM Monday through Friday. Work on weekends is permitted and shall be requested to the RPR 72 hours in advance.](#) Work may not be allowed on specific days as determined by the RPR and/or the Owner. Such days will not count towards exhausted contract time.

The following specification sections and regulations further define how work must be executed.

- General Provisions Section 80-04 Limitation of Operations
- General Provisions Section 80-04.1 Operational Safety on Airport During Construction
- FAA Advisory Circular 150/5370-2 (latest revision) "Operational Safety on Airports during Construction"
- The Construction Safety and Phasing Plans
- Airport Security and Compliance Requirements

**001-1.3 Prior Notification.** In accordance with Section 100-04 *Project Progress Schedule* of the General Provisions, the Contractor shall provide an overall project schedule prior to the pre-construction meeting. This schedule shall be updated during the project as specified.

In addition, the Contractor shall coordinate with the RPR and Owner and submit a detailed written weekly schedule of work that provides the work task by specification number for each day of the following week. The weekly schedule shall be submitted each week for the duration of the project, a minimum of 3-days prior to the week covered by the schedule.

In accordance with Section 80-04 of the General Provisions, the Contractor shall notify the RPR at least 48 hours in advance of the time he intends to start work or begin work in a new work area. It should be noted by the Contractor that 48 hours is the minimum time required by the Owner to issue a proper Notice to Airmen (NOTAM) of the pending construction activities. The Contractor's weekly construction schedules will also provide advance notice. The RPR and/or Owner may disallow work in areas not included in the weekly schedule and for which the required 48-hours advance notice is not provided. Such instance shall not be a valid claim for delays. Prior to the beginning of work each day, the Contractor's Site Superintendent shall meet with the RPR to discuss the day's work schedule. The Contractor must notify the RPR at least 24-hours in advance of any items that will require acceptance testing. 72-hours' notice must be provided for testing on Mondays or testing the day immediately following a Holiday.

**001-1.4 Operational Safety.** Work performed under this contract will require safety and phasing in accordance with FAA regulations defined in Section 80-04.1 *Operational Safety on Airports During Construction* of the General Provisions. The Contractor shall take all precautions necessary to ensure the safety of operating aircraft, as well as his/her own equipment and personnel.

**001-1.5 Coordination.** The Contractor must coordinate all operations with the RPR and/or Owner. The

RPR or Owner will handle coordination with the Federal Aviation Administration, Air Traffic Control Tower, and Tenants.

**001-1.6 Regulations.** All work shall be performed in accordance with FAA Advisory Circular 150/5370-2 (latest revision), “*Operational Safety on Airports during Construction*”.

**001-1.7 Construction Safety and Phasing Plans (CSPP).** In addition, all work shall be performed in accordance with the approved Construction Safety and Phasing Plans. The plans have been prepared by the Owner and RPR and approved by the FAA. It outlines the site-specific requirements for safely performing the work in accordance with AC 150/5370-2 (latest revision). The Contractor shall review, in detail, the Construction Safety and Phasing Plans.

**001-1.8 Contractor’s Safety Plan Compliance (SPCD).** Once the Contractor has read and fully understands the CSPP, they shall prepare and submit for approval a Safety Plan Compliance Document (SPCD) as required by FAA AC 150/5370-2 (latest revision).

Similar to a shop drawing the SPCD, including all requirements of this specification, shall be submitted to the RPR for review prior to the Pre-Construction Meeting. The SPCD must be reviewed and approved by the Owner prior to issuance of the notice-to-proceed.

The Contractor shall designate an individual as the Site Safety officer (SSO). The SSO may be the Contractor’s Site Superintendent who is responsible for day to day operations on the site. The SSO shall be on site daily and work on a daily basis to implement and enforce the CSPP and SPCD. The SSO shall conduct daily inspections. Among other items, the daily inspections shall include inspection of the barricades, lights, closure markers and protection of the taxiway/runway safety and object free areas.

When necessary, the SSO will work with the RPR and Owner on safety related items.

**001-1.9 Barricades.** The Contractor shall place and maintain construction barricades to clearly define and close work areas to aircraft operations. The barricades are shown in the safety and phasing plans. Barricades shall be placed as shown or as directed by the RPR and/or Owner. Barricades shall meet the minimum requirement of FAA AC 150/5370-2 (latest revision). Refer to details in the contract documents. All temporary lights and barricades shall be weighted against jet blasts (100 mph). The barricades shall be supplied by the Contractor. The Contractor will maintain ownership of the barricades at the completion of the project. Reference Section 70-08 *Barricades, Warning Signs, and Hazard Markings* of the General Provisions for further requirements.

**001-1.10 Runway and Taxiway Closure Markers.** The Contractor shall transport, place, and maintain runway and taxiway closure markers to clearly define surfaces closed to aircraft operations. The Runway Closure and Taxiway Closure Markers shall be supplied by the Owner. The required markers are shown in the contract drawings. Markers shall be placed as shown or as directed by the RPR and/or Owner. Closure Markers shall meet the minimum requirement of FAA AC 150/5370-2 (latest revision). The method and procedure for securing the markers from dislodging must be approved by the Owner and RPR. Refer to marker details in the contract documents.

**001-1.11 Height Restrictions.** No equipment will be allowed to penetrate the Runway approach surfaces and transitions defined in 49 CFR Part 77 when the runway is active. Tall equipment, such as cranes or boom trucks, will be required to have a flag attached to the highest point. Additionally, during periods of darkness or reduced visibility a red light at the highest point shall also be required.

**001-1.12 Marking of Vehicles and Equipment.** Each motorized vehicle operating on the airport shall be equipped with an amber flashing light. All equipment must have a 3-foot square flag consisting of international orange and white squares not less than one foot square displayed in full view above the vehicle.



Equipment must also have an amber flashing light when operated during periods of limited visibility including darkness, fog, and rain. When not in use, all equipment shall be returned to the designated staging area and lowered to the maximum extent possible. All Contractor and subcontractor vehicles shall have the company identification plainly visible on both sides of the vehicle in order to identify the vehicle.

**001-1.13 Setback Requirements.** No construction operations shall be carried on within 129.5 feet from the centerline of any active taxiway or within 250 feet of the centerline of any active runway unless prior approval has been obtained and such actions are included in the phasing plans. The distances above represent the Taxiway Object Free Area and the Runway Object Free Area respectively.

**001-1.14 Protection of Restricted Areas.** The Contractor shall stake and permanently mark on the ground with a readily recognizable marking (football field marking, flagging, cones, or similar material) the restriction lines adjacent to the work area so that workmen can readily recognize the limitations. The restricted areas are defined in the phasing plans and contract drawings.

**001-1.15 Trenches and Excavations.** The Contractor will not be permitted to leave any trenches or other excavations open at night, on weekends or at other times when the Contractor is not on the site, except as approved by the RPR. Open trenches must be clearly defined, confined to the work area(s), and completely surrounded with construction barricades. In addition, no excavations exceeding three inches (3”) in depth shall be left open within the object free areas while the runway, taxiways, or aprons, are in use. All excavations in paved areas must be backfilled and the pavement repaired and properly cured prior to the area being opened to traffic.

**001-1.16 Grading of Temporary Conditions.** The following applies when runways or taxiways must be re-opened. The Contractor shall ensure that the work area within the safety areas of the runways, taxiways and aprons are graded away from the pavements at a maximum slope of 5% and shall be left in such condition that it will drain readily and effectively and will not pose a hazard to aircraft. No piles of soil shall be left unspread, no drops or projections in excess of three inches, no sharp changes in grade will be permitted, and the surface shall be thoroughly compacted.

**001-1.17 Radio Control and Communication.** At a minimum, the Contractor shall have two-way communications between the superintendent, escorts, and gate guards to coordinate access to and from the work site. No FAA or airport frequency shall be used for this purpose.

When work areas are adjacent to, within, or require traversing active movement areas (such as taxiways and the runway) the Contractor shall have on site at all times at least two radios capable of monitoring the airport ground frequency (121.9). The radio shall be capable of reliable two-way communications from any location on the airport. The Contractor shall, before the start of construction, test his/her radio(s) with the appropriate agencies to demonstrate the capabilities and to demonstrate the performance of the operator and the equipment. Only MHT Operations will communicate directly with the ATCT. The Contractor shall operate these radios, at his/her expense

**001-1.18 Flagpersons.** The Contractor shall provide flagpersons or uniformed officers at locations where the haul routes enter public streets or highways from airport property in accordance with the applicable local requirements. Additionally, the Contractor shall provide flag persons whenever the service road is restricted to one lane of traffic.

**001-1.19 Owner Provided Escorts.** The Owner will provide escorts throughout the duration of construction. Contractor to coordinate schedule of activities at least one week in advance so that the Owner can schedule escorts.

**001-1.20 Contractor Provided Escorts.** Not required, except for the ALCMS modification work as described in Section M-300 *Modifications to ALCMS Equipment*.

**001-1.21 Haul Routes.** When public highways must be used for haul routes, it will become the Contractors responsibility to obtain the proper permits needed for this function and to obey all rules and regulations pertinent to the public highways.

Haul routes on the airport are shown on the contract drawings and the safety plans. The Contractors vehicles and equipment shall operate within the limits of the indicated haul route.

The Contractor's personnel and vehicles will not have access to the entire airport, but shall be limited to the designated work area(s), staging area(s), and haul route(s).

All paved haul roads or access roads shall be kept clean at all times to prevent the accumulation of dirt and mud and the generation of dust by sweeping, washing or other methods as directed by the Airport. Unpaved haul roads, if any, shall be maintained by blading and filling when directed by the Airport and dust shall be controlled at all times.

All paved haul roads disturbed shall be restored to their original condition or better before the contract will be considered complete. All restoration and dust control on haul roads shall be at the Contractors expense.

All non-paved areas on the airport which are disturbed by the Contractors operations shall be scarified or otherwise loosened to a depth not less than five inches (5"). Clods shall be broken and the top three inches (3") of soil shall be worked into a satisfactory seedbed by disking, or by use of cultipackers, rollers, drags, harrows, or other appropriate means. This area shall be seeded, fertilized and mulched.

**001-1.22 Security and Contractor Provided Gate Guards.** The Contractor shall comply with all airport security requirements as directed by the Owner. The Contractor's personnel, equipment, materials and deliveries shall be subject to security checks prior to or while on airport property. Any delays incurred due to security inspections shall not be a valid claim for delays.

The Contractor is responsible for maintaining controlled access to the airfield via any and all project access gates. The Contractor must provide an Owner approved security gate guard during all work hours. Gate guards are required to have an Airport issued SIDA badge. The Contractor shall only allow access to personnel directly working on the project. The access gate will be opened and closed by a MHT Airport Operations Specialist.

Personal Vehicles (POV ) are not permitted on the Airfield. The Contractor shall provide safe and adequate transportation to and from the area where POV s are parked and the work area(s).

**001-1.23 Disposal of Surplus and Unsuitable Materials.** All surplus and unsuitable materials not identified to be retained by the Owner, whether suitable or unsuitable, shall be legally disposed of by the Contractor off airport property. No separate measurement or payment will be made for the handling, hauling or disposal, but rather shall be incidental to the item that generated that material.

**001-1.24 Storm Water Management.** The Contractor is responsible for managing all storm water for the duration of the project including all diversion and dewatering of the site. The Contractor is also responsible for repairing all damage caused by storm water. All costs associated with the storm water management shall be incidental to the overall project. The Contractor shall follow all U. S. Environmental Protection Agency and N.H. Department of Environmental Service regulations.

**001-1.25 U. S. EPA National Pollutant Discharge Elimination System (NPDES) Construction General Permit for Stormwater Discharges during Construction.** The Contractor shall refer to Section C-102 *Temporary Air and Water Pollution, Soil Erosion, And Siltation Control* for additional information

concerning the notification requirements to be covered under the US Environmental Protection Agency (EPA) NPDES Construction General Permit for Stormwater Discharges during Construction and the preparation of a Storm Water Pollution Prevention Plan (SWPPP). Additional information relating to the submission of the

**001-1.26 Storage of Materials and Equipment.** The area for storing materials and parking/servicing equipment is shown in the contract drawings. The Contractor will be required to return all equipment to the appropriate Contractor's staging area at the end of work, each day, unless otherwise approved.

Equipment shall be parked in the designated area when not in use.

The Contractor shall provide all necessary temporary fencing and gates to protect materials and equipment from pilferage. The Owner is not responsible for any vandalized equipment or materials stored on the property.

Any area occupied or utilized by the Contractor shall be maintained in a clean and orderly condition satisfactory to the Owner. At the completion of the project, all Contractors' facilities shall be removed promptly and in a workman like manner and the area left clean and free of all debris or surplus material. The Contractor is responsible for restoring to original condition any areas used for the Contractor's operation at no additional cost to the Owner.

**001-1.27 Maintenance of the Construction Site.** The Contractor shall keep the construction site free of paper, boxes, and other debris that could be blown onto the runways, taxiways, and/or aprons.

All airport pavements shall be kept clear and clean at all times. All rocks, mud, and other debris carried on to the airport pavement by the Contractor's equipment must be report to the RPR or Airport Operations. Airport Operations will then close the affected area to air traffic and the Contractor will immediately sweep the area to the satisfaction of Airport Operations.

The Contractor shall have access to the equipment for the application of water to control dust within the construction site and on haul roads. The equipment shall be equipped with a shut-off control valve which can be operated from the cab by the operator. The Contractor shall apply water for dust control as necessary to prevent dust from the construction site and/or haul roads from being a hazard to aircraft and from being a nuisance to the public as direct by the RPR. All water shall be supplied by the Contractor.

The Contractor shall maintain at the job site at all times while the construction under this contract is in progress a self-propelled, self-contained vacuum sweeper with rotating brooms and with a 4-cubic yard capacity approved by the RPR. The sweeper shall operate as necessary to keep active aircraft pavements, access roads and the work areas clean. At the close of each day's work, all active aircraft pavements and airport paved roads used or dirtied by the Contractor shall again be swept.

The Contractor shall also be responsible for supplying any other equipment as may be necessary to clean all areas that are contaminated as a result of his/her operations to the complete satisfaction of the RPR and the Owner.

Trucks loaded in the construction area shall have loads trimmed as necessary to ensure that no particles, stones, or debris will fall off and that no legal load limits are exceeded.

The Contractor shall be particularly careful not to track foreign material onto pavements outside of the work area(s) (e.g., tack-coat, rocks, etc). The Contractor shall be responsible for removing foreign materials from vehicle tires prior to the vehicle leaving its work area.

**001-1.28 Maintenance of the Existing Airfield Lighting.** All existing airfield lighting systems required to safely operate aircraft shall be operational each night and during inclement weather throughout the construction period.

It shall be the responsibility of the Contractor to check the operation of the existing lights each day, to notify the RPR and the Owner of any problems and make any repairs necessary due to his/her operation.

The Contractor shall furnish and install all materials necessary to provide temporary lighting and make any temporary connections to keep the existing airfield lighting operational until the new lighting fixtures, cables, etc. can be installed.

**001-1.29 Smoking.** Absolutely no smoking will be permitted within the AOA. Any Contractor violating this rule shall be asked to leave the premises.

**001-1.30 Employee Identification Badges.** Full-time competent and responsible employees of the Contractor, such as superintendents and foremen, shall obtain an Airport SIDA badge. Additionally, employees who will be onsite for more than two continuous weeks shall obtain an Airport SIDA badge. The SIDA badge requires finger printing screening and a criminal history check. The badge application process may take up to fourteen (14) days, the Contractor shall plan accordingly.

The Contractor shall have a minimum of 1/2 (50%) of on-site workers, including sub-contractors, submit to the badging process, unless otherwise approved by MHT Operations Management. Badged individuals must display their Airport issued badges on their outermost garment at all times while on the airfield.

Refer to the Construction Safety and Phasing Plan (CSPP) and Supplemental Provision documents for more information and costs associated with obtaining badges and vehicle permit stickers. The costs associated with security access badges are the responsibility of the Contractor and shall not be paid for by the Owner.

At all times while on the airfield, non-badged workers must be:

1. Within 100 feet of a badged worker
2. Within visual contact of a badged worker
3. Able to respond to the requests of a badged worker
4. Able to command the attention of a badged worker.

Any non-badged workers will not be allowed on the airfield without valid picture identification acceptable to the TSA (current and valid driver's license, passport, etc.), and shall remain with a badged worker or Airport escort at all times.

The Contractor shall provide the Owner with a list of employees on the job site and their badge number. The list shall include subcontractors and employees. The list shall be updated and submitted weekly.

**Upon completion of the contract the Contractor shall turn all the badges in to the Owner for disposal.**

**001-1.31 Record Documents.** The Contractor shall provide all Final Project Documentation as specified throughout the projects specifications and summarized in FAA General Provisions Section 90 *Measurement and Payment* paragraph 90-11 *Contractor Final Project Documentation*. The Record Drawings shall also include digital submission as outlined in Section M-400 *Field Data Collection for GIS Survey Conversion* and other sections, as well as provided in AutoCAD and PDF formats.

## **MATERIALS**

**001-2.1 Materials.** Prior to ordering, the Contractor shall submit shop drawings to the RPR for all materials to be used on the project. The submittals and shop drawings shall include a manufacturer's certification that each product meets the specified standard(s), when applicable. Materials not reviewed and approved prior to any installation for the project are subject to having the Contractor remove the unacceptable materials and replaced with approved materials at no additional expense to the Owner.

## METHOD OF MEASUREMENT

**001-3.1 Mobilization.** Mobilization shall be measured in accordance with Item C-105 *Mobilization* lump sum item.

**001-3.2 Safety and Phasing.** Safety and Phasing items as outlined in Section M-200 *Maintenance and Protection of Traffic* and the Contract Documents shall include: Contractor provided barricades, cones, taxiway closure markers **(to be provided by the Owner)**, lighted X for runway closure **(to be provided by the Owner)**, construction signs, furnishing and installing blank panels for existing guidance signs, covering lights during closures as indicated, disabling circuits during closures as indicated, routing new temporary FAA L-824 cable with temporary connections to keep light circuits active as indicated, lockout/tagout of circuits, maintenance of the construction site, sweeping, application of water for dust control and clean-up of stockpiles on pavements, flaggers, radios, training, badging, badging fees, preparation of required schedules, and all requirements of the project safety and phasing plans. It shall also include all work associated with the Owner provided barricades. Assembly, transport, placement, repositioning, maintaining, disassembly and removal of all safety and phasing items shall not be measured separately but rather shall be considered incidental to the item. All Safety and Phasing materials and work will not be measured separately and shall be incidental to the lump sum item for the requirements outlined in Section M-200 *Maintenance and Protection of Traffic*.

**001-3.3 Contractor's Safety Plan Compliance Document (SPCD).** The Contractor's preparation and submission of the SPCD will not be measured separately and shall be incidental to the lump sum item for the requirements outlined in Section M-200 *Maintenance and Protection of Traffic*.

**001-3.4 Safety Barricades.** Safety barricades will not be separately measured and shall be incidental to the lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*.

**001-3.5 Gate Guard - Allowance.** Measurement for this allowance will be as outlined in Item M-100 *Gate Guard Allowance Item*.

**001-3.6. USEPA NPDES Construction General Permit (CGP) for Stormwater Discharges during Construction/SWPPP.** The preparation of the SWPPP and submission of the Notice of Intent (NOI) for coverage under the USEPA NPDES CGP will not be measured separately and shall be incidental to the lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*.

## BASIS OF PAYMENT

**001-4.1 Mobilization.** Mobilization will be paid for in accordance with the Item C-105 Mobilization lump sum item.

**001-4.2 Safety and Phasing.** Payment for all Safety and Phasing materials and work will not be paid for separately and will be incidental to lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*. Payment thereof shall constitute full compensation for all labor, preparation, materials, equipment, expenses and incidentals. Payment shall be made after review and upon acceptance of the document by the Owner and in accordance with the requirements in Item M-200 *Maintenance and Protection of Traffic* Basis of Payment.

**001-4.3 Safety Plan Compliance Document (SPCD).** Payment for the preparing, furnishing materials and implementing the SPCD, will not be paid for separately and will be incidental to lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*. Payment thereof shall constitute full compensation for all labor, preparation, materials, equipment, expenses and incidentals. Payment shall be made after review and upon acceptance of the document by the Owner and in accordance with the

requirements in Item M-200 *Maintenance and Protection of Traffic* Basis of Payment.

**001-4.4 Safety Barricades.** Safety barricades will not be paid for separately and will be incidental to the lump sum item as outlined in Item M-200 *Maintenance and Protection of Traffic*. Payment thereof shall constitute full compensation for all labor, preparation, materials, equipment, expenses and incidentals. Payment shall be made after review and upon acceptance of the materials by the Owner and in accordance with the requirements in Item M-200 *Maintenance and Protection of Traffic* Basis of Payment.

**001-4.5 Gate Guard - Allowance.** Payment for this allowance will be paid as outlined in Item M-100 *Allowance Items*.

**Payment shall be made under:**

Refer to the individual item descriptions from this Section for measurement and payment as referenced above. These referenced items from this section are to be measured and paid under other referenced item sections of the Contract. Any other items, not identified under the Method of Measurement and Basis of Payment as outlined above, shall be considered incidental to the overall project and will not be measured or paid for separately.

**END OF ITEM G-001**

**ITEM M-100  
GATE GUARD ALLOWANCE**

**CONTRACT DOCUMENTS**

**100-0.1** This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

**a.** All Allowances, if noted on the Bid Form, shall be included in the Base Bid and shall be carried by the Contractor, unless specifically noted to be carried by a subcontractor.

**b.** The Contractor shall cause the work covered by these Allowances to be performed for such amounts and by such persons as the Owner may direct but he will not be required to employ persons against whom he makes a reasonable objection.

**c.** If the cost, when determined, is more than or less than the Allowance, the Contract Sum shall be adjusted accordingly by Change Order, and if allowable herein, will include additional or reduced handling costs on the site, labor, installation costs, overhead, profit and other expenses resulting to the Contractor from any increase over or decrease from the original Allowance.

**d.** Refer to related Drawings and Specifications for additional information regarding Work to be included as part of Allowances.

**DESCRIPTION**

**100-1.1** Under this item, the Contractor shall coordinate with Manchester-Boston Regional Airport and their gate guard security company to provide gate guards for the project under the allowance provided by this specification. The Contractor shall coordinate with the gate guard security company with regard to scheduling the gate guards and when the gate guards will be required to be performing their duties.

**MATERIALS**

**100-2.1** Not Used.

**CONSTRUCTION DETAILS**

**100-3.1** Not Used.

**METHOD OF MEASUREMENT**

**100-4.1** Measurement for the allowance for gate guards will be based on the actual time worked by the gate guard and any allowable associated costs. The exact amount of reimbursement to the gate guard security company will be indicated on the Gate Guard Security Company's invoice and will be the basis of measurement for the allowance without any additional mark-up by the Contractor. There shall be no separate measurement for the Contractor's cost to coordinate and administer the scheduling of the gate guards and it shall be considered incidental to the overall project.

## **BASIS OF PAYMENT**

**100-5.1** The amount paid to the Contractor shall be the exact amount indicated on the Contractor's invoice from the gate guard security company without mark-up. There shall be no separate payment to the Contractor to coordinate and administer the scheduling of the gate guards and these costs are considered incidental to the overall project.

Payment will be made under:

Project Item M-100-1	Allowance – Gate Guards	<b>\$35,000 - Allowance</b>
----------------------	-------------------------	-----------------------------

**END OF ITEM M-100**



**ITEM M-200**  
**MAINTENANCE AND PROTECTION OF TRAFFIC**

**CONTRACT DOCUMENTS**

**200-0.1** This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

**DESCRIPTION**

**200-1.1 GENERAL.** This work shall consist of maintaining aircraft and vehicular traffic and protecting the public from damage to person and property within the limits of and for the duration of the Contract.

The Contractor shall comply with all guidelines regarding construction safety set forth in FAA Advisory Circular 150/5370-2 (latest revision), *Operational Safety on Airports During Construction* and Special Provisions.

The following items are specifically included without limiting the generality implied by these Specifications and the Contract Drawings.

- Preparation of the Safety Plan Compliance Document with submission to the Engineer and Airport for review and implementation
- Preparation and On-line Submission of the U. S. Environmental Protection Agency (USEPA) National Pollution Discharge Elimination System (NPDES) Stormwater Construction General Permit (CGP) Notice of Intent (NOI) at least fourteen (14) calendar days prior to the commencement of work and the filing of the Notice of Termination (NOT) at the completion of the project.
- Providing qualified flag persons, as required, at the locations shown on the plans or as directed by the Owner's representative.
- Provide Contractor Support services as described in Section M-300 ALCMS Modifications.
- Locating and marking of existing underground lighting or other airfield circuits within the project work areas.
- Staged or phased construction
- Off-peak construction periods, including both day and night shift work
- Temporary construction lighting for night shift construction periods, if applicable.
- Installation, maintenance and removal of temporary work zone (RSA) delineation markers, including the furnishing of stakes and cones which will remain the property of the Contractor at the completion of the project.
- Installation, maintenance and removal of temporary or permanent barricades, warning signs, hazard markings and runway closure markings, including lighted runway closure markings. Furnishing temporary barricades for the project which will remain the property of the Contractor at the completion of the project.
- Temporary alteration or decommissioning of any existing Runway or Taxiway lighting and signage and coordination with MHT Ops/FAA Tech Ops for NAVAIDs shutdowns, if required.

- Installation, maintenance, and removal of temporary lights and lighting circuits, including “jumpers” of circuits as required.
- Installation, maintenance, and removal of temporary guidance sign coverings
- Installation, maintenance, and removal of temporary light coverings
- Installation, maintenance, and removal of temporary lights and lighting
- Testing and maintenance of existing, temporary, and new lighting circuitry.
- Installation, maintenance, and removal of any temporary pavement tapers, transitions or temporary accesses to any airport facilities, if applicable.
- Installation, maintenance, and removal of any temporary asphalt pavement tapers and/or transitions in accordance with FAA Advisory Circular 150/5370-13 - *Off-Peak Construction using Hot Mix Asphalt* (latest revision).
- Installation, maintenance, and removal of any temporary drainage, including, ditches, swales, piping and de-watering of work areas.
- Alteration, adjustment, maintenance of any drainage inlets, structures or systems necessary to maintain runway drainage during construction.
- Cleaning and maintenance of all areas within construction limits and haul routes or areas disturbed by the Contractor's operation via vacuum sweeper trucks.
- Restoration of all surfaces disturbed because of the Contractor's Operations, which are not otherwise paid for under a specific item.
- Provide temporary stake-mounted threshold lights and other edge lighting revisions, if required.
- Placement of temporary markings, including a black primer coat, prior to placing the temporary marking as shown on the plans, in accordance with FAA AC 150/5340-1 *Standards for Airport Markings* (latest revision), and meeting the requirements of Specification Section P-620, if required..
- Removal of temporary markings by approved techniques, as shown on the Plans, in accordance with FAA Advisory Circular 150/5340-1 *Standards for Airport Markings* (latest revision), and meeting the requirements of Specification Section P-620., if required.

## **METHOD OF MEASUREMENT**

**200-2.1** Payment for maintenance and protection of traffic will be made on a lump sum basis. The lump sum shall include all items required to satisfy this Specification.

## **BASIS OF PAYMENT**

**200-3.1** The lump sum price bid for maintenance and protection of traffic shall include all equipment, materials, and labor necessary to adequately and safely maintain and protect traffic. Progress payments will be made for this item in proportion to the total amount of contract work completed, less any deductions for unsatisfactory maintenance and protection of traffic.

In the event the contract completion date is extended, no additional payment will be made for maintenance and protection of traffic.

No payment will be made under maintenance and protection of traffic for each calendar day during which there are substantial deficiencies in compliance with the Specification requirements of any subsection of this Section as determined by the Engineer. The amount of such calendar day non-payment will be determined by dividing the lump sum amount bid for maintenance and protection of traffic by the number of calendar days between the date the Contractor commences work and the date of completion as designated in this proposal, without regard to any extension of time.

If the Contractor fails to maintain and protect traffic adequately and safely for a period of four (4) hours, the Owner shall correct the adverse conditions by any means it deems appropriate and shall deduct the cost of the corrective work from any monies due the Contractor. The cost of this work shall be in addition to the liquidated damages and non-payment for maintenance and protection of traffic listed above.

However, where major non-conformance with the requirement of this Specification is noted by the Engineer and prompt Contractor compliance is deemed not to be obtainable, all contract work may be stopped by direct order of the Engineer regardless of whether corrections are made by the Owner as stated in the paragraph above.

Payment will be made under:

Project Item M-200-1                      Maintenance and Protection of Traffic - per Lump Sum

**END OF SECTION M-200**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM M-300**  
**MODIFICATIONS TO ALCMS EQUIPMENT**

**DESCRIPTION**

**300-1.1 GENERAL** This work shall include the modifications to the existing Airport Lighting Control and Monitoring System (ALCMS) and Touchscreen Panels located in the Air Traffic Control Tower and Airfield Lighting Vault to incorporate the reconfigured taxiway graphics for Taxiway H Runway Incursion Mitigation Project, primarily for the reconfiguration of Taxiways L and H into Taxiway K with the Taxiway K1 & K2 stubs. This work includes modifications to these circuits, all labor, programming, modifications to graphic screens, and all other work required to fully upgrade the existing airfield lighting circuits in the ALCMS performed by the vendor/supplier/manufacturer.

The project also includes modification upgrades by the vendor/supplier/manufacturer to the existing ADB-Safegate (formerly Liberty Systems) ALCMS system to allow for remote control software and hardware upgrades due to the existing equipment being obsolete and outdated.

All work done by the Contractor to assist the vendor/supplier with completion of this item shall be included for payment under items of work in Section L-109 – *Airport Transformer Vault and Vault Equipment*, unless stated to included elsewhere herein. Contractor shall assist in coordinating the completion of all work to provide modifications and upgrades to the ALCMS system.

**300-1.2 SHOP DRAWINGS.** Contractor shall submit shop drawings for approval by the Engineer, prior to implementing any software changes or installing any equipment, if required. Proposed software changes shall be submitted to Airport Operations and the ATCT supervisor for approval independent of the Engineer. Contractor shall put his shop drawing check stamp on all shop drawings submitted for approval.

**300-1.3 AS BUILT DRAWINGS.** The Contractor shall, at all times, maintain a complete accurate and up to date set of as built drawings. These as built drawings shall be available to the Engineer at all times for his review. At the completion of the contract, the Contractor shall submit two (2) clean, legible and complete sets of as built drawings and O&M documentation to the Airport prior to the final request for payment.

**300-1.4 CODES, PERMITS, FEES.**

a. The Contractor is presumed to be knowledgeable of national and local code requirements. If the Contractor believes any requirement of the drawings or specifications is not in conformance with code or other applicable requirements, the Contractor shall so notify the Engineer before the work is installed. The decision of the Engineer in interpreting the drawings and specifications and code requirements relating thereto for a specific application under this contract shall be considered final.

b. The Contractor shall give all necessary notices, obtain all permits, and pay all inspection and other fees required by governmental authorities having jurisdiction over the work under this contract. Receipt of all required approvals, clearances, and certificates by the Owner shall be a prerequisite to acceptance and final payment for the work.

**300-1.5 MATERIALS AND WORKMANSHIP.** Materials furnished shall be new, shall be undamaged when installed, and shall conform to all established and applicable standards and test requirements of Underwriters Laboratories (U.L.), National Electrical Manufacturers Association (NEMA), and American National Standards Institute (ANSI), and the Institute of Electrical and Electronics Engineers (IEEE).

**300-1.6 PROJECT COORDINATION.** The ALCMS Manufacturer shall provide an experienced and qualified Engineering, Sales and Service staff to support the Contractor and airport throughout the

installation and life of the system.

The project shall follow this basic generic cycle of events, but due to the nature of this particular upgrade, all milestones may not be applicable:

	<b>Milestone</b>	<b>Description</b>
1.	Submittal	The ALCMS Manufacturer shall submit ALCMS equipment specifications to the Contractor.
2.	Submittal Review and Approval	Submittal is reviewed by the Contractor, Airport, and Engineer(s).
3.	Production Release	The ALCMS Manufacturer shall release approved system to manufacturing.
4.	Demo CD 35% Software Completion	The ALCMS Manufacturer shall send to the Contractor, Airport, and Engineers a Demo CD of the planned layout of the touchscreen modifications that will be used for the control of the ALCMS system.
5.	Production	System modifications are manufactured or engineered.
6.	Production Testing	System is tested by the ALCMS Manufacturer.
7.	Factory Acceptance Testing	System is available for Factory Acceptance Testing (FAT) witnessed by Airport/Owner.
8.	Shipment of system	Approved system is shipped to installation site, if applicable.
9.	Installation	Contractor installs equipment and completes external wiring, if applicable.
10.	Commissioning	The ALCMS Manufacturer shall arrive at installation site to complete commissioning of system and verify Contractor installation and wiring.
11.	System Readiness Check	The ALCMS Manufacturer shall perform a system readiness check to verify proper operation of all equipment prior to cut over.
12.	System Cut-over	The ALCMS Manufacturer and Contractor shall cut over the new system and bring it on-line and operational.
13.	System Acceptance Testing	System is available for System Acceptance Testing (SAT) which shall be witnessed the by Airport/Owner and/or Engineer.
14.	Manuals / As-Built drawings	The ALCMS Manufacturer shall issue operator manuals, maintenance manuals and ATC manuals and final as-built drawings.
15.	On-Site or Virtual Training	The ALCMS Manufacturer shall complete on-site or virtual training of Operations/Maintenance, and ATC personnel.
16.	Final Owner Acceptance	Upon completion of all contractual requirements, system is accepted in writing by the Airport/Owner.
17.	Warranty and Support	The ALCMS Manufacturer shall provide warranty and support per the contractual requirements.

### **300-1.07 CONTRACTOR INSTALLATION REQUIREMENTS**

a. The installing contractor shall be responsible for the physical installation of all associated ALCMS components. At a minimum, this includes the Constant Current Regulators (CCRs) and Distributed Control and Monitoring Equipment (DCME) as applicable.

(1) The Contractor shall furnish, install, relocate, connect and test all equipment, equipment accessories, conduit cables, wires, buses, grounds and support necessary to insure a complete and operable electrical distribution facility for the airport lighting system as specified in the submittal package.

(2) The equipment installation and mounting shall comply with the requirements of the National Electrical Code and local code agency having jurisdiction.

### **300-1.08 WIRE AND CONNECTIONS**

- a. The Contractor shall make all necessary electrical connections at each location in accordance with the ALCMS manufacturer's wiring diagrams, as applicable.
- b. All wires called out in the drawings associated with equipment that is to be controlled or monitored should be pulled, terminated and dressed at the appropriate terminal blocks and at the associated equipment.
- c. The Contractor shall leave sufficient extra wire length on each control/monitoring lead to make future changes in connections at the terminal block.

### **300-1.09 MARKING AND LABELING**

All equipment, control wires, terminal blocks, etc., shall be tagged, marked or labeled as specified below:

- a. Wire Identification: The Contractor shall furnish and install labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks.
- b. Wire labels, if used, shall be of the self-sticking, pre-printed type and of the manufacturer's recommended size for the wire involved. Identification markings designated in the plans shall be followed.
- c. Tags, if used, shall be nonferrous metal or plastic. Each tag shall be securely tied to the proper wire by a nonmetallic cord or plastic wire tie.

### **300-1.10 INSTALLATION OF DATA CABLES**

- a. The Contractor shall install, terminate and test all data cables required for the project as shown on the Contract Drawings. This includes all of the following components: Data cables, terminal cabinets and jumper cables.
- b. All associated data cables shall be tested upon completion of the cable installation and termination of connectors.
- c. Tests shall include verification of point-point continuity of each wire.
- d. All test data shall be recorded and included in a test report that shall be submitted to the Airport / Owner for approval.
- e. Commissioning of the system shall not begin until all test reports are submitted and approved and a copy provided to ALCMS Manufacturer.

### **300-1.11 CONTRACTOR POWER-UP AND INITIAL TESTING**

The Contractor shall perform the following power-up and commissioning tasks:

- a. Power up all assemblies.
- b. Verify communication is established between all assemblies.
- c. Initiate lighting commands from Tower Touchscreen and verify proper control operations are being executed at the Vault assembly.
- d. Test monitoring feedback to verify proper wiring and operation.
- e. Inform ALCMS manufacturer in writing all mentioned power up tests are complete.

### **300-1.12 ALCMS MANUFACTURER PLC COMMISSIONING**

The ALCMS Manufacturer shall perform the following installation and commissioning tasks:

- a. Verify Contractor connections including power, control and monitoring.
- b. Verify proper labeling of equipment.
- c. Verify communication connections.
- d. Perform system testing including control, monitoring and diagnostics.
- e. Training on ALCMS related equipment.
- f. Perform System Acceptance Testing (SAT).

### **300-1.13 SYSTEM ACCEPTANCE TEST (SAT)**

Following the final installation and commissioning of the system, the ALCMS Manufacturer shall perform a demonstration of the system performance. This demonstration shall include the following:

- a. Lighting control functions
- b. Monitoring functions
- c. Alarm functions
- d. Print and Display functions

The ALCMS Manufacturer shall develop a SAT test plan in accordance with the specifications and issue this to the Contractor for approval from the Airport and Engineer.

The SAT shall be witnessed by owner representatives, the Contractor and the Engineer.

### **300-1.14 AS-INSTALLED DRAWINGS**

a. The ALCMS Manufacturer shall provide six (6) hard copies of As-Installed drawings after system acceptance. The As-Installed drawings shall include the following information:

- (1) System Block Diagram (1-line drawings)
- (2) System External Wiring Diagrams
- (3) Assembly Drawings
- (4) Assembly Wiring Diagrams

b. The As-Installed drawings shall be 11" X 17" in size and shall be spiral bound or supplied in 3-ring binders. The cover of each binder shall be labeled with all project-related information.

### **300-1.15 ON-SITE OR VIRTUAL TRAINING**

a. The ALCMS manufacturer shall provide, to the Contractor and Owner, a final training course syllabus and training schedule thirty (30) days before the on-site or virtual training.

b. Any audio/video recordings of training classes described herein are the sole responsibility of the Contractor for the Owner's future use. Coordination of the video recording must be organized by the Contractor and approved by the Owner and Engineer.

c. All training sessions shall be held in a facility provided by the Airport for training performed on-site or virtually. For on-site or virtual training performed, the on-site facility should have tables, chairs, projection screen and sufficient space to lay out manuals and drawings. If the training is performed virtual, the Owner shall provide adequate internet connections for the on-site computer systems/projection/for the ALCMS manufacturer and the Contractor to use for the training.



d. The ALCMS manufacturer shall provide all required visual aids and presentations to be used for the training.

### **300-1.16 AIR TRAFFIC CONTROLLER TRAINING**

a. The ALCMS manufacturer shall provide two (2), 1-hour User Training Class for Air Traffic Control (ATC) personnel.

b. ATC Training coordinator should be present for both classes and shall be the responsible for training remaining personnel not able to attend these classes.

c. This training shall include discussion and review of the following:

- (1) PLC General System Overview
- (2) Touchscreen Operations
- (3) Using the Control System (GUI)
- (4) Command and Control Sequences

d. Training classes for ATC personnel should be limited to a maximum of 4 - 6 people per class.

e. Air Traffic Control should designate a Training Coordinator that shall be responsible for scheduling and organizing on-site or virtual training for their personnel. In addition, this Coordinator shall be responsible for training other personnel that were absent or unable to attend the training sessions.

f. Any additional training beyond contract requirements shall be the responsibility of the ATC Training Coordinator to complete.

### **300-1.17 MAINTENANCE TRAINING**

a. The ALCMS manufacturer shall provide two (2), 1-hour Training Class for maintenance personnel. This training shall include discussion and review of the following:

- (1) System Block Diagram
- (2) System Assemblies and Wiring Diagrams
- (3) Touchscreen Operation
- (4) Graphical User Interface (GUI) Screens
- (5) Implementing Airfield Lighting Changes

b. Training classes for maintenance personnel should be limited to a maximum of 4 - 6 people per class.

c. Maintenance should designate a Training Coordinator that shall be responsible for scheduling and organizing on-site or virtual training for their personnel. In addition, this Coordinator shall be responsible for training other personnel that were absent or unable to attend the training sessions.

d. Any additional training beyond contract requirements shall be the responsibility of the training coordinator to complete.

**300-1.18 OWNER SYSTEM ACCEPTANCE AND WARRANTY START DATE.** Upon successful completion of the SAT and on-site training, the Owner shall issue the ALCMS manufacturer a written notice of system acceptance within five (5) working days.

The date the final acceptance letter is received or five (5) days following successful completion of the SAT (whichever occurs first) represents the start of the warranty period. Please refer to the Warranty section for more information regarding the ALCMS warranty guarantee.

**300-1.19 SYSTEM WARRANTY.** All equipment shall be warranted against defects in workmanship, hardware and software for a period of one (1) year from initial operation of the system but not more than eighteen (18) months from the manufacturer's shipment of the system.

During this time period the ALCMS manufacturer shall provide all parts, labor and technical support with the following conditions:

- a. The manufacturer shall correct by repair or replacement, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, provided further that Buyer gives manufacturer written notice of such defects after delivery of the goods to Buyer.
- b. The manufacturer may examine any goods upon which a claim is made in the same condition as when defect therein is discovered, and may require the return of the goods to establish any claim.
- c. The manufacturer's liability under no circumstances shall exceed the contract price of goods claimed to be defective.
- d. Any returns under this guarantee are to be on a transportation charge prepaid basis. For products not manufactured by, but sold by the manufacturer, warranty is limited to that extended by the original manufacturer.

### **300-1.20 SYSTEM SERVICE AND SUPPORT**

- a. The ALCMS Manufacturer shall provide technical assistance and support during the warranty period.

## **EQUIPMENT AND MATERIALS**

**300-2.1 GENERAL.** Contractor shall submit shop drawings for approval by the Engineer, prior to implementing any software changes. Proposed software changes shall be submitted to Airport Operations and the ATCT supervisor for approval independent of the Engineer. Contractor shall put his shop drawing check stamp on all shop drawings submitted for approval.

**300-2.2 EXISTING AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM (ALCMS)** The existing ALCMS, as manufactured by Liberty Airport Systems (currently d/b/a ADB-SAFEGATE Contact person: Galen Dixon 614-323-6242), shall be updated by the manufacturer to accurately reflect the new reconfiguration of airport taxiways and associated modifications, as well as the system equipment upgrades. Consideration shall be given to the control of the airfield lighting system during the transition and provisions shall be made to operate the system manually during this time, if necessary.

A replacement and new Constant Current Regulators are to be installed under this project. CCR circuits which are to be modified include:

1. Replacement of Taxiway K & L Taxiway Edge Lights (formerly Taxiway H & L TW Edge)
2. New Taxiways K & H In-pavement Taxiway Centerline Lights

**300-2.3 CONSTANT CURRENT REGULATORS.** Replacement of existing and new Constant Current Regulators. Refer to Section L-109, *Airfield Transformer Vault and Vault Equipment* for additional information concerning the installation of the Constant Current Regulators.

## **CONSTRUCTION METHODS**

**300-3.1 AIRFIELD LIGHTING TOUCHSCREEN MODIFICATIONS.** The existing ALCMS system consists of a touchscreen in the Air Traffic Control Tower, Airfield Lighting Vault and Airfield Operations. The system is PLC based and software controlled. The system will be updated at all locations by the system manufacturer under this Contract.

All work required by the Contractor to obtain temporary work badges and escorting duties for Liberty Airport Systems (currently d/b/a ADB-SAFEGATE) technicians associated with this work item shall be considered as work necessary to complete the installation.

**300-3.2 CONTRACTOR SUPPORT.** The Contractor shall support the manufacturer with the system commissioning. Effort to include escorting the vendor/supplier, badging, fees and any incidental items required to complete the work shall be part of the Section M-200-1 Item for Maintenance and Protection of Traffic. Although anticipated to be minimal, any payment for installing equipment or terminations by the Contractor work for ALCMS modifications shall considered for payment under Section L-109, *Airport Transformer Vault and Vault Equipment*.

## **METHOD OF MEASUREMENT**

**300-4.1** Airfield Lighting Control and Monitoring System (ALCMS) Modifications furnished and installed, as required by the drawings and these specifications, to modify the ALCMS system for the taxiway reconfigurations shall be measured for payment as part of this specification under the Allowance. The ALCMS modifications shall as outlined herein shall be part of a Lump Sum price from the ALCMS vendor/manufacturer, Liberty Airport Systems (currently d/b/a ADB-SAFEGATE). The ALCMS vendor/manufacturer's invoice will be the basis of measurement for the allowance without any additional mark-up by the Contractor.

Measurement for Contractor performed pre-installation work for vendor installed equipment, including installation of equipment to be monitored by ALCMS equipment will be based on the actual time worked, associated materials, and any allowable associated costs (i.e. allowed extra work markups in accordance with the Supplemental Provisions and General Conditions). It is anticipated that this effort may not be required or will be minimal since the equipment to be monitored has already been installed.

No Measurement for other Contractor performed work, include escorting, badging, fees, terminations (if applicable), and any incidentals required to complete the work to assist vendor/manufacturer with the system commissioning effort will be measured under this Section. There shall be no separate measurement for the Contractor's cost to coordinate and administer the scheduling with the ALCMS vendor/manufacturer and it shall be considered incidental to the overall project.

**300-4.2** As noted above, measurement shall not include any support work by the Contractor to assist vendor/supplier/manufacturer with the system commissioning with above noted effort under paragraph 300-4.1 which will be paid for under either Section Item M-200, *Maintenance and Protection of Traffic* or Section L-109, *Airport Transformer Vault and Vault Equipment*.

**300-4.3** There will be no work to install and commission new constant current regulators included for measurement under this item. All work associate with constant current regulator installation for this project will be paid under Section L-109, *Airport Transformer Vault and Vault Equipment*.

## **BASIS OF PAYMENT**

**300-5.1** Payment shall be made at the Lump Sum invoice price from the ALCMS vendor/supplier/manufacturer under the Allowance amount for the complete and accepted ALCMS Modifications. The Lump Sum price shall be full compensation for all services and items included as designated in this allowance item, including preparation, assembly, delivery, transportation, and installation of materials and equipment, labor, equipment, tools, and incidentals necessary to complete this item. The

ALCMS vendor/manufacture's invoice will be paid as part of the allowance amount without any additional mark-up by the Contractor.

**300-5.2** Payment for any work by the Contractor to assist vendor with the system commissioning with above noted effort, outlined above in paragraphs 300-4.1 and 300-4.2, will be paid for under Specification Section Item M-200-1 *Maintenance and Protection of Traffic* or Section L-109, *Airport Transformer Vault and Vault Equipment*.

Payment shall be made under:

Project Item M-300-1 Allowance - ALCMS Modifications	\$85,000 Per Allowance
--	------------------------

**ITEM M-400**  
**RECORD DOCUMENTS**

**DESCRIPTION**

**400-1.1 General.** The Contractor's attention is also directed to Section G-001 *Special Work Requirements* paragraph 001-1.30 *Record Documents* and Section 90 *Measurement and Payment* paragraph 90-11 *Contractor Final Project Documentation* of the General Conditions for additional project closeout documents and requirements.

The work included under this section of these specifications shall consist of preparing and submitting project record documents to the owner as specified in the items outlined below:

**a. Record Documents.** This item includes the following items:

- 1. As-Built Plans.**
- 2. Project Photographs**
- 2. Aerial Photos**
- 4. Final DBE Participation Statement.**

**b. Field Data Collection for GIS Survey Conversion.** This item includes requirements for providing aeronautical data collection and conversion associated with work Tasks herein. This includes but is not limited to: collection of airfield features within the project limits for GIS conversion in accordance with FAA criteria. This work shall be performed in addition to the Record Drawings as required in Section G-001 *Special Work Requirements* paragraph 001-1.30 *Record Documents* and Section 90 *Measurement and Payment* paragraph 90-11 *Contractor Final Project Documentation* of the General Conditions.

**RELATED DOCUMENTS**

**400-2.1** Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-16B, "General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submissions to the National Geodetic Survey."

**400-2.2** FAA AC 150/5300-17C, "Standards for Using Remote Sensing Technologies in Airport Surveys."

**400-2.3** FAA AC 150/5300-18B, "General Guidance and Specifications for Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards."

**REQUIREMENTS**

**400-3.1 RECORD DOCUMENTS**

**a. As-Built Plans.** The Contractor shall maintain at the site a set of drawings on which shall be accurately recorded the actual as-built locations and dimensions of all his/her work. Changes and variations from the Contract Drawings should be clearly noted. The location and elevation of utilities and other items encountered during progress of the work shall be recorded. Notations on mechanical and electrical work shall include nameplate data for all installed equipment. The Contractor shall keep these drawings current as work progresses and available for review by the Engineer at all times. This record of as-built conditions shall include the work of all subcontractors.

Prior to final acceptance of the work, the Contractor shall have a final survey made by a **Land Surveyor**

**licensed in the State of New Hampshire.** The final survey shall consist of taking shots at the same stations as the design cross sections with elevations recorded at every location where a proposed grade was shown on the design cross section, at all changes in grade, at the top and toes of slopes, and at the limits of work.

It shall also include the location and elevation of all structures, lights, signs, installed utilities, pavement markings, and joints. For drainage items the survey shall include rim elevations, invert elevations, and sump elevations. All survey shall be referenced to the National Geodetic Survey (NGS) Primary Airport Control Station (PAC) and/or Secondary Airport Control Stations (SACS). PAC and SAC locations and data may be obtained from <http://www.ngs.noaa.gov/cgi-bin/airports.prl?TYPE=PACSAC>. A copy of the Survey information shall be delivered to the Engineer in the appropriate vertical datum, in State Plane coordinate system, and in AutoCAD® 2014 format. All elevations shall be to the nearest 0.01 foot with the exception of turf areas which may be to the nearest 0.1 foot.

All “As-Built” information from the final survey shall be shown on the As-Built Drawings and submitted to the Engineer for review. Any errors shall be corrected by the Contractor as required. The As-Built Drawings and final survey shall be completed and accepted by the Engineer before final payment will be made.

**b. Project Photographs.** The Contractor shall furnish photographs of the project, the views shall be as directed or approved by the Engineer. The photographs shall show the project site prior to construction, the work in progress and the project site at the completion of work.

A minimum of 60 color photographs will be taken during each 30-day period of the contract. A digital camera shall be used to take the photographs. At the completion of each 30-day period of the project the Contractor shall deliver to the Engineer one Color print of each view and a CD/USB flash drive with each photo. Each view shall be clearly labeled with the date, project and identification of the view.

**c. Aerial Photos.** The Contractor shall furnish four (4) sets of four 11-inch by 14-inch unmounted, oblique aerial color photographs taken from an altitude to completely cover the site of the work, with sufficient detail to shown the work from four different quadrants. These photographs shall be taken after completion of the contract. The Contractor shall inscribe on the reverse side of each photograph all pertinent information such as description, date, compass direction on which the picture was taken, AIP project number, photograph shall include all the airport boundaries.

All sets of photographs shall be delivered to the Engineer. These photographs to be taken with a digital format aerial camera with a photo resolution no less than 2750 x 2200 pixels, minimum photo size shall be 16 MP unless approved by the Engineer.

1. The Contractor shall furnish eleven (11) color aerial photographs of the entire airport, including all airport boundaries, I-293 on the north, the F.E. Everett Turnpike on the west, Route 28 on the east, and Delta Drive on the south. This photograph shall be taken with a mapping quality (cartographic) camera.

The Contractor shall submit certification that the camera has been calibrated within the last three (3) years in accordance with USGS mapping standards. The photo shall be vertical and shall be enlarged to 1" = 400'. The 1" = 400' enlargements shall be mounted on 48" x 48" Gator Board (or approved equal) and shall be identified on the back of the Gator Board. The Contractor shall also provide a digital image of the aerial photo on CD/USB flash drive.

2. The Contractor shall furnish six (6) color aerial photographs of the entire airport, including all airport boundaries, North Perimeter Road on the north, Brown Avenue on the west, Harvey Road on the east, and South Perimeter Road on the south. This photograph shall be taken with a mapping quality (cartographic) camera. The contractor shall submit certification that the camera has been calibrated within the last three (3) years in accordance with USGS mapping standards. The photo shall be vertical and shall

be enlarged to 1" = 200'. The 1" = 200' enlargements shall be mounted on 48" x 65" Gator Board (or approved equal) and shall be identified on the back of the Gator Board.

3. The Contractor shall furnish one (1) color aerial photographs of the entire airport, including all airport boundaries, I-293 on the north, the F.E. Everett Turnpike on the west, Route 28 on the east, and Delta Drive on the south. This photograph shall be taken with a mapping quality (cartographic) camera. The Contractor shall submit certification that the camera has been calibrated within the last three (3) years in accordance with USGS mapping standards. The photo shall be vertical and shall be enlarged to approximately 1" = 800' and have the ability to fit on a 24" x 24" mount. This enlargement shall be mounted on 24" x 24" DiBond Mounting Material (or approved equal) and shall be identified on the back of the mount.

Snow cover will not be permitted. Cloud cover shall not obscure photos. The photos shall be taken at the time of day when shadows from the sun will be minimal. Photos shall be clear, in focus, with high resolution and sharpness. Color and tint shall be correct; washed out photos will not be accepted. The Contractor shall submit to the Engineer, contact prints of the photograph for approval prior to making enlargements. Enlargements shall be mounted on Gator Board as indicated above and shall be identified on the back of the Gator Board. Photos shall be suitable for photogrammetric mapping.

**d. Final DBE Participation Statement.** The Contractor shall submit a statement showing the final accounting of all DBE participation actually used in the execution of the work prior to the final acceptance of the project. Should the actual DBE participation be less than the contract goals and/or contractor's assurance submitted with the bid proposal, than the Contractor shall provide written documentation of their good faith effort to achieve the goal per the requirements of the MHT DBE Plan.

#### **400-3.2 FIELD DATA COLLECTION FOR GIS SURVEY CONVERSION**

**a. GIS Survey Conversion Personnel Qualifications.** This work shall be performed by a **registered licensed surveyor or professional engineer** in the State of New Hampshire. The Contractor (or their subcontractor) shall be experienced in:

1. Survey projects utilizing Global Positioning System (GPS) collection methods;
2. National Geodetic Survey (NGS) specifications, standards, and software;
3. Knowledge of the National Spatial Reference System (NSRS), NGS Continuously Operating Reference Stations (CORS), horizontal and vertical controls, and the High Accuracy Reference Network (HARN);
4. Using CORS data to establish geodetic ties to NSRS;
5. Establishing aerial photography, photo control points, reading and annotating information on aerial photography;
6. Recovering marks, setting marks, and writing station descriptions of survey marks to NGS standards.

**b. Collection of Data.**

1. The Contractor shall ensure that all relevant layers/features for the final as-built survey are collected and/or converted in accordance with FAA AC 150/5300-18B.
2. As part of the survey work, the Contractor shall verify the Runway End/Threshold PK nail point at Runway 17 End and Runway 17 Threshold in accordance with FAA AC 150/5300-18B, "General Guidance and Specifications for Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards."
3. The Contractor shall assist the Resident Project Representative (RPR) with the collection of data inside the electrical manholes or other structures, including but not limited to: location, size and orientation of conduits inside the manholes.

**c. Preparation of Deliverables.** The Contractor shall submit all collected data (in AutoCAD

format), and associated required deliverables specified in FAA AC 150/5300-18B and as amended by Manchester-Boston Regional Airport, and herein. This includes, but is not limited to:

1. Survey Quality Control Plan (completed prior to the start of work)
2. Final Project Report
3. Documentation required for each feature as defined by Chapter 5 of FAA AC 150/5300-18B
4. All final processing, adjustment, or reduction files used to produce the final data. This includes the results of independent software files produced during the reduction of the final data, and any other product necessary to recreate the data.

## **METHOD OF MEASUREMENT**

**400-4.1** Record Documents (As Built Plans, Project Photographs, Aerial Photos, & DBE Statement) shall be measured as a single fixed lump sum unit, complete and accepted by the Engineer/RPR.

Any other project record documentation outlined in the Contract Documents, not stated herein, shall not be measured separately and shall be considered as incidental to the overall project items.

**400-4.2** Field Data Collection for GIS Survey Conversion shall be measured as a single lump sum unit complete and accepted by the Engineer/RPR.

Verification of the Runway End/Threshold point for Runway 17 shall not be measured separately and shall be considered incidental to the overall GIS/Field Survey work during the installation of the taxiway reconstruction work.

## **BASIS OF PAYMENT**

**400-5.1** Payment for the Record Documents (As Built Plans, Project Photographs, Aerial Photos, & DBE Statement) shall be made at the fixed lump sum price specified in the bid proposal for furnishing the Record Documents, as measured and specified above, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, expenses, survey, preparation, printing, mounting, processing, and all incidentals to provide the required Record Documents accepted by the Engineer/RPR and Owner.

Any other project record documentation outlined in the Contract Documents, not stated herein, shall not be paid separately and shall be considered as incidental to the overall project items.

**400-5.2** Payment shall be made at the contract lump sum price for the Field Data Collection for GIS Survey Conversion of the GIS Data collected, submitted and approved by the Owner. This shall include compensation for all labor, equipment, and incidentals associated with collecting, analyzing, processing, reviewing and submitting this data.

Also, the verification of the Runway End/Threshold points at the Runway 17 shall not be paid separately and shall be considered incidental to the overall GIS/Field Survey work after the installation of the taxiway reconfiguration work.

Payment will be made under:

Project Item M-400-1	Record Documents per Lump Sum
Project Item M-400-2	Field Data Collection for GIS Survey Conversion per Lump Sum

## **END OF SECTION M-400**



**ITEM M-500**  
**ENGINEER FIELD OFFICE**

**CONTRACT DOCUMENTS**

**500-0.1** This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

**DESCRIPTION**

**500-1.1 Description.** The work included under this section of these specifications shall consist of furnishing and maintaining the Engineer's Field Office and associated equipment in accordance with Section C-105 Mobilization and Section 60-05 of the General Provisions.

**EQUIPMENT AND MATERIALS**

**500-2.1 General.** Equipment used in the performance of the work required by this section of the specifications shall be subject to the approval of the Resident Project Representative (RPR) and maintained in a satisfactory working condition at all times.

**500-2.2 Engineer's Field Office.** The Contractor shall furnish and maintain during construction of the improvements contained in this Contract, a suitable field office for the RPR at the site of the work. The field office, including all requirements of this specification, shall be available for use by the RPR on the first day of work on the project. The field office shall remain on the site, for the RPR's use, until the project has been approved and accepted during the project's final inspection. This shall include the duration of all awarded work under the contract to include base bid and multiple project areas if applicable. The office shall be equipped with electric lights, heating, and air conditioning, with sanitary facilities in the direct vicinity. Drinking water shall be provided. The field office shall contain not less than 300 square feet of floor area and shall be equipped with locks for doors, and window shades for all windows. The office shall be equipped with the following furniture and equipment:

1. 1 - standard-size, flat top desk
2. 2 - desk chairs
3. 1 - 6-foot folding table
4. 8 - folding chairs
5. 1 - four-drawer steel file cabinet
6. 1 - OSHA compliant first aid kit
7. 1 - UL listed dry chemical fire extinguisher with minimum rating for Type 2A:10B:C
8. 1 - internet connection for computer (4G USB Modem or equivalent) capable of establishing an internet connection from any location on the job site.
9. 1 - small, office-type refrigerator
10. 1 - multifunction printer/scanner/copier with ink and supplies provided for the duration of the project
11. 1 - 30-gallon and 1 - 15-gallon waste baskets with liner supplies and disposal
12. 1 - laser auto-level, graduated level rod and receiver with recent calibration certificate by a certified technician

The location of the field office shall be approved by the Owner and the RPR. The Contractor shall maintain the office during construction and remove it upon completion of the work.

The Contractor shall pay all internet/data service, sanitary facility, heating and electric bills applicable to the Contract.

The Contractor shall furnish assistance to the RPR, as requested, to check the layout, obtain quantities or otherwise control the work. Such assistance shall be understood to include the provision of suitable manpower to assist the RPR in taping measurements, holding a survey rod, checking grades and the like. The Contractor's obligations for furnishing assistance to the RPR shall be deemed incidental to the completion of the various work items and no separate payment shall be made for such assistance.

### **METHOD OF MEASUREMENT**

**500-3.1 Engineer's Field Office.** All work and costs involved in furnishing and maintaining the Engineer's field office shall be measured as a lump sum.

### **BASIS OF PAYMENT**

**001-4.1 Engineer's Field Office.** Payment shall be made at the contract unit price, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, utilities, expenses, setup, removal, and incidentals required. The first payment equal to 75% of the bid amount shall be made when the office is completely set up as specified, usable and accepted by the RPR. The remaining 25% shall be made upon completion and acceptance of all work and removal of the office.

Payment will be made under:

Project Item M-500-4.1      Engineer Field Office per Lump Sum

### **END OF SECTION M-500**

**ITEM M-600**  
**CONSTRUCTION ACCESS MODIFICATIONS**

**CONTRACT DOCUMENTS**

**600-0.1** This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

**DESCRIPTION**

**600-1.1** This item includes all of the work necessary to provide the road improvements for the proposed temporary access gate near Aviation Associates onto the Airport as shown on the plans or otherwise directed by the Resident Project Representative (RPR) due to existing field conditions. The temporary access road and temporary gate to be installed will become the project access road and entrance gate to the Airside work.

After the completion of the work, the temporary access road and the temporary fence and gate shall be removed and the existing fence restored to its original configuration. In addition, the existing vehicle service road pavement shall be removed and replaced, if determined by the RPR to have been damaged by the hauling activities from the project.

**MATERIALS**

**600-2.1 GRAVEL:** The gravel material may be recycled material from on-site sources if materials are available. The gravel materials shall meet the requirements of NHDOT Item 304.3 – Crushed Gravel specification, which are as follows:

**REQUIREMENTS FOR NHDOT CRUSHED GRAVEL GRADATION**

<u>Sieve Size</u>	<u>NHDOT 304.3 Allowable Range</u> <u>Percentage Passing by Weight</u>
3 inch	100
2 inch	95 - 100
1-1/2 inch	----
1 inch	55– 85
3/4 inch	----
No. 4	27 - 52
No. 40	----
No. 200	0 – 12*

\* Fraction passing #4 Sieve

**600-2.2 RECLAIMED ASPHALT PAVEMENT (RAP):** Reclaimed Asphalt Pavement (RAP) material is to be used as a temporary surface material and shall meet the requirements for the material as outlined in NHDOT Standard Specifications for Road and Bridge Construction (NHDOT Standard Specifications) Sections 401. The material shall have the following gradation:

## REQUIREMENTS FOR RAP GRADATION

<u>Sieve Size</u>	<u>Percentage Passing by Weight</u>
1-1/2 inch	100
1 inch	90 - 100
3/4 inch	-----
1/2 inch	65 - 90
No. 4	30 - 55
No. 200	0 - 10

**600-2.3 VEHICLE SURFACE ROAD HOT MIX ASPHALT PAVEMENT:** The hot mix asphalt materials used to replace the existing asphalt material at the end of the work shall meet the requirements for Item 403.11 (NHDOT Standard 3/4" binder mix) as outlined in NHDOT Standard Specifications for Road and Bridge Construction (NHDOT Standard Specifications) Sections 401 and 403.

**600-2.4 CHAIN LINK FENCE AND GATE:** The proposed chain link fence and gate materials for the temporary access shall as specified in Section F-162 *Chain Link Fences* within these Contract Document specifications.

**600-2.5 TURF RESTORATION MATERIALS:** The proposed turf restoration materials for the temporary access road surface materials to be removed after the completion of the work shall be as specified in Section T-901 *Seeding*, T-905 *Topsoil* and T-908 *Mulch* within these Contract Document specifications.

## CONSTRUCTION

**600-3.1 PREPARING SUBGRADE.** Before any base material is placed, the subgrade shall be prepared and conditioned as specified. The material shall be checked and accepted by the RPR before placing and spreading operations are started.

All base material shall be placed "in-the-dry" on a stable subgrade. The Contractor shall be responsible for any required dewatering and protection of the subgrade during excavation and compaction requirements of the subgrade prior to base material placement.

**600-3.2 GRAVEL.** The gravel course shall be placed in the depth shown on the details where designated on the Plans or as directed by the RPR. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular base materials which, due to grain sizes or shapes, are not sufficiently stable to support without movement the construction equipment, shall be mechanically stabilized to the depth necessary to provide such stability as directed by the RPR. The mechanical stabilization shall principally include the addition of a fine-grained medium to bind the particles of the base material sufficiently to furnish a bearing strength, so that the course will not deform under the traffic of the construction equipment. The addition of the binding medium to the base material shall not increase the soil constants of that material above the limits specified.

The base course shall be constructed in layers, as necessary. Any layer shall be not more than eight inches (8") of compacted thickness, unless otherwise directed by the RPR. The base material shall be deposited and spread evenly to a uniform thickness and width. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. Any necessary sprinkling shall be kept

within this limit. No material shall be placed in snow or on a soft, muddy, or frozen course.

After spreading, the base material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the base course.

The Contractor will be responsible for the Quality Control of the gravel installation with RPR verification. The field density of the compacted material shall be at least **ninety-five percent (95%) of the maximum density** of laboratory specimens prepared from samples of the gravel material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D 698 – Standard Proctor Density. The in-place field density shall be determined in accordance with ASTM D 1556 (*Density of Soil In-Place by the Sand-Cone Method*) or ASTM D 2922 (*Density of Soil In-Place by the Nuclear Density Method*). The moisture content of the material at the start of compaction shall not be below nor more than two percentage (2%) points above the optimum moisture content.

**600-3.3 RECLAIMED ASPHALT PAVEMENT (RAP):** The Recycled Asphalt Pavement (RAP) material shall be installed as a surface treatment to meet the requirements as outlined in NHDOT Standard Specifications Sections 304 for shoulder gravels. The Contractor will be responsible for the Quality Control of the pavement installation with RPR verification. The minimum compaction requirement shall be **at least ninety percent (90%) of maximum theoretical density** as determined from field testing and documentation using a nuclear density gauge.

**600-3.4 VEHICLE SERVICE ROAD HOT MIX ASPHALT PAVEMENT.** The hot asphalt mix materials shall be installed to meet the requirements as outlined in NHDOT Standard Specifications Sections 401 and 403. The Contractor will be responsible for the Quality Control of the pavement installation with the RPR verification. The minimum compaction requirement shall be **at least ninety-one percent (91%) of maximum theoretical density** as determined from field testing and documentation using a nuclear density gauge. The nuclear gauge shall be used to monitor the pavement density in accordance with ASTM D2950 *Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods*. The hot mix asphalt pavement may be installed in a single lift with proper grade control.

**600-3.4 CHAIN LINK FENCE & GATE.** The existing fence materials shall be carefully removed and salvaged to MHT Maintenance for re-use if in acceptable condition or disposal if not salvageable. All new fencing and gate materials shall be as specified in Section F-162, *Chain Link Fences*. The new gate and fencing shall be installed in the location as shown on the plans and in accordance with the plan details. If existing chain link fence to remain is damaged during the removal or installation of the new temporary gate and fence, the Contractor shall replace in-kind at no additional expense to the Owner. At the completion of all work, the temporary gate and fence shall be removed and the fencing shall be re-installed to its original configuration.

**600-3.5 TURF RESTORATION.** The turf restoration will include the removal and proper disposal of the surface treatment course for the limits of the temporary access road footprint as shown on the plans or as otherwise directed by the RPR. The turf restoration topsoil shall be placed in the depth shown on the details where designated on the Plans or as directed by the RPR. The material shall be shaped and thoroughly compacted within the tolerances specified in accordance with the installation requirements of Section T-901 *Seeding*, T-905 *Topsoil* and T-908 *Mulch* within these Contract Document specifications.

## METHOD OF MEASUREMENT

**600-4.1** Construction Access Modifications shall be measured by the lump sum for a complete temporary construction access installation, maintenance, and removal to the satisfaction of the RPR in accordance with the limits shown on the drawings, or as otherwise directed by the RPR for minor modifications. The measurement of turf restoration items shall be incidental to the lump sum costs of this item.

The measurement of the temporary vehicle gate and temporary fencing shall be made separately in accordance with the provision of Section F-162 *Chain Link Fences*. However, the cost of re-installing the fencing from the temporary configuration to the original configuration shall be considered incidental to this lump sum item of work and shall not be measured separately for new fence installation under Section F-162 *Chain Link Fences*.

**600-4.2** Vehicle Service Road pavement shall be measured by the number of tons of asphalt pavement for the limits as shown on the plans, or as directed by the RPR, which is accepted by the RPR. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

The removal of the existing pavements shall be measured separately in accordance with the provisions of Section P-101 *Preparation/Removal of Existing Pavement*. However, the cost of fine grading of the underlying gravel surface after the pavement removal shall be considered as incidental to the Vehicle Service Road pavement item.

The pavement surface materials measurement will not be required to have formal Quality Assurance testing (i.e. cores, etc.) as outlined NHDOT Quality Assurance requirements as specified in the NHDOT Standard Specifications Sections 401 and 403, but the Contractor shall achieve the proper compaction requirements as outlined within this specification and as verified by the Contractor's Quality Control data with verification by the RPR.

## BASIS OF PAYMENT

**600-5.1** Payment will be made at the contract unit price per lump sum for the Construction Access Modifications. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. The preparation work for the temporary access road shall include any unclassified excavation of existing temporary roadway footprint materials (i.e. turf, various soil types, broken up pavement, etc.) to a subgrade elevation, handling, and hauling of all of the existing material, and the legal disposal of these materials off the Airport site (including any other incidental costs to the Contractor as part of a legal disposal of the material) for the limits of work as indicated on the Plans or otherwise directed by the RPR. The installation work shall include preparation of subgrade; site grading; furnishing, hauling, placement and compaction of the base gravel materials; furnishing, hauling, placement, compaction and maintenance of the surface materials; chain link fence removal and preparation for temporary gate; all turf restoration work; and all other incidental items necessary for a complete temporary access installation and maintenance, as well as the removal after the completion of the work to the satisfaction of the RPR.

Based upon the contract lump sum price for "Construction Access Modifications", the partial payments will be allowed as follows:

- a. With first pay request, 60%.
- b. When 50% or more of the original contract is earned, an additional 20%.
- c. After Final Inspection, Construction Access area clean-up, and delivery of all Project Closeout

materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation*, the final 20%.

The chain link fence gate will be paid for under a separate project item, except for the preparation and restoration of the existing fence, which includes the removal of existing fence materials and reinstallation of fence materials to its original configuration which shall be considered as part of this lump sum item of work.

**600-5.2** Payment for the asphalt mixture meeting the acceptance of the RPR shall be made at the contract unit price per ton for the asphalt mixture. The price shall be compensation for furnishing all materials, for all preparation, mixing, fine grading of the gravel surface, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

M-600-1            Construction Access Modifications - - per Lump Sum

M-600-2            Vehicle Service Road Asphalt Pavement - - per Ton

**END OF SECTION M-600**

PAGE LEFT BLANK INTENTIONALLY



**ITEM M-700**  
**ELECTRICAL WORK ALLOWANCE**

**CONTRACT DOCUMENTS**

**700-0.1** This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

**a.** Allowances, as noted on the Bid Form, shall be included in the Base Bid and shall be carried by the Contractor, unless specifically noted to be carried by a subcontractor.

**b.** The Contractor shall cause the work covered by the Allowances to be performed for such amounts and by such persons as the Owner may direct but he will not be required to employ persons against whom he makes a reasonable objection.

**c.** The Contractor shall perform the work under the allowance for the Electrical Work item on a "Time and Materials" basis as noted in FAA General Provisions Section 40-04, *Extra Work* using the following conditions:

**Materials:** The actual costs of the materials purchased by the General Contractor with an allowable fee of ten (10) percent (for coordination and administrative purposes). If a subcontractor purchases the material, the subcontractor is allowed coordination and administrative fee of ten percent (10%), while the General Contractor is limited to an additional five percent (5%) administrative fee for the subcontractor's material costs with markup.

**Labor:** The actual working hours of labor at the labor wage rates from the documented wage and fringe benefit rates used in the Certified Payrolls with overhead and profit fees plus any additional documented burdens not exceeding fifty percent (50%) of the combined certified payroll rates with overhead and profit. If the General Contractor performs the labor directly, an overhead and profit fee of fifteen percent (15%) will be allowed for the Certified Payroll rate (Wage & Fringe Benefits) and adding the documented burden not exceeding fifty percent (50%). If a subcontractor performs the labor, the subcontractor is allowed the overhead and profit fee of fifteen percent (15%) above the Certified Payroll rates and adding the documented burden noted above, while the General Contractor is limited to an additional five percent (5%) administrative fee for the subcontractor's actual labor cost with markups (overhead & profit and documented burden).

**Equipment:** The actual working hours (i.e. no down time allowed) for the equipment based on machinery rental rates submitted during the submittal process and approved prior to any work being performed. The machinery rental rates shall not exceed the allowable rates by providing documentation the proposed rates are less than the current allowable rates listed in the *Rental Blue Book for Construction Equipment*, published by Primedia Business Directories and Books Group. No allowable markup for overhead and profit or administrative fee is allowed for equipment.

Superintendence, small tools, typical fleet vehicles, incidental items, consumables and manual equipment: Not allowable expenses for Time and Materials.

**d.** If the cost, when determined, is more than or less than the Allowance, the Contract Sum shall be adjusted accordingly by Change Order, and if allowable herein, will include additional or reduced handling costs on the site, labor, installation costs, overhead, profit and other expenses resulting to the Contractor from any increase over or decrease from the original Allowance.

**e.** Refer to related Drawings and Specifications for additional information regarding Work to be included as part of Allowances.

## DESCRIPTION

**700-1.1** The work shall include furnishing and installing FAA and/or MHT communication cable and other necessary cabling replacements within new and existing conduit or duct banks per these specifications at the locations shown on the plans. The time and materials cost will include the installation of cable and associated materials, cable splicing/connections, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR, FAA Tech Operations, and MHT Operations/Maintenance representative. However, the installation items shall not include the installation of handholes or duct banks/conduit and associated installation for handholes or duct banks/conduit. Requirements and payment for the installation of underground conduit and duct banks, with trenching and backfilling, are included in the specification outlined in Item L-110, *Airport Underground Electrical Duct Banks and Conduits*. Also, if there is L-824 power cabling replacement, it shall meet the requirements and payment for the installation of underground cabling under the specifications outlined under Item L-108, *Underground Power Cable for Airports*.

## MATERIALS

**700-2.1** The following materials are being used as the “basis of design” for the installation of the communications and other cable replacement. The final approval of all materials to be installed shall be finalized through the submittal process and as specified by FAA – NavAids Design and/or MHT Operations/Maintenance. All materials shall be approved prior to purchase and installation.

### **700-2.1.1 Fiber Optic Communication Cable and Associated Materials.**

#### **a. Fiber Optic Backbone Cable:**

- (1) Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568, ISO 11801, ICEA 696, ITU G.652 and listed as complying with UL 444 and UL 1666.
- (2) Cable Type: Singlemode, 9/125  $\mu\text{m}$  (OS1/OS2) complying with TIA-492CAAA.
- (3) Cable Capacity: 24-strand fiber.
- (4) Cable Applications: Indoor/Outdoor use listed NFPA 262 Type OFNP plenum cable.
- (5) Cable Jacket Color: Single mode Fiber (OS1/OS2): Black, flame retardant PVC.

#### **b. Fiber Optic Cable Innerduct:**

- (1) Description: Single Wall, HDPE corrugated for outside plant use with 900 lb. pull rope
- (2) Size: Nominal 1” inner diameter
- (3) Color: Orange

#### **c. Fiber Optic Interconnecting Devices:**

- (1) Connector Type: SC Type Connectors, as specified by FAA, and comply with TIA 604-3. No other fiber connector types are authorized.
- (2) Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
- (3) Maximum Attenuation/Insertion Loss: 0.3 dB.

#### **d. Patch Panel and Enclosure:**

- (1) Patch Panel: Wall-mounted unit of steel construction with pre-loaded snap-in fiber adapter panels for 24 Single-Mode simplex ports. SC connector type.
- (2) Enclosure: Patch Panel shall be in a NEMA 3R enclosure for mounting in a handhole.

### **700-2.1.2 Standard Telephone Communication Cable.**

#### **a. Copper:**

- (1) Description: Category 3 cable for general communication use complying to UL Listed Type MPR/CMR TIA 568-B.2.

- (2) Cable Type: Individual 24 gage solid bare copper wire with colored semi-rigid PVC insulation jacket, 300 Volt rating.
- (3) Cable Capacity: 50 pair.
- (4) Cable Applications: Indoor/Outdoor use plenum cable.
- (5) Cable Jacket Color: Gray, flame retardant PVC.

**700-2.1.3 Miscellaneous Types of Cable.** The final approval of any miscellaneous cabling materials to be installed shall be identified and finalized through the submittal process and the materials shall be as specified by FAA – Navajds Design and/or MHT Operations/Maintenance. The materials shall be approved prior to purchase and installation.

## **CONSTRUCTION**

**700-3.1 Cable Installations.** The Contractor shall install the communication and power cables in accordance with manufacturer's recommendations for the final selection of materials and as directed by FAA Technical Operations and/or MHT Operations/Maintenance. All communication and power cable installations shall include all materials and equipment necessary for a complete and operational system, as well as the removal of the existing cabling within the replacement limits. The installation shall include connection to existing terminals/patch panels, additional panel enclosures (as applicable) and all splicing and connections as required for the installation. There shall also be service loop slack provided for each terminal/patch panel and in manholes.

## **METHOD OF MEASUREMENT**

**700-4.1 Cable Replacement:** Measurement for the allowance for cable replacement installation will be based on the allowable Time and Material costs as outlined above in paragraph 700-0.1 d. of this item. This detailed breakdown of costs shall be the basis of measurement for the allowance. There shall be no separate measurement for the Contractor's cost to remove existing cabling materials, to coordinate and administer the scheduling of the subcontractors, suppliers or equipment rental companies and these costs shall be considered incidental to the allowable fees and overall project costs.

## **BASIS OF PAYMENT**

**100-5.1 Cable Replacement:** The amount paid to the Contractor shall be the amount indicated on the Contractor's detailed breakdown of the actual costs outlined above. There shall be no separate payment to the Contractor's cost to remove existing cabling materials, to coordinate and administer the scheduling of the subcontractors, suppliers or equipment rental companies and these costs shall be considered incidental to the allowable fees and overall project costs.

Payment will be made under:

M-700-1 Allowance for FAA and MHT Cable Replacement	\$60,000 - Allowance
---	----------------------

## **REFERENCE**

- NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005 and All Revisions.
- ICEA S-83-596 - Indoor Optical Fiber Cables; Insulated Cable Engineers Association; 2011 and All Revisions.
- IEEE 802.3 – IEEE Standards for Ethernet
- NEC Articles 800 – Communication Circuits
- NECA/BICSI 568 - Standard for Installing Building Telecommunications Cabling; National Electrical Contractors Association; 2006.
- TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 2012 and All Revisions.
- TIA-526-7 - Optical Power Loss Measurement of Installed Single mode Fiber Cable Plant, latest revision.
- TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2015 and All Revisions.
- TIA-568-C.3 - Optical Fiber Cabling Components Standard; Rev C, 2008 (with Addenda; 2011) and All Revisions.
- TIA-569-C - Commercial Building Standard for Telecommunications Pathways and Spaces; Rev C, 2012 (with Addenda; 2013) and All Revisions.
- TIA-598-C - Optical Fiber Cable Color Coding; Rev C, 2005 and All Revisions.
- TIA-606-B - Administration Standard for the Telecommunications Infrastructure; Rev B, 2012 and All Revisions.
- TIA-607-B - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; Rev B, 2012 (with Addenda; 2013) and All Revisions.
- UL 444 - Communications Cables; Current Edition, Including All Revisions.
- UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.
- UL 1666 – Riser Flame Test; Current Edition, Including All Revisions.
- UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

## **END OF SECTION M-700**

**ITEM C-100**  
**CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)**

**100-1 General.** Quality is more than test results. Quality is the combination of proper materials, testing, workmanship, equipment, inspection, and documentation of the project. Establishing and maintaining a culture of quality is key to achieving a quality project. The Contractor shall establish, provide, and maintain an effective Contractor Quality Control Program (CQCP) that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The Contractor shall establish a CQCP that will:

- a. Provide qualified personnel to develop and implement the CQCP.
- b. Provide for the production of acceptable quality materials.
- c. Provide sufficient information to assure that the specification requirements can be met.
- d. Document the CQCP process.

The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the CQCP has been reviewed and approved by the Resident Project Representative (RPR). No partial payment will be made for materials subject to specific quality control (QC) requirements until the CQCP has been reviewed and approved.

The QC requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the quality assurance (QA) testing requirements. QA testing requirements are the responsibility of the RPR or Contractor as specified in the specifications.

A Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Resident Project Representative (RPR), Contractor, subcontractors, testing laboratories, and Owner's representative must be held prior to start of construction. The QC/QA workshop will be facilitated by the Contractor. The Contractor shall coordinate with the Airport and the RPR on time and location of the QC/QA workshop. Items to be addressed, at a minimum, will include:

- a. Review of the CQCP including submittals, QC Testing, Action & Suspension Limits for Production, Corrective Action Plans, Distribution of QC reports, and Control Charts.
- b. Discussion of the QA program.
- c. Discussion of the QC and QA Organization and authority including coordination and information exchange between QC and QA.
- d. Establish regular meetings to discuss control of materials, methods and testing.
- e. Establishment of the overall QC culture.

**100-2 Description of program.**

**a. General description.** The Contractor shall establish a CQCP to perform QC inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. The CQCP shall ensure conformance to applicable specifications and plans with respect to materials, off-site fabrication, workmanship, construction, finish, and functional performance. The CQCP shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this

section and any other activities deemed necessary by the Contractor to establish an effective level of QC.

**b. Contractor Quality Control Program (CQCP).** The Contractor shall describe the CQCP in a written document that shall be reviewed and approved by the RPR prior to the start of any production, construction, or off-site fabrication. The written CQCP shall be submitted to the RPR for review and approval at least **ten (10)** calendar days before the CQCP Workshop. The Contractor's CQCP and QC testing laboratory must be approved in writing by the RPR prior to the Notice to Proceed (NTP).

The CQCP shall be organized to address, as a minimum, the following:

1. QC organization and resumes of key staff
2. Project progress schedule
3. Submittals schedule
4. Inspection requirements
5. QC testing plan
6. Documentation of QC activities and distribution of QC reports
7. Requirements for corrective action when QC and/or QA acceptance criteria are not met
8. Material quality and construction means and methods. Address all elements applicable to the project that affect the quality of the pavement structure including subgrade, subbase, base, and surface course. Some elements that must be addressed include, but is not limited to mix design, aggregate grading, stockpile management, mixing and transporting, placing and finishing, quality control testing and inspection, smoothness, laydown plan, equipment, and temperature management plan.

The Contractor must add any additional elements to the CQCP that is necessary to adequately control all production and/or construction processes required by this contract.

**100-3 CQCP organization.** The CQCP shall be implemented by the establishment of a QC organization. An organizational chart shall be developed to show all QC personnel, their authority, and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all QC staff by name and function, and shall indicate the total staff required to implement all elements of the CQCP, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the CQCP, the personnel assigned shall be subject to the qualification requirements of paragraphs 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The QC organization shall, as a minimum, consist of the following personnel:

**a. Program Administrator.** The Contractor Quality Control Program Administrator (CQCPA) must be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The CQCPA must have a minimum of five (5) years of experience in QC pavement construction with prior QC experience on a project of comparable size and scope as the contract.

Included in the five (5) years of paving/QC experience, the CQCPA must meet at least one of the following requirements:

- (1) Professional Engineer with one (1) year of airport paving experience.
- (2) Engineer-in-training with two (2) years of airport paving experience.
- (3) National Institute for Certification in Engineering Technologies (NICET) Civil Engineering Technology Level IV with three (3) years of airport paving experience.
- (4) An individual with four (4) years of airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

The CQCPA must have full authority to institute any and all actions necessary for the successful implementation of the CQCP to ensure compliance with the contract plans and technical specifications. The CQCPA authority must include the ability to immediately stop production until materials and/or processes are in compliance with contract specifications. The CQCPA must report directly to a principal officer of the construction firm. The CQCPA may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

**b. QC technicians.** A sufficient number of QC technicians necessary to adequately implement the CQCP must be provided. These personnel must be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II in Civil Engineering Technology or higher, and shall have a minimum of two (2) years of experience in their area of expertise.

The QC technicians must report directly to the CQCPA and shall perform the following functions:

- (1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by paragraph 100-6.
- (2) Performance of all QC tests as required by the technical specifications and paragraph 100-8.
- (3) Performance of tests for the RPR when required by the technical specifications.

Certification at an equivalent level of qualification and experience by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

**c. Staffing levels.** The Contractor shall provide sufficient qualified QC personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The CQCP shall state where different technicians will be required for different work elements.

**100-4 Project progress schedule.** Critical QC activities must be shown on the project schedule as required by Section 80, paragraph 80-03, *Execution and Progress*.

**100-5 Submittals schedule.** The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include as a minimum:

- a. Specification item number
- b. Item description
- c. Description of submittal
- d. Specification paragraph requiring submittal
- e. Scheduled date of submittal

**100-6 Inspection requirements.** QC inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by paragraph 100-9.

Inspections shall be performed as needed to ensure continuing compliance with contract requirements until completion of the particular feature of work. Inspections shall include the following minimum requirements:

**a.** During plant operation for material production, QC test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used

in proportioning and mixing shall be inspected to ensure its proper operating condition. The CQCP shall detail how these and other QC functions will be accomplished and used.

**b.** During field operations, QC test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The CQCP shall document how these and other QC functions will be accomplished and used.

#### **100-7 Contractor QC testing facility.**

**a.** For projects that include Item P-401, Item P-403, and Item P-404, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM D3666, *Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials*:

8.1.3 Equipment Calibration and Checks;

8.1.9 Equipment Calibration, Standardization, and Check Records;

8.1.12 Test Methods and Procedures

**b.** For projects that include P-501, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM C1077, *Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation*:

7 Test Methods and Procedures

8 Facilities, Equipment, and Supplemental Procedures

**100-8 QC testing plan.** As a part of the overall CQCP, the Contractor shall implement a QC testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional QC tests that the Contractor deems necessary to adequately control production and/or construction processes.

The QC testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

**a.** Specification item number (e.g., P-401)

**b.** Item description (e.g., Hot Mix Asphalt Pavements)

**c.** Test type (e.g., gradation, grade, asphalt content)

**d.** Test standard (e.g., ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

**e.** Test frequency (e.g., as required by technical specifications or minimum frequency when requirements are not stated)

**f.** Responsibility (e.g., plant technician)

**g.** Control requirements (e.g., target, permissible deviations)

The QC testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The RPR shall be provided the opportunity to witness QC sampling and testing.

All QC test results shall be documented by the Contractor as required by paragraph 100-9.



**100-9 Documentation.** The Contractor shall maintain current QC records of all inspections and tests performed. These records shall include factual evidence that the required QC inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the RPR daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the CQCPA.

Contractor QC records required for the contract shall include, but are not necessarily limited to, the following records:

**a. Daily inspection reports.** Each Contractor QC technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous QC inspections have been performed and shall, as a minimum, include the following:

- (1) Technical specification item number and description
- (2) Compliance with approved submittals
- (3) Proper storage of materials and equipment
- (4) Proper operation of all equipment
- (5) Adherence to plans and technical specifications
- (6) Summary of any necessary corrective actions
- (7) Safety inspection.
- (8) Photographs and/or video

The daily inspection reports shall identify all QC inspections and QC tests conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible QC technician and the CQCPA. The RPR shall be provided at least one copy of each daily inspection report on the work day following the day of record. When QC inspection and test results are recorded and transmitted electronically, the results must be archived.

**b. Daily test reports.** The Contractor shall be responsible for establishing a system that will record all QC test results. Daily test reports shall document the following information:

- (1) Technical specification item number and description
- (2) Test designation
- (3) Location
- (4) Date of test
- (5) Control requirements
- (6) Test results
- (7) Causes for rejection
- (8) Recommended remedial actions
- (9) Retests

Test results from each day's work period shall be submitted to the RPR prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical QC charts. When QC daily test results are recorded and transmitted electronically, the results must be archived.

**100-10 Corrective action requirements.** The CQCP shall indicate the appropriate action to be taken when

a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the CQCP as a whole, and for individual items of work contained in the technical specifications.

The CQCP shall detail how the results of QC inspections and tests will be used for determining the need for corrective action and shall contain clear rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical QC charts for individual QC tests. The requirements for corrective action shall be linked to the control charts.

**100-11 Inspection and/or observations by the RPR.** All items of material and equipment are subject to inspection and/or observation by the RPR at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate QC system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to inspection and/or observation by the RPR at the site for the same purpose.

Inspection and/or observations by the RPR does not relieve the Contractor of performing QC inspections of either on-site or off-site Contractor's or subcontractor's work.

#### **100-12 Noncompliance.**

a. The Resident Project Representative (RPR) will provide written notice to the Contractor of any noncompliance with their CQCP. After receipt of such notice, the Contractor must take corrective action.

b. When QC activities do not comply with either the CQCP or the contract provisions or when the Contractor fails to properly operate and maintain an effective CQCP, and no effective corrective actions have been taken after notification of non-compliance, the RPR will recommend the Owner take the following actions:

- (1) Order the Contractor to replace ineffective or unqualified QC personnel or subcontractors and/or
- (2) Order the Contractor to stop operations until appropriate corrective actions are taken.

### **METHOD OF MEASUREMENT**

**100-13 Basis of measurement and payment.** Contractor Quality Control Program (CQCP) is for the personnel, tests, facilities and documentation required to implement the CQCP. The CQCP will be paid as a lump sum with the following schedule of partial payments:

a. With first pay request, 25% with approval of CQCP and completion of the Quality Control (QC)/Quality Assurance (QA) workshop.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 20%.

d. When 75% or more of the original contract is earned, an additional 20%

e. After final inspection and acceptance of project, the final 10%.

## **BASIS OF PAYMENT**

### **100-14 Payment will be made under:**

Item C-100 Contractor Quality Control Program (CQCP)

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

National Institute for Certification in Engineering Technologies (NICET)

ASTM International (ASTM)

ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

**END OF ITEM C-100**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM C-102**  
**TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL**

**DESCRIPTION**

**102-1.** This item shall consist of temporary control measures as shown on the plans or as ordered by the Resident Project Representative (RPR) during the life of a contract to control pollution of air and water, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

Temporary erosion control shall be in accordance with the approved erosion control plan; the approved Construction Safety and Phasing Plan (CSPP) and AC 150/5370-2, *Operational Safety on Airports During Construction*. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be designed, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

**MATERIALS**

**102-2.1 Grass.** Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

**102-2.2 Mulches.** Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per Item T-908. Mulches shall not create a wildlife attractant.

**102-2.3 Fertilizer.** Fertilizer shall be a standard commercial grade and shall conform to all federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

**102-2.4 Slope drains.** Slope drains may be constructed of pipe, fiber mats, rubble, concrete, asphalt, or other materials that will adequately control erosion.

**102-2.5 Silt fence.** Silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461.

**102-2.6 Other.** All other materials shall meet commercial grade standards and shall be approved by the RPR before being incorporated into the project.

**CONSTRUCTION REQUIREMENTS**

**102-3.1 General.** In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The RPR shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

**102-3.2 Schedule.** Prior to the start of construction, the Contractor shall submit schedules in accordance with the approved Construction Safety and Phasing Plan (CSPP) and the plans for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the RPR.

**102-3.3 Construction details.** The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the plans and approved CSPP. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, schedule and perform clearing and grubbing operations so that grading operations and permanent erosion control features can follow immediately if project conditions permit. Temporary erosion control measures are required if permanent measures cannot immediately follow grading operations. The RPR shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the RPR.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the RPR. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the RPR, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The RPR may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be maintained by the Contractor during the construction period.

Provide temporary structures whenever construction equipment must cross watercourses at frequent intervals. Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

**102-3.4 Installation, maintenance and removal of silt fence.** Silt fences shall extend a minimum of 16 inches (41 cm) and a maximum of 34 inches (86 cm) above the ground surface. Posts shall be set no more than 10 feet (3 m) on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch (300-mm) overlap and securely sealed. A trench shall be excavated approximately 4 inches (100 mm) deep by 4 inches (100 mm) wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of

silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the RPR.

**102-3.4 Stormwater Prevention Pollution Plan.** The Contractor shall be responsible for and develop a customized Storm Water Pollution Prevention Plan (SWPPP) for the project. The Contractor shall prepare the SWPPP in conjunction with the Contract Document and any environmental permit requirements. The Owner and RPR shall review and approve the SWPPP, in writing, prior to commencing work.

The Contractor shall identify Best Management Practices (BMPs) to be implemented during construction in addition to the minimum requirements shown in the Contract Documents and for any stockpile, material storage, or staging locations. BMPs are designed to minimize potential contamination of stormwater as a result of contact with soil stockpiles, materials, equipment and vehicles. The SWPPP BMPs shall also be considered for temporary stockpile or storage locations not immediately on the project site, but used for the project.

The Contractor shall be responsible to prepare and submit a Notice of Intent (NOI) to the U.S. Environmental Protection Agency (EPA) for coverage under the Construction General Permit (CGP) for Stormwater Discharge from Construction Sites as part of the USEPA NNPDES program. The Contractor shall be considered to be the “Operator” having the “day-to-day” operational control for the project. The NOI shall be submitted electronically (<https://www.epa.gov/npdes/submitting-notice-intent-noi-notice-termination-not-or-low-erosivity-waiver-low-under>) at least fourteen (14) calendar days prior to the commencement of work. In addition, the Contractor is responsible for submitting the Notice to Terminate (NOT) upon completion of the project. No separate measurement or payment shall be made for a customized SWPPP and submittals of the NOI and NOT to the U.S. EPA.

## **METHOD OF MEASUREMENT**

**102-4.1** Temporary erosion and pollution control work required will be performed as scheduled or directed by the RPR. Completed and accepted work will be measured as follows:

- a. Temporary seeding and mulching will be measured by the square yard (square meter).
- b. Temporary slope drains will be measured by the linear foot (meter).
- c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard (cubic meter) of excavation performed, including necessary cleaning of sediment basins, and the cubic yard (cubic meter) of embankment placed as directed by the RPR.
- d. All fertilizing will be measured by the ton (kg).
- e. Installation and removal of silt fence will be measured by the linear foot (meter) .
- f. Installation and removal of inlet protection filter bags will be measured by the each .
- g. Installation and removal of erosion control log will be measured by the linear foot (meter).
- h. Installation and removal of stabilized construction entrance will be measured by the each .
- i. Installation of erosion control blanket will be measured by the square yard (square meter).

**102-4.2** Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

**102-4.3** The Storm Water Pollution Prevention Plan (SWPPP) and submission of the USEPA NPDES CGP

Notice of Intent will not be measured separately and will be considered incidental to the lump sum item as outlined in Section M-200 *Maintenance and Protection of Traffic*.

### **BASIS OF PAYMENT**

**102-5.1** Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the RPR and measured as provided in paragraph 102-4.1 will be paid for under:

- Item C-102-5.1      Installation and removal of inlet protection filter bags per each
- Item C-102-5.2      Installation and removal of erosion control logs per linear feet (meter)
- Item C-102-5.3      Installation and removal of stabilized construction entrance per each
- Item C-102-5.4      Installation of erosion control blanket per square yard (square meter)

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control features not covered by contract items that are ordered by the RPR will be paid for in accordance with Section 90, paragraph 90-05 *Payment for Extra Work*.

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### Advisory Circulars (AC)

- AC 150/5200-33      *Hazardous Wildlife Attractants on or Near Airports*
- AC 150/5370-2      *Operational Safety on Airports During Construction*

#### ASTM International (ASTM)

- ASTM D6461      *Standard Specification for Silt Fence Materials*

#### United States Department of Agriculture (USDA)

- FAA/USDA Wildlife Hazard Management at Airports, A Manual for Airport Personnel

### **END OF ITEM C-102**



## **ITEM C-105 MOBILIZATION**

**105-1 Description.** This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

**105-2 Mobilization limit.** Mobilization shall be limited to **three (3) percent** of the total project cost.

**105-3 Posted notices.** Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster “Equal Employment Opportunity is the Law” in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL “Notice to All Employees” Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

**105-4 Engineer/RPR field office.** The Contractor shall provide dedicated space for the use of the field RPR and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity in accordance with local building codes.

### **METHOD OF MEASUREMENT**

**105-5 Basis of measurement and payment.** Based upon the contract lump sum price for “Mobilization” partial payments will be allowed as follows:

- a. With first pay request, 25%.
- b. When 25% or more of the original contract is earned, an additional 25%.
- c. When 50% or more of the original contract is earned, an additional 40%.
- d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation*, the final 10%.

### **BASIS OF PAYMENT**

**105-6 Payment will be made under:**

Item C-105-6.1      Mobilization

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD)

WH 1321 – Employee Rights under the Davis-Bacon Act Poster

**END OF SECTION C-105**

**ITEM C-110**  
**METHOD OF ESTIMATING PERCENTAGE OF MATERIAL**  
**WITHIN SPECIFICATION LIMITS (PWL)**

**110-1 General.** When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average ( $\bar{X}$ ) and sample standard deviation ( $S_n$ ) of the specified number ( $n$ ) of sublots for the lot and the specification tolerance limits,  $L$  for lower and  $U$  for upper, for the particular acceptance parameter. From these values, the respective Quality index,  $Q_L$  for Lower Quality Index and/or  $Q_U$  for Upper Quality Index, is computed and the PWL for the lot for the specified  $n$  is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

**110-2 Method for computing PWL.** The computational sequence for computing PWL is as follows:

- a. Divide the lot into  $n$  sublots in accordance with the acceptance requirements of the specification.
- b. Locate the random sampling position within the subplot in accordance with the requirements of the specification.
- c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.
- d. Find the sample average ( $\bar{X}$ ) for all subplot test values within the lot by using the following formula:

$$\bar{X} = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

Where:  $\bar{X}$  = Sample average of all subplot test values within a lot

$x_1, x_2, \dots, x_n$  = Individual subplot test values

$n$  = Number of subplot test values

- e. Find the sample standard deviation ( $S_n$ ) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \dots + d_n^2)/(n-1)]^{1/2}$$

Where:  $S_n$  = Sample standard deviation of the number of subplot test values in the set

$d_1, d_2, \dots, d_n$  = Deviations of the individual subplot test values  $x_1, x_2, \dots$  from the average value  $\bar{X}$

that is:  $d_1 = (x_1 - \bar{X}), d_2 = (x_2 - \bar{X}) \dots d_n = (x_n - \bar{X})$

$n$  = Number of subplot test values

**f.** For single sided specification limits (i.e., L only), compute the Lower Quality Index  $Q_L$  by use of the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with  $Q_L$ , using the column appropriate to the total number (n) of measurements. If the value of  $Q_L$  falls between values shown on the table, use the next higher value of PWL.

**g.** For double-sided specification limits (i.e., L and U), compute the Quality Indexes  $Q_L$  and  $Q_U$  by use of the following formulas:

$$Q_L = (X - L) / S_n$$

and

$$Q_U = (U - X) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with  $Q_L$  and  $Q_U$ , using the column appropriate to the total number (n) of measurements, and determining the percent of material above  $P_L$  and percent of material below  $P_U$  for each tolerance limit. If the values of  $Q_L$  fall between values shown on the table, use the next higher value of  $P_L$  or  $P_U$ . Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where:  $P_L$  = percent within lower specification limit

$P_U$  = percent within upper specification limit

### EXAMPLE OF PWL CALCULATION

**Project:** Example Project

**Test Item:** Item P-401, Lot A.

#### A. PWL Determination for Mat Density.

##### 1. Density of four random cores taken from Lot A.

$$A-1 = 96.60$$

$$A-2 = 97.55$$

$$A-3 = 99.30$$

$$A-4 = 98.35$$

$$n = 4$$

##### 2. Calculate average density for the lot.

$$X = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

$$X = (96.60 + 97.55 + 99.30 + 98.35) / 4$$

$$X = 97.95\% \text{ density}$$

##### 3. Calculate the standard deviation for the lot.

$$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2) / (4 - 1)]^{1/2}$$

$$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$$

$$S_n = 1.15$$

4. Calculate the Lower Quality Index  $Q_L$  for the lot. ( $L=96.3$ )

$$Q_L = (X - L) / S_n$$

$$Q_L = (97.95 - 96.30) / 1.15$$

$$Q_L = 1.4348$$

5. Determine PWL by entering Table 1 with  $Q_L = 1.44$  and  $n = 4$ .

$$PWL = 98$$

#### **B. PWL Determination for Air Voids.**

1. Air Voids of four random samples taken from Lot A.

$$A-1 = 5.00$$

$$A-2 = 3.74$$

$$A-3 = 2.30$$

$$A-4 = 3.25$$

2. Calculate the average air voids for the lot.

$$X = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

$$X = (5.00 + 3.74 + 2.30 + 3.25) / 4$$

$$X = 3.57\%$$

3. Calculate the standard deviation  $S_n$  for the lot.

$$S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$$

$$S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$$

$$S_n = 1.12$$

4. Calculate the Lower Quality Index  $Q_L$  for the lot. ( $L = 2.0$ )

$$Q_L = (X - L) / S_n$$

$$Q_L = (3.57 - 2.00) / 1.12$$

$$Q_L = 1.3992$$

5. Determine  $P_L$  by entering Table 1 with  $Q_L = 1.41$  and  $n = 4$ .

$$P_L = 97$$

6. Calculate the Upper Quality Index  $Q_U$  for the lot. ( $U = 5.0$ )

$$Q_U = (U - X) / S_n$$

$$Q_U = (5.00 - 3.57) / 1.12$$

$$Q_U = 1.2702$$

7. Determine  $P_U$  by entering Table 1 with  $Q_U = 1.29$  and  $n = 4$ .

$$P_U = 93$$

8. Calculate Air Voids PWL

$$PWL = (P_L + P_U) - 100$$

$$PWL = (97 + 93) - 100 = 90$$

## EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

**Project:** Example Project

**Test Item:** Item P-401, Lot A.

### A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

A-3 = 99.30

A-4 = 98.35

A-2 = 97.55

A-1 = 96.60

2. From ASTM E178, Table 1, for  $n=4$  an upper 5% significance level, the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

- a. For measurements greater than the average:

If (measurement - average)/(standard deviation) is less than test criterion,  
then the measurement is not considered an outlier.

For A-3, check if  $(99.30 - 97.95) / 1.15$  is greater than 1.463.

Since 1.174 is less than 1.463, the value is not an outlier.

- b. For measurements less than the average:

If (average - measurement)/(standard deviation) is less than test criterion,  
then the measurement is not considered an outlier.

For A-1, check if  $(97.95 - 96.60) / 1.15$  is greater than 1.463.

Since 1.135 is less than 1.463, the value is not an outlier.

**Note:** In this example, a measurement would be considered an outlier if the density were:

Greater than  $(97.95 + 1.463 \times 1.15) = 99.63\%$

OR

less than  $(97.95 - 1.463 \times 1.15) = 96.27\%$ .

**Table 1. Table for Estimating Percent of Lot Within Limits (PWL)**

Percent Within Limits (P <sub>L</sub> and P <sub>U</sub> )	Positive Values of Q (Q <sub>L</sub> and Q <sub>U</sub> )							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420
96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits ( $P_L$ and $P_U$ )	Negative Values of Q ( $Q_L$ and $Q_U$ )							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566
43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM E178

Standard Practice for Dealing with Outlying Observations

**END OF ITEM C-110**



**ITEM P-101**  
**PREPARATION/REMOVAL OF EXISTING PAVEMENTS**

**DESCRIPTION**

**101-1** This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

**EQUIPMENT AND MATERIALS**

**101-2** All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

**CONSTRUCTION**

**101-3.1 Removal of existing pavement.**

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

**a. Concrete pavement removal.** Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size as designated by the resident project representative. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Spall and underbreak repair shall be in accordance with the plans. Any underlying material that is to remain in place, shall be recompacted and/or replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at the Contractor's expense.

**b. Asphalt pavement removal.** Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. The pavement shall be removed so the joint for each layer of pavement replacement is offset 1 foot from the joint in the preceding layer. This does not apply if the removed pavement is to be replaced with concrete or soil. If the material is to be wasted on the airport site, it shall be broken to a maximum size of 4 inches (mm).

**c. Repair or removal of Base, Subbase, and/or Subgrade.** All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

**101-3.2 Preparation of joints and cracks prior to overlay/surface treatment.** Remove all vegetation and debris from cracks to a minimum depth of 1 inch (25 mm). If extensive vegetation exists, treat the specific

area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than 1/4 inch (6 mm) wide) with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch (3 mm), not to exceed 1/4 inch (6 mm). Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide (38 mm)), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

**Gradation**

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	90-100
No. 16 (1.18 mm)	65-90
No. 30 (600 µm)	40-60
No. 50 (300 µm)	25-42
No. 100 (150 µm)	15-30
No. 200 (75 µm)	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the RPR.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled to within +0 to -1/8 inches (+0 to -3 mm) of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

**101-3.3 Removal of Foreign Substances/contaminates** prior to overlay and remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction. High pressure water, cold milling, or rotary grinding may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch (3 mm) deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense. No material shall be

deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

#### **101-3.4 Concrete spall or failed asphaltic concrete pavement repair.**

**a. Repair of concrete spalls in areas to be overlaid with asphalt.** The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The perimeter of the repair shall be saw cut a minimum of 2 inches (50 mm) outside the affected area and 2 inches (50 mm) deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches (100 mm) in depth. This method of repair applies only to pavement to be overlaid.

**b. Asphalt pavement repair.** The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. Materials and methods of construction shall comply with the applicable sections of these specifications.

**101-3.5 Cold milling.** Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed off Airport property. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

**a. Patching.** The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The RPR shall layout the area to be milled with a straightedge in increments of 1-foot (30 cm) widths. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall be repaired by the Contractor at the Contractor's Expense.

**b. Profiling, grade correction, or surface correction.** The milling machine shall have a minimum width of 7 feet (2 m) and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and -1/4 inch (+0 mm and -6mm) of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to remove the millings or cuttings from the pavement and load them into a truck. All millings shall be removed and disposed of off the airport.

**c. Clean-up.** The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property.

**101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment.** Existing asphalt pavements to be treated with a surface treatment shall be prepared as follows:

**a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause.** Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.

**b. Repair joints and cracks in accordance with paragraph 101-3.2.**

c. Remove oil or grease that has not penetrated the asphalt pavement by scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

d. Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

**101-3.7 Maintenance.** The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

**101-3.8 Preparation of Joints in Rigid Pavement prior to resealing.** Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.

**101-3.8.1 Removal of Existing Joint Sealant.** All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch (2 mm) from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry.

**101-3.8.2 Cleaning prior to sealing.** Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.

**101-3.8.3 Joint sealant.** Joint material and installation will be in accordance with Item P-605.

**101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing.** Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the pavement.

**101-3.9.1 Preparation of Crack.** Widen crack with router or random crack saw by removing a minimum of 1/16 inch (2 mm) from each side of crack. Immediately before sealing, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

**101-3.9.2 Removal of Existing Crack Sealant.** Existing sealants will be removed by routing or random crack saw. Following routing or sawing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

**101-3.9.3 Crack Sealant.** Crack sealant material and installation will be in accordance with Item P-605.

**101-3.9.4 Removal of Pipe and other Buried Structures.**

a. **Removal of Existing Pipe Material.** Remove the types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 100% of ASTM D1557.

b. **Removal of Inlets/Manholes.** Where indicated on the plans or as directed by the RPR, inlets and/or manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to 100% of ASTM D1557, when outside of paved areas must be compacted to 95% of ASTM D698.

**c. Removal of Existing Cabling Material.** Remove the various types of cabling which are to be abandoned as indicated on the plans for conduits and duct banks to remain. The cabling material shall be legally disposed of off-site in a timely manner following removal.

## **METHOD OF MEASUREMENT**

**101-4.1 Pavement removal.** The unit of measurement for pavement removal shall be the number of square yards (square meters) removed by the Contractor. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation shall be incidental to pavement removal.

**101-4.2 Joint and crack repair.** The unit of measurement for joint and crack repair shall be the linear foot (meter) of joint.

**101-4.3 Removal of Foreign Substances/contaminates.** Not Used.

**101-4.4 Spalled and failed asphalt pavement repair.** Not Used.

**101-4.5 Concrete Spall Repair.** Not Used.

**101-4.6 Cold milling.** The unit of measure for cold milling shall be **up to four inches (4") per lift** of milling per square yard (square meter). The location and average depth of the cold milling shall be as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.

**101-4.7 Removal of Pipe and other Buried Structures.**

**a.** The unit of measurement for removal of pipe will be made at the contract unit price for each linear foot completed and accepted item.

**b.** The unit of measurement for removal of buried structures will be made at the contract unit price for each completed and accepted item.

**c.** The unit of measurement for removal of cabling will be made at the contract unit price for each linear foot completed and accepted item. There shall be no separate measurement whether there is only one cable or multiple conductors for the linear section of duct bank or conduit for each circuit of cabling being removed.

This price for above items shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.9.4.

## **BASIS OF PAYMENT**

**101-5.1 Payment.** Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P 101-5.1	Pavement Removal - per square yard (square meter)
Item P 101-5.2	Joint and Crack Repair – per linear foot (meter)
Item P 101-5.3	Not Used
Item P-101-5.4	Not Used

Item P-101-5.5	Not Used
Item P-101-5.6	Cold Milling – per square yard (square meter)
Item P 101-5.7A	Removal of Pipe - per linear foot (meter)
Item P 101-5.7B	Removal of Drain Inlet/Manhole – per each unit
Item P 101-5.7C	Removal of Electric Manhole/Handhole – per each unit
Item P 101-5.7D	Removal of Cabling In Conduit/Duct Bank to be Abandoned - per linear foot (meter)

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5380-6      Guidelines and Procedures for Maintenance of Airport Pavements.

ASTM International (ASTM)

ASTM D6690    Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

**END OF ITEM P-101**

**ITEM P-152**  
**EXCAVATION, SUBGRADE, AND EMBANKMENT**

**DESCRIPTION**

**152-1.1** This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

**152-1.2 Classification.** All material excavated shall be classified as defined below:

**a. Unclassified excavation.** Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature.

**152-1.3 Unsuitable excavation.** Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material suitable for topsoil may be used on the embankment slope when approved by the RPR.

**CONSTRUCTION METHODS**

**152-2.1 General.** Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared or cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the RPR. All unsuitable material shall be disposed of in waste areas as shown on the plans. All waste areas shall be graded to allow positive drainage of the area and adjacent areas. The surface elevation of waste areas shall be specified on the plans or approved by the RPR.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the RPR notified per Section 70, paragraph 70-20. At the direction of the RPR, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches (100 mm), to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches (150 mm) of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the RPR, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

**a. Blasting.** Blasting shall not be allowed.

**152-2.2 Excavation.** No excavation shall be started until the work has been staked out by the Contractor and the RPR has obtained from the Contractor, the survey notes of the elevations and measurements of the

ground surface. The Contractor and RPR shall agree that the original ground lines shown on the original topographic mapping are accurate, or agree to any adjustments made to the original ground lines.

Digital terrain model (DTM) files of the existing surfaces, finished surfaces and other various surfaces were used to develop the design plans.

Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder.

Volumetric quantities were calculated using design cross sections which were created for this project using the DTM files of the applicable design surfaces and generating End Area Volume Reports. Paper copies of design cross sections and a paper copy of the original topographic map will be issued to the successful bidder.

Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations. Prior to disturbing original grade, Contractor shall verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within 0.1 foot (30 mm) of the stated elevations for ground surfaces, or within 0.04 foot (12 mm) for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the RPR in writing at least two weeks before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the RPR. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes **as** shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

The grade shall be maintained so that the surface is well drained at all times.

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the RPR. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

**a. Selective grading.** When selective grading is indicated on the plans, the more suitable material designated by the RPR shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

**b. Undercutting.** Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches (300 mm) below the subgrade or to the depth specified by the RPR. Muck, peat, matted roots, or



other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard (per cubic meter) for unclassified excavation. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans. Undercutting will be paid as unclassified excavation.

**c. Over-break.** Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the RPR. All over-break shall be graded or removed by the Contractor and disposed of as directed by the RPR. The RPR shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the RPR determines as avoidable. Unavoidable over-break will be classified as "Unclassified Excavation."

**d. Removal of utilities.** The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet (60 cm) below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the RPR. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

**152-2.3 Borrow excavation.** Borrow areas are not required.

**152-2.4 Drainage excavation.** Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the RPR. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

**152-2.5 Preparation of cut areas or areas where existing pavement has been removed.** In those areas on which a subbase or base course is to be placed, the top 12 inches (300 mm) of subgrade shall be compacted to not less than **one hundred percent (100%)** of maximum density for non-cohesive soils, and **ninety-five percent (95%)** of maximum density for cohesive soils as determined by **ASTM D1557**. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

**152-2.6 Preparation of embankment area.** All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (150 mm) and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (300 mm) and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

**152-2.7 Control Strip.** The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials,

equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

**152-2.8 Formation of embankments.** The material shall be constructed in lifts as established in the control strip, but not less than 6 inches (150 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the RPR. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within  $\pm 2\%$  of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The RPR will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with D 1557. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the RPR for every 3,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the RPR.

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted to not less than **one hundred percent (100%)** of maximum density for non-cohesive soils, and **ninety-five percent (95%)** of maximum density for cohesive soils as determined by **ASTM D1557**. Under all areas to be paved, the embankments shall be compacted to a depth of **12 inches** and to a density of not less than **one hundred percent (100%)** of the maximum density as determined by **ASTM D1557**. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches (100 mm) which shall be prepared for a seedbed in accordance with Item T-901.

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The RPR shall perform all density tests. If the specified density is not attained, the area represented by the test or as designated by the RPR shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches (100 mm) in their greatest dimensions will not be allowed in the top 12 inches (300 mm) of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the RPR and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the RPR.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet (60 cm) in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift shall not be constructed above an elevation 4 feet (1.2 m) below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in lifts, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

**152-2.9 Proof rolling.** The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. Before start of embankment and after compaction is completed, the subgrade area shall be proof rolled with either a 20 ton (18.1 metric ton) Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to at least 80 psi (0.551 MPa) or 35 ton Proof Roller with tires spaced not more than 32 inches (0.8 m) on-center with tires inflated to 125 psi (0.861 MPa) in the presence of the RPR. Apply a minimum of 40% coverage, or as specified by the RPR, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas is incidental to this item.

**152-2.10 Compaction requirements.** The subgrade under areas to be paved shall be compacted to a depth of **12 inches** (300 mm) and to a density of not less than **one-hundred percent (100%)** of the maximum dry density as determined by **ASTM D1557**. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of 12 inches (300 mm) and to a density of not less than ninety-five percent (95%) of the maximum density as determined by ASTM D698.

The material to be compacted shall be within  $\pm 2\%$  of optimum moisture content before being rolled to

obtain the prescribed compaction (except for expansive soils). When the material has greater than 30 percent retained on the ¾ inch (19.0 mm) sieve, follow the procedures in AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles. Tests for moisture content and compaction will be taken at a minimum of **2,000 S.Y.** of subgrade. All quality assurance testing shall be done by the RPR.

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 within 12 months prior to its use on this contract. The gage shall be field standardized daily.

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the RPR and the finished subgrade shall be maintained.

**152-2.11 Finishing and protection of subgrade.** Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the RPR.

**152-2.12 Haul.** All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

**152-2.13 Surface Tolerances.** In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

- a. Smoothness.** The finished surface shall not vary more than +/- ½ inch (12 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m)

straightedge for the full length of each line on a 50-foot (15-m) grid.

- b. Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +/- 0.05 feet (15 mm) of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to be placed, grade shall not vary more than 0.10 feet (30 mm) from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

**152-2.14 Topsoil.** When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the RPR, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

## **METHOD OF MEASUREMENT**

**152-3.0** Measurement for payment specified by the cubic yard (cubic meter) shall be computed by the average end areas of design cross sections or the comparison of digital terrain model (DTM) surfaces for computation of neat line design quantities. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by cross-sections shown on the plans, subject to verification by the RPR.

**152-3.1** The quantity of unclassified excavation to be paid for shall be the number of cubic yards (cubic meters) measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

**152-3.2** The quantity of unsuitable excavation to be paid for shall be the number of cubic yards (cubic meters) measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

## **BASIS OF PAYMENT**

**152-4.1** Unclassified excavation payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

**152-4.1** Unsuitable excavation payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-152-4.1	Unclassified Excavation - per cubic yard (cubic meter)
Item P-152-4.2	Unsuitable Excavation - per cubic yard (cubic meter)

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180	Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
--------------	---

ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> (2700 kN-m/m <sup>3</sup> ))
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2	Operational Safety on Airports During Construction Software
---------------	---

Software

FAARFIELD	– FAA Rigid and Flexible Iterative Elastic Layered Design
-----------	---

U.S. Department of Transportation

FAA RD-76-66	Design and Construction of Airport Pavements on Expansive Soils
--------------	---

## **END OF ITEM P-152**

**ITEM P-154  
SUBBASE COURSE**

**DESCRIPTION**

**154-1.1** This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

**MATERIALS**

**154-2.1 Materials.** The subbase material shall consist of hard durable particles or fragments of granular aggregates. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The material shall be free from vegetative matter, excessive amounts of clay, and other objectionable substances; uniformly blended; and be capable of being compacted into a dense, stable subbase.

The subbase material shall exhibit a California Bearing Ratio (CBR) value of at least 20 when tested in accordance with ASTM D1883. The subbase material shall meet the gradation specified in the table below.

**Subbase Gradation Requirements**

Sieve designation	Percentage by weight passing sieves	Contractor's Final Gradation	Job Control Grading Band Tolerances <sup>1</sup> (Percent)
	Subbase Aggregate		
3 inch (75 mm)	100		0
1 1/2 inch (37.5 mm)			0
3/4 inch (19.0 mm)	70-100		±10
No. 10 (2.00 mm)	20-100		±10
No. 40 (425 µm)	5-60		±5
No. 200 (75 µm)	0-10		±5

<sup>1</sup>The "Job Control Grading Band Tolerances" shall be applied to "Contractor's Final Gradation" to establish the job control grading band.

The portion of the material passing the No. 40 (425 µm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D4318.

**154-2.2 Sampling and testing.**

**a. Aggregate base materials.** Samples shall be taken by the Contractor per ASTM D75 for initial aggregate subbase requirements and gradation. Material shall meet the requirements in paragraphs 154-2.1. The Contractor shall submit to the Resident Project Representative (RPR) certified test results showing that

the aggregate meets the Material requirements of this section. Tests shall be representative of the material to be used for the project.

**b. Gradation requirements.** The Contractor shall take at least [ one ] aggregate subbase sample per day in the presence of the RPR to check the final gradation. Samples shall be taken from the in-place, un-compacted material at sampling locations determined by the RPR on a random basis per ASTM D3665. Sampling shall be per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the RPR by the Contractor each day during construction. Material shall meet the requirements in paragraph 154-2.1.

**154-2.3 Separation Geotextile.** Not used.

**154-2.4 Geogrid.** Not used.

## CONSTRUCTION METHODS

**154-3.1 General.** The subbase course shall be placed where designated on the plans or as directed by the RPR. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically modified to the depth necessary to provide stability as directed by the RPR. The mechanical modification shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic.

**154-3.2 Preparing underlying course.** Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances in accordance with Item P-152. Correct ruts, soft yielding spots in the underlying courses, and subgrade areas having inadequate compaction and/or deviations of the surface from the specified requirements, by loosening and removing soft or unsatisfactory material, adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course by mixing the overlying course material into the underlying course, and compacting by approved methods. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The underlying course shall be checked and accepted by the RPR before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

**154-3.3 Control Strip.** The first half-day of subbase construction shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.



**154-3.4 Placement.** The material shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted. The material shall not be placed when the underlying course is soft or yielding.

The material shall meet gradation and moisture requirements prior to compaction. Material may be free-draining and the minimum moisture content shall be established for placement and compaction of the material.

The material shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

**154-3.5 Compaction.** The subbase material shall be compacted, adjusting moisture as necessary, to be within  $\pm 2\%$  of optimum moisture. The field density of the compacted material shall be at least **one-hundred percent (100%)** of the maximum density as specified in paragraph 154-3.9a. If the specified density is not attained, the area of the lift represented by the test shall be reworked and/or re-compact and additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

**154-3.6 Weather limitation.** Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on subbase course shall not be conducted when the subgrade is wet or frozen or the subbase material contains frozen material.

**154-3.7 Maintenance.** No base or surface course shall be placed on the subbase until the subbase has been accepted by the RPR. The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, the Contractor shall verify that materials still meet all specification requirements before placement of additional material. Equipment may be routed over completed sections of subbase course, provided the equipment does not damage the subbase course and the equipment is routed over the full width of the completed subbase course. Any damage to the subbase course from routing equipment over the subbase course shall be repaired by the Contractor at their expense.

**154-3.8 Surface tolerance.** In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and re-compact to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

**a. Smoothness.** The finished surface shall not vary more than  $\pm \frac{1}{2}$  inch (12 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

**b. Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within  $\pm 0.05$

feet (15 mm) of the specified grade.

**154-3.9 Acceptance sampling and testing.** The aggregate base course shall be accepted for density and thickness on an area basis. Two test shall be made for density and thickness for each 1200 square yards (1000 square meters). Sampling locations will be determined on a random basis per ASTM D3665.

**a. Density.** The RPR shall perform all density tests.

Each area shall be accepted for density when the field density is at least **one-hundred percent (100%)** of the maximum density of laboratory specimens compacted and tested per **ASTM D1557**. The in-place field density shall be determined per ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the area represented by the failed test shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

When the material has greater than 30 percent retained on the  $\frac{3}{4}$  inch (19.0 mm) sieve, use methods in ASTM D1557 and the procedures in AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles.

**b. Thickness.** The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

## METHOD OF MEASUREMENT

**154-4.1** Subbase course shall be measured by the number of cubic yards (cubic meters) of subbase course material placed and compacted to specified density and plan thickness requirements in the completed course. The quantity of subbase course material shall be measured in final position based upon the depth tests or cores taken as directed by the RPR, at the rate of two test per each 1200 square yards (1000 square meters) of subbase course or the survey of the completed work computed from elevations to the nearest 0.01 foot (3 mm). On individual depth measurements, thicknesses more than 1/2 inch (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch (12 mm) in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

## BASIS OF PAYMENT

**154-5.1** Payment shall be made at the contract unit price per cubic yard (cubic meter) for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-5.1	Subbase Course - per cubic yard (cubic meter)
----------------	---

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM C117	Standard Test Method for Materials Finer than 75- $\mu\text{m}$ (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> (2,700 kN-m/m <sup>3</sup> ))
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4759	Practice for Determining the Specification Conformance of Geosynthetics
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

### American Association of State Highway and Transportation Officials (AASHTO)

M 288	Geotextile Specification for Highway Applications
-------	---

**END OF ITEM P-154**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-209**  
**CRUSHED AGGREGATE BASE COURSE**

**DESCRIPTION**

**209-1.1** This item consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans.

**MATERIALS**

**209-2.1 Crushed aggregate base.** Crushed aggregate shall consist of clean, sound, durable particles of crushed stone, or crushed gravel and shall be free from coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials or coatings. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate portion, defined as the portion passing the No. 4 (4.75 mm) sieve shall consist of fines from the coarse aggregate crushing operation. The fine aggregate shall be produced by crushing stone, or gravel that meet the coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in the following table.

**Crushed Aggregate Base Material Requirements**

<b>Material Test</b>	<b>Requirement</b>	<b>Standard</b>
<b>Coarse Aggregate</b>		
Resistance to Degradation	Loss: 45% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 98% with at least one fractured face <sup>1</sup>	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles <sup>2</sup>	ASTM D4791
Clay lumps and friable particles	Less than or equal to 3 percent	ASTM C142
<b>Fine Aggregate</b>		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

<sup>1</sup> The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

<sup>2</sup> A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

**209-2.2 Gradation requirements.** The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa.

### Gradation of Aggregate Base

Sieve Size	Design Range Percentage by Weight passing	Contractor's Final Gradation	Job Control Grading Band Tolerances <sup>1</sup> (Percent)
2 inch (50 mm)	100		0
1-1/2 inch (37.5 mm)	95-100		±5
1 inch (25.0 mm)	70-95		±8
3/4 inch (19.0 mm)	55-85		±8
No. 4 (4.75 mm)	30-60		±8
No. 40 <sup>2</sup> (425 µm)	10-30		±5
No. 200 <sup>2</sup> (75 µm)	0-5		±3

<sup>1</sup> The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

<sup>2</sup> The fraction of material passing the No 200 (75 µm) sieve shall not exceed two-thirds the fraction passing the No 40 (425 µm) sieve.

#### 209-2.3 Sampling and Testing.

**a. Aggregate base materials.** The Contractor shall take samples of the aggregate base in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 209-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

**b. Gradation requirements.** The Contractor shall take at least two (2) aggregate base samples per day in the presence of the Resident Project Representative (RPR) to check the final gradation. Sampling shall be per ASTM D75. Material shall meet the requirements in paragraph 209-2.2. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the RPR.

**209-2.4 Separation Geotextile.** Not used.

### CONSTRUCTION METHODS

**209-3.1 Control strip.** The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved by the RPR.

**209-3.2 Preparing underlying subgrade and/or subbase.** The underlying subgrade and/or subbase shall be checked and accepted by the RPR before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with Item P-152, at the Contractor's expense, may be required by the RPR if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

**209-3.3 Production.** The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.5, the approved material may be transported directly to the placement.

**209-3.4 Placement.** The aggregate shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

The aggregate shall meet gradation and moisture requirements prior to compaction. The base course shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications at the Contractor's expense.

**209-3.5 Compaction.** Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade.

The field density of each compacted lift of material shall be at least **one-hundred percent (100%)** of the maximum density of laboratory specimens prepared from samples of the base material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with **ASTM D1557**. The moisture content of the material during placing operations shall be within  $\pm 2$  percentage points of the optimum moisture content as determined by **ASTM D6938**. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

**209-3.6 Weather limitations.** Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

**209-3.7 Maintenance.** The base course shall be maintained in a condition that will meet all specification requirements. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

**209-3.8 Surface tolerances.** After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and recompact to grade until the required smoothness and accuracy are obtained and approved by the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

**a. Smoothness.** The finished surface shall not vary more than 3/8-inch (9 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

**b. Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +0 and -1/2 inch (12 mm) of the specified grade.

**209-3.9 Acceptance sampling and testing.** Crushed aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each 1200 square yds (1000 m<sup>2</sup>). Sampling locations will be determined on a random basis per ASTM D3665

**a. Density.** The RPR shall perform all density.

Each area shall be accepted for density when the field density is at least **one-hundred percent (100%)** of the maximum density of laboratory specimens compacted and tested per **ASTM 1557**. The in-place field density shall be determined per ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompact and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

**b. Thickness.** Depth tests shall be made by test holes at least 3 inches (75 mm) in diameter that extend through the base. The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompact to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

## **METHOD OF MEASUREMENT**

**209-4.1** The quantity of crushed aggregate base course will be determined by measurement of the number of cubic yards (cubic meters) of material actually constructed and accepted by the RPR as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

## **BASIS OF PAYMENT**

**209-5.1** Payment shall be made at the contract unit price per cubic yard (cubic meter) for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209-5.1	Crushed Aggregate Base Course - per cubic yard (cubic meter)
----------------	--



## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- $\mu\text{m}$ (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> (2700 kN-m/m <sup>3</sup> ))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4643	Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating
ASTM D4751	Standard Test Methods for Determining Apparent Opening Size of a Geotextile
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate

ASTM D6938                      Standard Test Method for In-Place Density and Water Content of Soil  
and Soil-Aggregate by Nuclear Methods (Shallow Depth)

ASTM D7928                      Standard Test Method for Particle-Size Distribution (Gradation) of Fine-  
Grained Soils Using the Sedimentation (Hydrometer) Analysis

American Association of State Highway and Transportation Officials (AASHTO)

M288                                Standard Specification for Geosynthetic Specification for Highway  
Applications

**END OF ITEM P-209**

**ITEM P-401**  
**ASPHALT MIX PAVEMENT**

**DESCRIPTION**

**401-1.1** This item shall consist of pavement courses composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared base or stabilized course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

**MATERIALS**

**401-2.1 Aggregate.** Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand, and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. Coarse aggregate is the material retained on the No. 4 (4.75 mm) sieve. Fine aggregate is the material passing the No. 4 (4.75 mm) sieve.

**a. Coarse aggregate.** Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

**Coarse Aggregate Material Requirements**

<b>Material Test</b>	<b>Requirement</b>	<b>Standard</b>
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate <b>or</b> Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Percentage of Fractured Particles	Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face <sup>1</sup>	ASTM D5821
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 <sup>2</sup>	ASTM D4791
Bulk density of slag <sup>3</sup>	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

<sup>1</sup> The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

<sup>2</sup> A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

<sup>3</sup> Only required if slag is specified.

**b. Fine aggregate.** Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the fine aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed in the table below.

### Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0% maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419
Natural Sand	15% maximum by weight of total aggregate	ASTM D1073

**c. Sampling.** ASTM D75 shall be used in sampling coarse and fine aggregate.

**401-2.2 Mineral filler.** Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

### Mineral Filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

**401-2.3 Asphalt binder.** Asphalt binder shall conform to ASTM D6373 **Performance Grade (PG) 76-28.**

### Asphalt Binder PG Plus Test Requirements

Material Test	Requirement	Standard
Elastic Recovery	75% minimum	ASTM D6084 <sup>1</sup>

<sup>1</sup> Follow procedure B on RTFO aged binder.

**401-2.4 Anti-stripping agent.** Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

## COMPOSITION

**401-3.1 Composition of mixture(s).** The asphalt mix shall be composed of a mixture of aggregates, filler and anti-strip agent if required, and asphalt binder. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

**401-3.2 Job mix formula (JMF) laboratory.** The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF; and be listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Resident Project Representative (RPR) prior to start of construction.

**401-3.3 Job mix formula (JMF).** No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.2.

The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. Samples shall be prepared and compacted using a Marshall compactor in accordance with ASTM D6926.

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

The JMF shall be submitted in writing by the Contractor at least thirty (30) days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

The JMF shall be dated, and stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 401-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 401-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 401-2.1.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each coarse and fine aggregate.
- Percent natural sand.
- Percent fractured faces.
- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows or gyrations
- Laboratory mixing and compaction temperatures.
- Supplier-recommended field mixing and compaction temperatures.
- Plot of the combined gradation on a 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.
- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

**Table 1. Asphalt Design Criteria**

Test Property	Value	Test Method
Number of blows	75	
Air voids (%)	3.5	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
Tensile Strength Ratio (TSR) <sup>1</sup>	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA) <sup>2,3</sup>	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

<sup>1</sup> Test specimens for TSR shall be compacted at  $7 \pm 1.0$  % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

<sup>2</sup> AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes

<sup>3</sup> Where APA not available, use Hamburg Wheel test (AASHTO T-324) 10mm @ 20,000 passes at 50°C.

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

**Table 2. Aggregate - Asphalt Pavements**

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25.0 mm)	--
3/4 inch (19.0 mm)	100
1/2 inch (12.5 mm)	90-100
3/8 inch (9.5 mm)	72-88
No. 4 (4.75 mm)	53-73
No. 8 (2.36 mm)	38-60
No. 16 (1.18 mm)	26-48
No. 30 (600 $\mu$ m)	18-38
No. 50 (300 $\mu$ m)	11-27
No. 100 (150 $\mu$ m)	6-18
No. 200 (75 $\mu$ m)	3-6
<b>Minimum Voids in Mineral Aggregate (VMA)<sup>1</sup></b>	<b>15.0</b>
<b>Asphalt Percent:</b>	
Stone or gravel	5.0-7.5
Slag	6.5-9.5
<b>Recommended Minimum Construction Lift Thickness</b>	<b>2 inch</b>

<sup>1</sup> To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

**401-3.4 Reclaimed asphalt pavement (RAP).** RAP shall not be used.

**401-3.5 Control Strip.** Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR. The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 401-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons (227 metric tons) or 1/2 subplot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 401-4.14 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F (71°C). The equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 401-5.5a; and Mat density greater than or equal to 94.5%, air voids 3.5% +/- 1%, and joint density greater than or equal to 92.5%.

If the control strip is unacceptable, necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made and another control strip shall be placed. Unacceptable control strips shall be removed at the Contractor's expense.

The control strip will be considered one lot for payment based upon the average of a minimum of 3 samples (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 401-8.1 using a lot pay factor equal to 100.

## CONSTRUCTION METHODS

**401-4.1 Weather limitations.** The asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the RPR, if requested; however, all other requirements including compaction shall be met.

**Table 4. Surface Temperature Limitations of Underlying Course**

Mat Thickness	Base Temperature (Minimum)	
	°F	°C
3 inches (7.5 cm) or greater	40 <sup>1</sup>	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

**401-4.2 Asphalt plant.** Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items.

**a. Inspection of plant.** The RPR, or RPR's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

**b. Storage bins and surge bins.** The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in

storage and/or surge bins for a period greater than twelve (12) hours. If the RPR determines there is an excessive heat loss, segregation, or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

**401-4.3 Aggregate stockpile management.** Aggregate stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the asphalt batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

**401-4.4 Hauling equipment.** Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

**401-4.4.1 Material transfer vehicle (MTV).** Material transfer vehicles used to transfer the material from the hauling equipment to the paver, shall use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

**401-4.5 Asphalt pavers.** Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.12.

**401-4.6 Rollers.** The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, clean, and capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

**401-4.7 Density device.** The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

**401-4.8 Preparation of asphalt binder.** The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than



350°F (175°C) when added to the aggregate.

**401-4.9 Preparation of mineral aggregate.** The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

**401-4.10 Preparation of Asphalt mixture.** The aggregates and the asphalt binder shall be weighed or metered and mixed in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

**401-4.11 Application of Prime and Tack Coat.** Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

A prime coat in accordance with **Item P-602 shall not be required** for this project. .

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

**401-4.12 Laydown plan, transporting, placing, and finishing.** Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2d before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of **12.5** feet (m) except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least one foot (30 cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in

the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m). On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

**401-4.13 Compaction of asphalt mixture.** After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

**401-4.14 Joints.** The formation of all joints shall be made to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid asphalt except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh asphalt against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C); or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. Asphalt tack coat in accordance with P-603 shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

\*\*\*\*\*

Cut back of all cold joints is required as specified above.

The Contractor may provide additional joint density QC by use of joint heaters at the Contractor's expense. Electrically powered infrared heating equipment should consist of one or more low-level radiant energy heaters to uniformly heat and soften the pavement joints. The heaters should be configured to uniformly heat an area up to 18 inches (0.5 m) in width and 3 inches (75 mm) in depth. Infrared equipment shall be thermostatically controlled to provide a uniform, consistent temperature increase throughout the layer being heated up to a maximum temperature range of 200 to 300°F (93 to 150°C).

Propane powered infrared heating equipment shall be attached to the paving machine and the output of infrared energy shall be in the one to six-micron range. Converters shall be arranged end to end directly over the joint to be heated in sufficient numbers to continuously produce, when in operation, a minimum of 240,000 BTU per hour. The joint heater shall be positioned not more than one inch (25 mm) above the pavement to be heated and in front of the paver screed and shall be fully adjustable. Heaters will be required to be in operation at all times.

The heaters shall be operated so they do not produce excessive heat when the units pass over new or previously paved material.

**401-4.15 Saw-cut grooving.** Saw-cut grooves shall be provided as specified in Item P-621.

**401-4.16 Diamond grinding.** Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with a sufficient number of blades to create grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that cause ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

**401-4.17 Nighttime paving requirements.** The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

## **CONTRACTOR QUALITY CONTROL (CQC)**

**401-5.1 General.** The Contractor shall develop a Contractor Quality Control Program (CQCP) in accordance with Item C-100. No partial payment will be made for materials without an approved CQCP.

**401-5.2 Contractor quality control (QC) facilities.** The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

**401-5.3 Contractor QC testing.** The Contractor shall perform all QC tests necessary to control the

production and construction processes applicable to these specifications and as set forth in the approved CQCP. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the CQCP.

**a. Asphalt content.** A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day will be determined by averaging the test results.

**b. Gradation.** Aggregate gradations shall be determined a minimum of twice per day from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

**c. Moisture content of aggregate.** The moisture content of aggregate used for production shall be determined a minimum of once per day in accordance with ASTM C566.

**d. Moisture content of asphalt.** The moisture content shall be determined once per day in accordance with AASHTO T329 or ASTM D1461.

**e. Temperatures.** Temperatures shall be checked, at least four times per day, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

**f. In-place density monitoring.** The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

**g. Smoothness for Contractor Quality Control.**

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) “straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using either the FAA profile program, ProFAA, or FHWA ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

**(1) Transverse measurements.** Transverse measurements shall be taken for each day’s production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

**(2) Longitudinal measurements.** Longitudinal measurements shall be taken for each day’s production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving

lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3). Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

**h. Grade.** Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to and after the placement of the first lift and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically. The documentation will be provided by the Contractor to the RPR by the end of the following working day.

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 401-4.16.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus 1/2 inch and replacing with new material. Skin patching is not allowed.

**401-5.4 Sampling.** When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

**401-5.5 Control charts.** The Contractor shall maintain linear control charts for both individual measurements and range (i.e. difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day will be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

**a. Individual measurements.** Control charts for individual measurements shall be established to

maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

#### Control Chart Limits for Individual Measurements

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
<b>Asphalt Content</b>	±0.45%	±0.70%
<b>Minimum VMA</b>	-0.5%	-1.0%

**b. Range.** Control charts shall be established to control gradation process variability. The range shall be plotted as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of  $n = 2$ . Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for  $n = 3$  and by 1.27 for  $n = 4$ .

#### Control Chart Limits Based on Range

Sieve	Suspension Limit
1/2 inch (12.5 mm)	11%
3/8 inch (9.5 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (300 µm)	6%
No. 200 (75 µm)	3.5%
<b>Asphalt Content</b>	0.8%

**c. Corrective Action.** The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

**401-5.6 QC reports.** The Contractor shall maintain records and shall submit reports of QC activities daily, in accordance with Item C-100.

### MATERIAL ACCEPTANCE

**401-6.1 Acceptance sampling and testing.** Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

**a. Quality assurance (QA) testing laboratory.** The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will

be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation.

**b. Lot size.** A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

Where more than one plant is simultaneously producing asphalt for the job, the lot sizes will apply separately for each plant.

**c. Asphalt air voids.** Plant-produced asphalt will be tested for air voids on a subplot basis.

**(1) Sampling.** Material from each subplot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to maintain the material at or above the compaction temperature as specified in the JMF.

**(2) Testing.** Air voids will be determined for each subplot in accordance with ASTM D3203 for a set of three compacted specimens prepared in accordance with ASTM D6926.

**d. In-place asphalt mat and joint density.** Each subplot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

**(1) Sampling.** The Contractor will cut minimum 5 inch (125 mm) diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

**(2) Bond.** Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

**(3) Thickness.** Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

**(4) Mat density.** One core shall be taken from each subplot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the TMD for that subplot.

**(5) Joint density.** One core centered over the longitudinal joint shall be taken for each subplot that has a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

#### 401-6.2 Acceptance criteria.

**a. General.** Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, and grade.

**b. Air Voids and Mat density.** Acceptance of each lot of plant produced material for mat density and air voids will be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment will be determined in accordance with paragraph 401-8.1.

**c. Joint density.** Acceptance of each lot of plant produced asphalt for joint density will be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot will be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint will be reduced by five (5) percentage points. This lot pay factor reduction will be incorporated and evaluated in accordance with paragraph 401-8.1.

**d. Grade.** The final finished surface of the pavement shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch (12 mm) vertically.

Cross-sections of the pavement shall be taken at a minimum 50-foot (15-m) longitudinal spacing, at all longitudinal grade breaks, and at start and end of each lane placed. Minimum cross-section grade points shall include grade at centerline and edge of taxiway pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the subplot shall not be more than 95%.

**e. Profilograph roughness for QA Acceptance.** Not used.

**401-6.3 Percentage of material within specification limits (PWL).** The PWL will be determined in accordance with procedures specified in Item C-110. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

**Table 5. Acceptance Limits for Air Voids and Density**

Test Property	Pavements Specification Tolerance Limits	
	L	U
<b>Air Voids Total Mix (%)</b>	2.0	5.0
<b>Surface Course Mat Density (%)</b>	92.8	-
<b>Base Course Mat Density (%)</b>	92.0	-
<b>Joint density (%)</b>	90.5	--

**a. Outliers.** All individual tests for mat density and air voids will be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded, and the PWL will be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 1.55.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 94.5% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 94.0% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 92.5% with 1.55% or less variability.



#### **401-6.4 Resampling pavement for mat density.**

**a. General.** Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-6.1d and 401-6.2b. Only one resampling per lot will be permitted.

(1) A redefined PWL will be calculated for the resampled lot. The number of tests used to calculate the redefined PWL will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

**b. Payment for resampled lots.** The redefined PWL for a resampled lot will be used to calculate the payment for that lot in accordance with Table 6.

**c. Outliers.** Check for outliers in accordance with ASTM E178, at a significance level of 5%.

### **METHOD OF MEASUREMENT**

**401-7.1 Measurement.** Asphalt shall be measured by the number of tons of asphalt used in the accepted work. Batch weights or truck scale weights will be used to determine the basis for the tonnage.

### **BASIS OF PAYMENT**

**401-8.1 Payment.** Payment for a lot of asphalt meeting all acceptance criteria as specified in paragraph 401-6.2 shall be made based on results of tests for mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1c for mat density and air voids; and paragraph 401-6.2c for joint density, subject to the limitation that:

**a.** The total project payment for plant mix asphalt pavement shall not exceed **one hundred percent (100%)** of the product of the contract unit price and the total number of tons (kg) of asphalt used in the accepted work.

**b.** The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**c. Basis of adjusted payment.** The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71% then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1a. Payment in excess of 100% for accepted lots of asphalt shall be used to offset payment for accepted lots of asphalt pavement that achieve a lot pay factor less than 100%.

Payment for sublots which do not meet grade in accordance with paragraph 401-6.2d after correction for over 25% of the subplot shall be reduced by 5%.

**Table 6. Price adjustment schedule<sup>1</sup>**

<b>Percentage of material within specification limits (PWL)</b>	<b>Lot pay factor (percent of contract unit price)</b>
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject <sup>2</sup>

<sup>1</sup> Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1a.

<sup>2</sup> The lot shall be removed and replaced. However, the RPR may decide to allow the rejected lot to remain. In that case, if the RPR and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

**d. Profilograph Roughness.** Not used.

**401-8.1 Payment.**

Payment will be made under:

Item P-401-8.1                  Asphalt Surface Course - per ton (kg)

**REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Asphalt Paving Mixtures

ASTM D1073	Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
ASTM D1188	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Asphalt Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Asphalt Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5361	Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyrotory Compactor.
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus

- ASTM D6927 Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
- ASTM D6995 Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
- ASTM E11 Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
- ASTM E178 Standard Practice for Dealing with Outlying Observations
- ASTM E1274 Standard Test Method for Measuring Pavement Roughness Using a Profilograph
- ASTM E950 Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference
- ASTM E2133 Standard Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Association of State Highway and Transportation Officials (AASHTO)

- AASHTO M156 Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- AASHTO T329 Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
- AASHTO T324 Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures
- AASHTO T 340 Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)

Asphalt Institute (AI)

- Asphalt Institute Handbook MS-26, Asphalt Binder
- Asphalt Institute MS-2 Mix Design Manual, 7th Edition
- AI State Binder Specification Database

Federal Highway Administration (FHWA)

- Long Term Pavement Performance Binder Program

Advisory Circulars (AC)

- AC 150/5320-6 Airport Pavement Design and Evaluation

FAA Orders

- 5300.1 Modifications to Agency Airport Design, Construction, and Equipment Standards

Software

- FAARFIELD

**END OF ITEM P-401**

**ITEM P-403**  
**ASPHALT MIX PAVEMENT BASE COURSE**

**DESCRIPTION**

**403-1.1** This item shall consist of pavement courses composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

**MATERIALS**

**403-2.1 Aggregate.** Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. Coarse aggregate is the material retained on the No. 4 (4.75 mm) sieve. Fine aggregate is the material passing the No. 4 (4.75 mm) sieve.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

**Coarse Aggregate Material Requirements**

<b>Material Test</b>	<b>Requirement</b>	<b>Standard</b>
Resistance to Degradation	Loss: 40% maximum for surface, asphalt binder, and leveling course Loss: 50% maximum for base course	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Percentage of Fractured Particles	Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face <sup>1</sup>	ASTM D5821
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles with a value of 5:1 <sup>2</sup>	ASTM D4791
Bulk density of slag <sup>3</sup>	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

<sup>1</sup> The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

<sup>2</sup> A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

<sup>3</sup> Only required if slag is specified.

**b. Fine aggregate.** Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed in the table below.

### Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419
Natural Sand	15% maximum by weight of total aggregate	ASTM D1073

**c. Sampling.** ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

**403-2.2 Mineral filler.** Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

### Mineral filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

**403-2.3 Asphalt binder.** Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) **76-28**.

### Asphalt Binder PG Plus Test Requirements

Material Test	Requirement	Standard
Elastic Recovery	75% minimum	ASTM D6084 <sup>1</sup>

<sup>1</sup> Follow procedure B on RTFO aged binder.

**403-2.4 Anti-stripping agent.** Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

## COMPOSITION

**403-3.1 Composition of mixture.** The asphalt plant mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

**403-3.2 Job mix formula (JMF) laboratory.** The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF, and listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

**403-3.3 Job mix formula (JMF).** No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 403-3.2.

The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. Samples shall be prepared and compacted using a Marshall compactor in accordance with ASTM D6926.

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

The JMF shall be submitted in writing by the Contractor at least **thirty (30)** days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

The submitted JMF shall be dated, and stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 403-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 403-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 403-2.1 and 403-2.2.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each course and fine aggregate.
- Percent natural sand.
- Percent fractured faces.
- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows or gyrations.
- Laboratory mixing and compaction temperatures.
- Supplier recommended mixing and compaction temperatures.
- Plot of the combined gradation on the 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.
- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.
- Percentage and properties (asphalt content, asphalt binder properties, and aggregate properties) of reclaimed asphalt pavement (RAP) in accordance with paragraph 403-3.4, Reclaimed Hot-Mix Asphalt, if RAP is used.

**Table 1. Asphalt Design Criteria**

Test Property	Value	Test Method
Number of blows	75	
Air voids (%)	3.5	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
TSR <sup>1</sup>	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA) <sup>2,3</sup>	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

<sup>1</sup> Test specimens for TSR shall be compacted at  $7 \pm 1.0$  % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

<sup>2</sup> AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes

<sup>3</sup> Where APA not available, use Hamburg wheel test (AASHTO T 324) 10 mm@ 20,000 passes at 50°C.

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply, be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

**Table 2. Aggregate - Asphalt Pavements**

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25.0 mm)	--
3/4 inch (19.0 mm)	<b>100</b>
1/2 inch (12.5 mm)	<b>90-100</b>
3/8 inch (9.5 mm)	<b>72-88</b>
No. 4 (4.75 mm)	<b>53-73</b>
No. 8 (2.36 mm)	<b>38-60</b>
No. 16 (1.18 mm)	<b>26-48</b>
No. 30 (600 $\mu$ m)	<b>18-38</b>
No. 50 (300 $\mu$ m)	<b>11-27</b>
No. 100 (150 $\mu$ m)	<b>6-18</b>
No. 200 (75 $\mu$ m)	<b>3-6</b>
<b>Voids in Mineral Aggregate (VMA)<sup>1</sup></b>	<b>15.0</b>
<b>Asphalt Percent:</b>	
Stone or gravel	<b>5.0-7.5</b>
Slag	<b>6.5-9.5</b>
<b>Recommended Minimum Construction Lift Thickness</b>	<b>2 inch</b>

<sup>1</sup> To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

**403-3.4 Reclaimed Asphalt Pavement (RAP).** Reclaimed asphalt pavement shall consist of reclaimed asphalt pavement (RAP), coarse aggregate, fine aggregate, mineral filler, and asphalt. Recycled asphalt



shingles (RAS) shall not be allowed. The RAP shall be of a consistent gradation and asphalt content and properties. When RAP is fed into the plant, the maximum RAP chunk size shall not exceed 1-1/2 inches (38 mm). The reclaimed asphalt mix shall be designed using procedures contained in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition. The percentage of asphalt in the RAP shall be established for the mixture design according to ASTM D2172 using the appropriate dust correction procedure. The JMF shall meet the requirements of paragraph 403-3.3. RAP should only be used for shoulder surface course mixes and for any intermediate courses. The use of RAP containing Coal Tar shall not be allowed. Coal Tar surface treatments must be removed prior to recycling underlying asphalt material. The amount of RAP shall be limited to **fifteen percent (15%)**.

In addition to the requirements of paragraph 403-3.3, the JMF shall indicate the percent of reclaimed asphalt pavement and the percent and grade of new asphalt binder.

For the PG graded asphalt binder selected in paragraph 403-2.3, adjust as follows:

- a. For 0-20% RAP, there is no change in virgin asphalt binder content.
- b. For >20 to 30% RAP, select asphalt binder one grade softer, i.e., PG 64-22 would soften to PG 58-28.

**403-3.5 Control strip.** Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR. The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 403-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons (227 metric tons) or 1/2 subplot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 403-4.13 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F (71°C). The equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 403-6.1 and 403-6.2.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 403-5.5a; and Mat density greater than or equal to 94%, air voids 3.5% +/- 1%, and joint density greater than or equal to 92%.

If the control strip is unacceptable, necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made and another control strip shall be placed. Unacceptable control strips shall be removed at the Contractor's expense.

The control strip will be considered one lot for payment based upon the average of a minimum of 3 samples (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 403-8.1.

## **CONSTRUCTION METHODS**

**403-4.1 Weather limitations.** The asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may

be waived by the RPR, if requested; however, all other requirements including compaction shall be met.

**Table 4. Surface Temperature Limitations of Underlying Course**

Mat Thickness	Base Temperature (Minimum)	
	Degrees F	Degrees C
3 inches (7.5 cm) or greater	40	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

**403-4.2 Asphalt plant.** Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items:

**a. Inspection of plant.** The RPR, or RPR's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

**b. Storage bins and surge bins.** The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in storage and/or surge bins for a period greater than twelve (12) hours. If the RPR determines there is an excessive heat loss, segregation or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

**403-4.3 Aggregate stockpile management.** Aggregate stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

**403-4.4 Hauling equipment.** Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

**403-4.4.1 Material transfer vehicle (MTV).** Material transfer Vehicles shall be required due to the improvement in smoothness and decrease in both physical and thermal segregation. To transfer the material from the hauling equipment to the paver, use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

**403-4.5 Asphalt pavers.** Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment

shall be discontinued.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.11.

**403-4.6 Rollers.** The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

**403-4.6.1 Density device.** The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the density gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

**403-4.7 Preparation of asphalt binder.** The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of the unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F (175°C) when added to the aggregate.

**403-4.8 Preparation of mineral aggregate.** The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

**403-4.9 Preparation of asphalt mixture.** The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

**403-4.10 Application of Prime and Tack Coat.** Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

A prime coat in accordance with **Item P-602 shall not be required** for this project.

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

**403-4.11 Laydown plan, transporting, placing, and finishing.** Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2e before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted **12.5** feet (m) except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot (30 cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m). On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

**403-4.12 Compaction of asphalt mixture.** After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to

the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

**403-4.13 Joints.** The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid asphalt except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh asphalt against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C); or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. An asphalt tack coat or other product approved by the RPR shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

Cut back of all cold joints is required as specified above.

The Contractor may provide additional joint density QC by use of joint heaters at the Contractor's expense. Electrically powered infrared heating equipment should consist of one or more low-level radiant energy heaters to uniformly heat and soften the pavement joints. The heaters should be configured to uniformly heat an area up to 18 inches (0.5 m) in width and 3 inches (75 mm) in depth. Infrared equipment shall be thermostatically controlled to provide a uniform, consistent temperature increase throughout the layer being heated up to a maximum temperature range of 200°F to 300°F (93°C to 150°C).

Propane powered infrared heating equipment shall be attached to the paving machine and the output of infrared energy shall be in the one to six-micron range. Converters shall be arranged end to end directly over the joint to be heated in sufficient numbers to continuously produce, when in operation, a minimum of 240,000 BTU per hour. The joint heater shall be positioned not more than one inch (25 mm) above the pavement to be heated and in front of the paver screed and shall be fully adjustable. Heaters will be required to be in operation at all times.

The heaters shall be operated so they do not produce excessive heat when the units pass over new or previously paved material.

**403-4.14 Saw-cut grooving.** Saw-cut grooving is not required.

**403-4.15 Diamond grinding.** Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with a minimum of 55 to 60 blades per 12 inches (300 mm) of cutting head width; grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

**403-4.16 Nighttime Paving Requirements.** The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

### **CONTRACTOR QUALITY CONTROL (CQC)**

**403-5.1 General.** The Contractor shall develop a CQCP in accordance with Item C-100. No partial payment will be made for materials that are subject to specific QC requirements without an approved CQCP.

**403-5.2 Contractor quality control (QC) facilities.** The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

**403-5.3 Quality Control (QC) testing.** The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved CQCP. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the CQCP.

**a. Asphalt content.** A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day will be determined by averaging the test results.

**b. Gradation.** Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444 and ASTM C136, and ASTM C117.

**c. Moisture content of aggregate.** The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

**d. Moisture content of asphalt.** The moisture content of the asphalt shall be determined once per lot in accordance with AASHTO T329 or ASTM D1461.

**e. Temperatures.** Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

**f. In-place density monitoring.** The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

#### **g. Smoothness for Contractor Quality Control.**

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than 1/4 inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues.

The Contractor may use a 12-foot (3.7 m) "straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m)

straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using the FAA profile program, ProFAA, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement and between the start and stop of lanes place shall be evaluated separately for conformance with the plans.

**(1) Transverse measurements.** Transverse measurements shall be taken for each day's production placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

**(2) Longitudinal measurements.** Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 403-4.15 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3). Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

**h. Grade.** Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to the placement of the first lift and then prior to and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically. The documentation will be provided by the Contractor to the RPR by the end of the following working day.

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 403-4.15.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus 1/2 inch and replacing with new material. Skin patching

is not allowed.

**403-5.4 Sampling.** When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

**403-5.5 Control charts.** The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day shall be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

**a. Individual measurements.** Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the JMF target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

**Control Chart Limits for Individual Measurements**

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

**b. Range.** Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of  $n = 2$ . Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for  $n = 3$  and by 1.27 for  $n = 4$ .

**Control Chart Limits Based on Range**

( $n = 2$ )

Sieve	Suspension Limit
1/2 inch (12.5 mm)	11%
3/8 inch (9.5 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (300 µm)	6%
No. 200 (75 µm)	3.5%
Asphalt Content	0.8%



**c. Corrective action.** The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

**403-5.6 Quality control (QC) reports.** The Contractor shall maintain records and shall submit reports of QC activities daily, in accordance with the CQCP described in Item C-100.

## **MATERIAL ACCEPTANCE**

**403-6.1. Quality Assurance Acceptance sampling and testing.** Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

**a. Quality Assurance (QA) testing laboratory.** The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation.

**b. Lot Size.** A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

Where more than one plant is simultaneously producing asphalt for the job, the lot sizes will apply separately for each plant.

**c. Asphalt air voids.** Plant-produced asphalt will be tested for air voids on a subplot basis.

**(1) Sampling.** Material from each subplot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to maintain the material at or above the compaction temperature as specified in the JMF.

**(2) Testing.** Air voids will be determined for each subplot in accordance with ASTM D3203 for a set of three compacted specimens prepared in accordance with ASTM D6926.

**d. In-place asphalt mat and joint density.** Each subplot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

**(1) Sampling.** The Contractor will cut minimum 5 inches (125 mm) diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

**(2) Bond.** Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

**(3) Thickness.** Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch (6 mm) less than the thickness indicated

for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

**(4) Mat density.** One core shall be taken from each subplot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the TMD for that subplot.

**(5) Joint density.** One core centered over the longitudinal joint shall be taken for each subplot which contains a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

#### **403-6.2 Acceptance criteria.**

**a. General.** Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, and grade.

**b. Air voids.** Acceptance of each lot of plant produced material for air voids will be based upon the average air void from the sublots. If the average air voids of the lot are equal to or greater than 2% and equal to or less than 5%, then the lot will be acceptable. If the average is below 2% or greater than 5%, the lot shall be removed and replaced at the Contractor's expense.

**c. Mat density.** Acceptance of each lot of plant produced material for mat density will be based on the average of all of the densities taken from the sublots. If the average mat density of the lot so established equals or exceeds 94%, the lot will be acceptable. If the average mat density of the lot is below 94%, the lot shall be removed and replaced at the Contractor's expense.

**d. Joint density.** Acceptance of each lot of plant produced asphalt for joint density will be based on the average of all of the joint densities taken from the sublots. If the average joint density of the lot so established equals or exceeds 92%, the lot will be acceptable. If the average joint density of the lot is less than 92%, the Contractor shall stop production and evaluate the method of compacting joints. Production may resume once the reason for poor compaction has been determined and appropriate measures have been taken to ensure proper compaction.

**e. Grade.** The final finished surface of the pavement of the completed project shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch (12 mm) vertically.

Cross-sections of the pavement shall be taken at a minimum 50-foot (15-m) longitudinal spacing and at all longitudinal grade breaks. Minimum cross-section grade points shall include grade at centerline, , and edge of taxiway pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the subplot shall not be more than 95%.

#### **403-6.3 Resampling Pavement for Mat Density.**

**a. General.** Resampling of a lot of pavement will only be allowed for mat density and then, only if the Contractor requests same in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 403-6.1. Only one

resampling per lot will be permitted.

(1) A redefined mat density will be calculated for the resampled lot. The number of tests used to calculate the redefined mat density will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

**b. Payment for resampled lots.** The redefined mat density for a resampled lot will be used to evaluate the acceptance of that lot in accordance with paragraph 403-6.2.

**c. Outliers.** Check for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and density determined using the remaining test values.

## **METHOD OF MEASUREMENT**

**403-7.1 Measurement.** Plant mix asphalt mix pavement shall be measured by the number of tons (kg) of asphalt pavement used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

## **BASIS OF PAYMENT**

**403-8.1 Payment.** Payment for a lot of asphalt mixture meeting all acceptance criteria as specified in paragraph 403-6.2 shall be made at the contract unit price per ton (kg) for asphalt. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-403-8.1              Asphalt Base Course/Shoulder Pavement - per ton (kg)

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D1074	Standard Test Method for Compressive Strength of Bituminous Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4125	Standard Test Methods for Asphalt Content of Bituminous mixtures by the Nuclear Method
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5581	Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen)
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6307	Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyratory Compactor
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E2133	Standard Test Method for Using a Rolling Inclinator to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Association of State Highway and Transportation Officials (AASHTO)

- AASHTO M156      Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
- AASHTO T329      Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
- AASHTO T 340      Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)

Asphalt Institute (AI)

- MS-2              Mix Design Manual, 7th Edition
- MS-26            Asphalt Binder Handbook
- AI State Binder Specification Database

FAA Orders

- 5300.1            Modifications to Agency Airport Design, Construction, and Equipment Standards

Federal Highway Administration (FHWA)

- Long Term Pavement Performance Binder program

Software

- FAARFIELD

**END OF ITEM P-403**

**ITEM P-603**  
**EMULSIFIED ASPHALT TACK COAT**

**DESCRIPTION**

**603-1.1** This item shall consist of preparing and treating an asphalt or concrete surface with asphalt material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

**MATERIALS**

**603-2.1 Asphalt materials.** The asphalt material shall be an emulsified asphalt as specified in ASTM D3628 as an asphalt application for tack coat appropriate to local conditions. The emulsified asphalt shall not be diluted. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Resident Project Representative (RPR) before the asphalt material is applied for review and acceptance. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

**CONSTRUCTION METHODS**

**603-3.1 Weather limitations.** The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F (10°C) or above; the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

**603-3.2 Equipment.** The Contractor shall provide equipment for heating and applying the emulsified asphalt material. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven (700) feet per minute (213 m per minute).

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot (3.7-m) spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

A power broom and/or power blower suitable for cleaning the surfaces to which the asphalt tack coat is to be applied shall be provided.

**603-3.3 Application of emulsified asphalt material.** The emulsified asphalt shall not be diluted. Immediately before applying the emulsified asphalt tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material. The emulsified asphalt material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in the table below. The type of asphalt material and application rate shall be approved by the RPR prior to application.

#### **Emulsified Asphalt**

<b>Surface Type</b>	<b>Residual Rate, gal/SY (L/square meter)</b>	<b>Emulsion Application Bar Rate, gal/SY (L/square meter)</b>
<b>New asphalt</b>	0.02-0.05 (0.09-0.23)	0.03-0.07 (0.13-0.32)
<b>Existing asphalt</b>	0.04-0.07 (0.18-0.32)	0.06-0.11 (0.27-0.50)
<b>Milled Surface</b>	0.04-0.08 (0.18-0.36)	0.06-0.12 (0.27-0.54)
<b>Concrete</b>	0.03-0.05 (0.13-0.23)	0.05-0.08 (0.23-0.36)

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the RPR. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

**603-3.4 Freight and waybills** The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the RPR certified waybills and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

#### **METHOD OF MEASUREMENT**

**603-4.1** The emulsified asphalt material for tack coat shall be measured by the gallon (liter). Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D1250. The emulsified asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of emulsified asphalt material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

#### **BASIS OF PAYMENT**

**603.5-1** Payment shall be made at the contract unit price per gallon (liter) of emulsified asphalt material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.



Payment will be made under:

Item P-603-5.1                      Emulsified Asphalt Tack Coat - per gallon (liter)

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2995	Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

**END ITEM P-603**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-605**  
**JOINT SEALANTS FOR PAVEMENTS**

**DESCRIPTION**

**605-1.1** This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

**MATERIALS**

**605-2.1 Joint sealants.** Joint sealant materials shall meet the requirements of **ASTM D6690** *Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements*.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

**605-2.2 Backer rod.** The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be  $25\% \pm 5\%$  larger in diameter than the nominal width of the joint.

**605-2.3 Bond breaking tapes.** Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F (3°C) greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch (3 mm) wider than the nominal width of the joint and shall not bond to the joint sealant.

**CONSTRUCTION METHODS**

**605-3.1 Time of application.** Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F (10°C) and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

When used with Item P-606, such as light can installation, Item P-605 shall not be applied until the P-606 has fully cured.

**605-3.2 Equipment.** Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, **ten (10)** days prior to use on the project.

**a. Tractor-mounted routing tool.** Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

**b. Concrete saw.** Provide a self-propelled power saw, with water-cooled diamond or abrasive saw

blades, for cutting joints to the depths and widths specified.

**c. Sandblasting equipment.** Sandblasting is not allowed.

**d. Waterblasting equipment.** Waterblasting is not allowed.

**e. Hand tools.** Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

**f. Hot-poured sealing equipment.** The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

**g. Cold-applied, single-component sealing equipment.** The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

**605-3.3 Preparation of joints.** Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

**a. Sawing.** All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

**b. Sealing.** Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment and/or concrete saw as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch (12 mm) from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches (75 mm) from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

**c. Backer Rod.** When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

**d. Bond-breaking tape.** Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

**605-3.4 Installation of sealants.** Joints shall be inspected for proper width, depth, alignment, and

preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet (15 m) ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch (6 mm)  $\pm$  1/16 inch (2 mm) below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

**605-3.5 Inspection.** The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

**605-3.6 Clean-up.** Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

## **METHOD OF MEASUREMENT**

**605-4.1** Joint sealing material shall be measured by the linear foot (meter) of sealant in place, completed, and accepted.

## **BASIS OF PAYMENT**

**605-5.1** Payment for joint sealing material shall be made at the contract unit price per linear foot (meter). The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-5.1	Joint Sealing Filler, per linear foot (meter)
----------------	---

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt

### Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
----------------	---

**END ITEM P-605**

**ITEM P-606**  
**ADHESIVE COMPOUNDS, TWO-COMPONENT**  
**FOR SEALING WIRE AND LIGHTS IN PAVEMENT**

**DESCRIPTION**

**606-1.1** This specification covers two types of material; a liquid suitable for sealing electrical wire in saw cuts in pavement and for sealing light fixtures or bases in pavement, and a paste suitable for embedding light fixtures in the pavement. Both types of material are two-component filled formulas with the characteristics specified in paragraph 606-2.4. Materials supplied for use with asphalt and/or concrete pavements must be formulated so they are compatible with the asphalt and/or concrete.

**MATERIALS**

**606-2.1 Curing.** When pre-warmed to 77°F (25°C), mixed, and placed in accordance with manufacturer's directions, the materials shall cure at temperatures of 45°F (7°C) or above without the application of external heat.

**606-2.2 Storage.** The adhesive components shall not be stored at temperatures over 86°F (30°C), unless otherwise specified by the manufacturer.

**606-2.3 Caution.** Installation and use shall be in accordance with the manufacturer's recommended procedures. Avoid prolonged or repeated contact with skin. In case of contact, wash with soap and flush with water. If taken internally, call doctor. Keep away from heat or flame. Avoid vapor. Use in well-ventilated areas. Keep in cool place. Keep away from children.

**606-2.4 Characteristics.** When mixed and cured in accordance with the manufacturer's directions, the materials shall have the following properties shown in Table 1.

**Table 1. Property Requirements**

Physical or Electrical Property	Minimum	Maximum	ASTM Method
<u>Tensile</u>			
Portland cement concrete	1,000 psi (70 kg/sq cm)		D 638
Asphalt concrete	500 psi (35 kg/sq cm)		
<u>Elongation</u>			
Portland cement concrete		See note <sup>1</sup>	D 638
Asphalt concrete	50%		D 638
Coef. of cub. exp. cu. cm/cu. cm/°C	0.00090	0.00120	D 1168
Coef. of lin. exp. cm/cm/°C	0.000030	0.000040	D 1168
Dielectric strength, short time test	350 volts/mil.		D 149
Arc resistance	125 sec		

Physical or Electrical Property	Minimum	Maximum	ASTM Method
<u>Pull-off</u>			
Adhesion to steel	1,000 psi (70 kg/sq cm)		
Adhesion to Portland cement concrete	200 psi (14 kg/sq cm)		
Adhesion to asphalt concrete	No test available.		
Adhesion to aluminum	250 psi		

<sup>1</sup> 20% or more (without filler) for formulations to be supplied for areas subject to freezing.

## SAMPLING, INSPECTION, AND TEST PROCEDURES

**606-3.1 Tensile properties.** Tests for tensile strength and elongation shall be conducted in accordance with ASTM D638.

**606-3.2 Expansion.** Tests for coefficients of linear and cubical expansion shall be conducted in accordance with, Method B, except that mercury shall be used instead of glycerine. The test specimen shall be mixed in the proportions specified by the manufacturer, and cured in a glass tub approximately 2 inch (50 mm) long by 3/8 inch (9 mm) in diameter. The interior of the tube shall be precoated with a silicone mold release agent. The hardened sample shall be removed from the tube and aged at room temperature for one (1) week before conducting the test. The test temperature range shall be from 35°F (2°C) to 140°F (60°C).

**606-3.3 Test for dielectric strength.** Test for dielectric strength shall be conducted in accordance with ASTM D149 for sealing compounds to be furnished for sealing electrical wires in pavement.

**606-3.4 Test for arc resistance.** Test for arc resistance shall be conducted for sealing compounds to be furnished for sealing electrical wires in pavement.

**606-3.5 Test for adhesion to steel.** The ends of two smooth, clean, steel specimens of convenient size (1 inch by 1 inch by 6 inch) (25 mm by 25 mm by 150 mm) would be satisfactory when bonded together with adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure on a Riehle (or similar) tensile tester. The thickness of adhesive to be tested shall be 1/4 inch (6 mm).

### 606-3.6 Adhesion to Portland cement concrete

**a. Concrete test block preparation.** The aggregate grading shall be as shown in Table 2.

The coarse aggregate shall consist of crushed rock having a minimum of 75% of the particles with at least one fractured face and having a water absorption of not more than 1.5%. The fine aggregate shall consist of crushed sand manufactured from the same parent rock as the coarse aggregate. The concrete shall have a water-cement ratio of 5.5 gallons (21 liters) of water per bag of cement, a cement factor of 6,  $\pm 0.5$ , bags of cement per cubic yard (0.76 cubic meter) of concrete, and a slump of 2-1/2 inch (60 mm),  $\pm 1/2$  inch (60 mm  $\pm 12$  mm). The ratio of fine aggregate to total aggregate shall be approximately 40% by solid volume. The air content shall be 5.0%,  $\pm 0.5\%$ , and it shall be obtained by the addition to the batch of an air-entraining admixture such as Vinsol® resin. The mold shall be of metal and shall be provided with a metal base plate.

Means shall be provided for securing the base plate to the mold. The assembled mold and base plate shall be watertight and shall be oiled with mineral oil before use. The inside measurement of the mold shall be such that several one inch (25 mm) by 2-inch (75 mm) by 3-inch (25 mm by 50 mm by 75 mm) test



blocks can be cut from the specimen with a concrete saw having a diamond blade. The concrete shall be prepared and cured in accordance with ASTM C192.

**Table 2. Aggregate for Bond Test Blocks**

Type	Sieve Size	Percent Passing
<b>Coarse Aggregate</b>	3/4 inch (19.0 mm)	97 to 100
	1/2 inch (12.5 mm)	63 to 69
	3/8 inch (9.5 mm)	30 to 36
	No. 4 (4.75 mm)	0 to 3
<b>Fine Aggregate</b>	No. 4 (4.75 mm)	100
	No. 8 (2.36 mm)	82 to 88
	No. 16 (1.18 mm)	60 to 70
	No. 30 (600 $\mu$ m)	40 to 50
	No. 50 (300 $\mu$ m)	16 to 26
	No. 100 (150 $\mu$ m)	5 to 9

**b. Bond test.** Prior to use, oven-dry the test blocks to constant weight at a temperature of 220°F to 230°F (104°C to 110°C), cool to room temperature, 73.4°F  $\pm$  3°F (23°C  $\pm$  1.6°C), in a desiccator, and clean the surface of the blocks of film or powder by vigorous brushing with a stiff-bristled fiber brush. Two test blocks shall be bonded together on the one inch by 3 inch (25 mm by 75 mm) sawed face with the adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure in a Riehle (or similar) tensile tester. The thickness of the adhesive to be tested shall be 1/4 inch (6 mm).

**606-3.7 Compatibility with asphalt mix.** Test for compatibility with asphalt in accordance with ASTM D5329.

**606-3.8 Adhesive compounds - Contractor's responsibility.** The Contractor shall furnish the vendor's certified test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with asphalt concrete pavements. The report shall be provided to and accepted by the Resident Project Representative (RPR) before use of the material. In addition, the Contractor shall obtain a statement from the supplier or manufacturer that guarantees the material for one year. The supplier or manufacturer shall furnish evidence that the material has performed satisfactorily on other projects.

**606-3.9 Application.** Adhesive shall be applied on a dry, clean surface, free of grease, dust, and other loose particles. The method of mixing and application shall be in strict accordance with the manufacturer's recommendations. When used with Item P-605, such as light can installation, Item P-605 shall not be applied until the Item P-606 has fully cured.

## METHOD OF MEASUREMENT

**606-4.1** The adhesive compound shall be measured by the gallon (l) of adhesive as specified, in place, complete and accepted. When required in the installation of an in-runway lighting system or portion thereof, no measurement will be made for direct payment of adhesive, as the cost of furnishing and installing shall be considered as a subsidiary obligation in the completion of the installation.

## BASIS OF PAYMENT

**606-5.1** Payment shall be made, where applicable, at the contract unit price per gallon (l) for the adhesive. This price shall be full compensation for furnishing all materials, and for all preparation, delivering, and

application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

**No separate measurement or payment shall be made for materials used for in-pavement lighting systems.**

For other applications:

Item P-606-5.1            Adhesive Compound - per gallon (l) – **Not Used.**

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM D149	Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D5329	Standard Test Methods for Sealants and Fillers, Hot-applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements

**END OF ITEM P-606**

**ITEM P-610**  
**CONCRETE FOR MISCELLANEOUS STRUCTURES**

**DESCRIPTION**

**610-1.1** This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

**MATERIALS**

**610-2.1 General.** Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

**a. Reactivity.** Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

**610-2.2 Coarse aggregate.** The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

**Coarse Aggregate Grading Requirements**

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch (37.5 mm)	467 or 4 and 67
1 inch (25 mm)	57
3/4 inch (19 mm)	67
1/2 inch (12.5 mm)	7

**610-2.2.1 Coarse Aggregate susceptibility to durability (D) cracking.** Not used.

**610-2.3 Fine aggregate.** The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

**610-2.4 Cement.** Cement shall conform to the requirements of **C150 Type Type I or II.**

The chemical requirements for all cement types specified should meet suitable criteria for deleterious activity. Low alkali cements (less than 0.6% equivalent alkalies). Total Alkalies (Na<sub>2</sub>O and K<sub>2</sub>O) of the cement secured for the production of concrete shall be independently verified in accordance with ASTM C114 or ASTM C1365.

**610-2.5 Cementitious materials.**

**a. Fly ash.** Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

**b. Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

**610-2.6 Water.** Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

**610-2.7 Admixtures.** The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

**a. Air-entraining admixtures.** Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

**b. Water-reducing admixtures.** Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

**c. Other chemical admixtures.** The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

**610-2.8 Premolded joint material.** Premolded joint material for expansion joints shall meet the requirements of ASTM D1751.

**610-2.9 Joint filler.** The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

**610-2.10 Steel reinforcement.** Reinforcing shall consist of Reinforcing Steel conforming to the requirements of ASTM A615, ASTM A706, ASTM A775, and ASTM A934.

**610-2.11 Materials for curing concrete.** Curing materials shall conform to one of the following:

**Materials for Curing**

<b>Waterproof paper</b>	<b>ASTM C171</b>
<b>Clear or white Polyethylene Sheeting</b>	<b>ASTM C171</b>
<b>White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B</b>	<b>ASTM C309</b>

**CONSTRUCTION METHODS**

**610-3.1 General.** The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

**610-3.2 Concrete Mixture.** The concrete shall develop a compressive strength of 4000 psi (28 MPa) in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard (280 kg per cubic meter). The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches (100 mm) as determined by ASTM C143.

**610-3.3 Mixing.** Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F (10°C) nor more than 100°F (38°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

**610-3.4 Forms.** Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

**610-3.5 Placing reinforcement.** All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

**610-3.6 Embedded items.** Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

**610-3.7 Concrete Consistency.** The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

**610-3.8 Placing concrete.** All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet (1.5 m). Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

**610-3.9 Vibration.** Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

**610-3.10 Joints.** Joints shall be constructed as indicated on the plans.

**610-3.11 Finishing.** All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

**610-3.12 Curing and protection.** All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

**610-3.13 Cold weather placing.** When concrete is placed at temperatures below 40°F (4°C), follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

**610-3.14 Hot weather placing.** When concrete is placed in hot weather greater than 85°F (30 °C), follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

## **QUALITY ASSURANCE (QA)**

**610-4.1 Quality Assurance sampling and testing.** Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

**610-4.2 Defective work.** Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

#### **METHOD OF MEASUREMENT**

**610-5.1** Concrete shall be considered incidental and no separate measurement shall be made.

#### **BASIS OF PAYMENT**

**610-6.1** Concrete shall be considered incidental and no separate payment shall be made. The installation shall include full compensation for furnishing all materials including reinforcement and embedded items and for all preparation, delivery, installation, and curing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-610-6.1	Concrete, incidental to other work items
----------------	--

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete



ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

American Concrete Institute (ACI)

ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

**END OF ITEM P-610**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM P-620**  
**RUNWAY AND TAXIWAY MARKING**

**DESCRIPTION**

**620-1.1** This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

**MATERIALS**

**620-2.1 Materials acceptance.** The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

**620-2.2 Marking materials.**

**Table 1. Marking Materials**

<b>Paint<sup>1</sup></b>				<b>Glass Beads<sup>2</sup></b>	
<b>Type</b>	<b>Color</b>	<b>Fed Std. 595 Number</b>	<b>Application Rate Maximum</b>	<b>Type</b>	<b>Application Rate Minimum</b>
Waterborne Type II	White <sup>3</sup>	37925	115 ft <sup>2</sup> /gal	Type I, Gradation A	7 lb/gal
Waterborne Type II	White <sup>4</sup>	37925	115 ft <sup>2</sup> /gal	Type III	10 lb/gal
Waterborne Type II	Yellow	33538 or 33655	115 ft <sup>2</sup> /gal	Type I, Gradation A	7 lb/gal
Waterborne Type II	Red	31136	115 ft <sup>2</sup> /gal	Type I, Gradation A	5 lb/gal
Waterborne Type II	Black	37038	115 ft <sup>2</sup> /gal	No Beads	No Beads
Waterborne Type II	Green	34108	115 ft <sup>2</sup> /gal	No Beads	No Beads
Temporary Marking Waterborne Type II	ALL	See Above for Color Used	230 ft <sup>2</sup> /gal	No beads	No beads

<sup>1</sup> See paragraph 620-2.2a

<sup>2</sup> See paragraph 620-2.2b

<sup>3</sup> General application of White Paint

<sup>4</sup> Application of White Paint in Designators for Surface Painted Hold Markings

**a. Paint.** Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595 (see Table 1).

**Waterborne.** Paint shall meet the requirements of Federal Specification TT-P-1952F, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

Waterborne black paint should be used to outline a border at least 6 inches (150 mm) wide around markings on all light-colored pavements.

An initial application of pavement markings are required after paving operations are complete. The waterborne paint materials for the temporary markings at 100% of the specified application rate.

Prior to reopening pavements, the RPR to verify that all markings comply with Part 139 requirements. Temporary markings not in compliance with AC 150/5340-1 will require a NOTAM regarding any non-standard marking be issued. For example, temporary markings without beads.

**b. Reflective media.** Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type I, Gradation A, except white paint for Surface Painted Hold Signs shall use Type III.

Glass beads for red and pink paint shall meet the requirements for Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Type III glass beads shall not be used in red and pink paint.

## CONSTRUCTION METHODS

**620-3.1 Weather limitations.** Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

**620-3.2 Equipment.** Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

**620-3.3 Preparation of surfaces.** Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminants that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning

process.

**a. Preparation of new pavement surfaces.** The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

**b. Preparation of pavement to remove existing markings.** Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

**c. Preparation of pavement markings prior to remarking.** Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufacturers application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

**620-3.4 Layout of markings.** The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

**620-3.5 Application.** A period of 30 days shall elapse between placement of surface course or seal coat and the final application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

**Marking Dimensions and Spacing Tolerance**

<b>Dimension and Spacing</b>	<b>Tolerance</b>
36 inch (910 mm) or less	±1/2 inch (12 mm)
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch (25 mm)
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch (50 mm)
greater than 60 feet (18.3 m)	±3 inch (76 mm)

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

**620-3.6 Application--preformed thermoplastic airport pavement markings.** Preformed thermoplastic pavement markings not used.

**620-3.7 Control strip.** Prior to the full application of airfield markings, the Contractor shall prepare a

control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

**620-3.8 Retro-reflectance.** Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 reading shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

**Minimum Retro-Reflectance Values**

Material	Retro-reflectance mcd/m <sup>2</sup> /lux		
	White	Yellow	Red
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than <sup>1</sup>	100	75	10

<sup>1</sup> Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance

**620-3.9 Protection and cleanup.** After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

## **METHOD OF MEASUREMENT**

**620-4.1a** The quantity of surface preparation shall be measured by the number of square feet (square meters) for each type of surface preparation specified in paragraph 620-3.3.

**620-4.1b** The quantity of markings shall be paid for shall be measured by the number of square feet (square meters) of painting.

**620-4.1c** The quantity of reflective media shall be paid for by the number of pounds (km) of reflective media.

**620-4.1d** The quantity of temporary markings to be paid for shall be the number of square feet (square meters) of painting performed in accordance with the specifications and accepted by the RPR. Temporary marking includes surface preparation, application and complete removal of the temporary marking.

## **BASIS OF PAYMENT**

**620-5.1** This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

**620-5.1a** Payment for surface preparation shall be made at the contract price for the number of square feet (square meters) for each type of surface preparation specified in paragraph 620-3.3.

**620-5.2b** Payment for markings shall be made at the contract price by the number of square feet (square meters) of painting.

**620-5.3c** Payment for reflective media shall be made at the contract unit price for the number of pounds (km) of reflective media.

**620-5.4d** Payment for temporary markings shall be made at the contract price for the number of square feet (square meters) of painting. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-5.1a	Surface Preparation per square foot (square meter)
Item P-620-5.2b	Marking per square foot (square meter)
Item P-620-5.3c	Reflective Media per pound (km)
Item P-620-5.4d	Temporary runway and taxiway marking per square foot.

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a

ASTM G154	Portable Reflectometer Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
-----------	--

Code of Federal Regulations (CFR)

40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
29 CFR Part 1910.1200 Hazard Communication	

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
FED STD 595	Colors used in Government Procurement

Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based
-----------	-------------------------------

Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

**END OF ITEM P-620**



## **ITEM F-162 CHAIN-LINK FENCE**

### **DESCRIPTION**

**162-1.1** This item shall consist of furnishing and erecting a chain-link fence in accordance with these specifications, the details shown on the plans, and in conformity with the lines and grades shown on the plans or established by the RPR.

### **MATERIALS**

**162-2.1 Fabric.** The fabric shall be woven with a 9-gauge galvanized steel wire in a 2-inch (50 mm) mesh and shall meet the requirements of ASTM A392, Class 2.

**162-2.2 Barbed wire.** Barbed wire shall be 2-strand 12-1/2 gauge zinc-coated wire with 4-point barbs and shall conform to the requirements of ASTM A121, Class 3, Chain Link Fence Grade.

**162-2.3 Posts, rails, and braces.** Line posts, rails, and braces shall conform to the requirements of ASTM F1043 or ASTM F1083 as follows:

- Galvanized tubular steel pipe shall conform to the requirements of Group IA, (Schedule 40) coatings conforming to Type A, or Group IC (High Strength Pipe), External coating Type B, and internal coating Type B or D.
- Roll Formed Steel Shapes (C-Sections) shall conform to the requirements of Group IIA, and be galvanized in accordance with the requirements of ASTM F1043, Type A.

Posts, rails, and braces, with the exception of galvanized steel conforming to ASTM F1043 or ASTM F1083, Group 1A, Type A, or aluminum alloy, shall demonstrate the ability to withstand testing in salt spray in accordance with ASTM B117 as follows:

External: 1,000 hours with a maximum of 5% red rust.

Internal: 650 hours with a maximum of 5% red rust.

The dimensions of the posts, rails, and braces shall be in accordance with Tables I through VI of Federal Specification RR-F-191/3.

**162-2.4 Gates.** Gate frames shall consist of galvanized steel pipe and shall conform to the specifications for the same material under paragraph 162-2.3. The fabric shall be of the same type material as used in the fence.

**162-2.5 Wire ties and tension wires.** Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall be 7-gauge marcelled steel wire with the same coating as the fabric type and shall conform to ASTM A824.

All material shall conform to Federal Specification RR-F-191/4.

**162-2.6 Miscellaneous fittings and hardware.** Miscellaneous steel fittings and hardware for use with zinc-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A153. Barbed wire support arms shall withstand a load of 250 pounds (113 kg) applied vertically to the outermost end of the arm.

**162-2.7 Concrete.** Concrete shall have a minimum 28-day compressive strength of 3000 psi (2670 kPa).

**162-2.8 Marking.** Each roll of fabric shall carry a tag showing the kind of base metal (steel, aluminum, or aluminum alloy number), kind of coating, the gauge of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal (steel, aluminum, or aluminum alloy number), and kind of coating.

## CONSTRUCTION METHODS

**162-3.1 General.** The fence shall be constructed in accordance with the details on the plans and as specified here using new materials. All work shall be performed in a workmanlike manner satisfactory to the RPR. The RPR shall establish and mark the property line or fence line for the work. The Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches. The new fence shall be permanently tied to the terminals of existing fences as shown on the plans. The Contractor shall stake down the woven wire fence at several points between posts as shown on the plans.

The Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet (90 m). The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence.

**162-3.2 Clearing fence line.** Clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions that will interfere with proper construction of the fence. Stumps within the cleared area of the fence shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground, as specified in the plans. When shown on the plans or as directed by the RPR, the existing fences which interfere with the new fence location shall be removed by the Contractor as a part of the construction work unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and compacted with tampers.

The cost of removing and disposing of the material shall not constitute a pay item and shall be considered incidental to fence construction.

**162-3.3 Installing posts.** All posts shall be set in concrete at the required dimension and depth and at the spacing shown on the plans.

The concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within seven (7) days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned footing depth, a hole 2 inches (50 mm) larger than the greatest dimension of the posts shall be drilled to a depth of 12 inches (300 mm). After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required footing depth. No extra compensation shall be made for rock excavation.

**162-3.4 Installing top rails.** The top rail shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion.

**162-3.5 Installing braces.** Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

**162-3.6 Installing fabric.** The wire fabric shall be firmly attached to the posts and braced as shown on the plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than one inch (25 mm) or more than 4 inches (100 mm) from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 inches (150 mm) or less.

**162-3.7 Electrical grounds.** Electrical grounds shall be constructed at 500 feet (150 m) intervals. The ground shall be accomplished with a copper clad rod 8 feet (2.4 m) long and a minimum of 5/8 inches (16 mm) in diameter driven vertically until the top is 6 inches (150 mm) below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. Installation of ground rods shall not constitute a pay item and shall be considered incidental to fence construction. The Contractor shall comply with FAA-STD-019, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment, paragraph 4.2.3.8, Lightning Protection for Fences and Gates, when fencing is adjacent to FAA facilities.

**162-3.8 Cleaning up.** The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction. All disturbed areas shall be seeded per T-901.

## **METHOD OF MEASUREMENT**

**162-4.1** Chain-link fence will be measured for payment by the linear foot (meter). Measurement will be along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

**162-4.2** Gates will be measured as complete units.

## **BASIS OF PAYMENT**

**162-5.1** Payment for chain-link fence will be made at the contract unit price per linear foot (meter).

**162-5.2** Payment for vehicle or pedestrian gates will be made at the contract unit price for each gate.

The price shall be full compensation for furnishing all materials, and for all preparation, erection, and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item F-162-5.1	Chain-Link Fence - per linear foot (meter)
Item F-162-5.2a	Vehicle Gates - per each
Item F-162-5.2b	Pedestrian Gates – Not Used

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A121	Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
-----------	---

ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392	Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A491	Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A824	Standard Specification for Metallic-Coated Steel Marcellled Tension Wire for Use with Chain Link Fence
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM F668	Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and other Organic Polymer Coated Steel Chain-Link Fence Fabric
ASTM F1043	Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F1183	Standard Specification for Aluminum Alloy Chain Link Fence Fabric
ASTM F1345	Standard Specification for Zinc 5% Aluminum-Mischmetal Alloy Coated Steel Chain-Link Fence Fabric
ASTM G152	Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
ASTM G155	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials
Federal Specifications (FED SPEC)	
FED SPEC RR-F-191/3 Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)	
FED SPEC RR-F-191/4 Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)	
FAA Standard	
FAA-STD-019	Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment
FAA Orders	
5300.38	AIP Handbook

**END OF ITEM F-162**

**ITEM D-701**  
**PIPE FOR STORM DRAINS AND CULVERTS**

**DESCRIPTION**

**701-1.1** This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

**MATERIALS**

**701-2.1** Materials shall meet the requirements shown on the plans and specified below. Underground piping and components used in drainage systems for terminal and aircraft fueling ramp drainage shall be noncombustible and inert to fuel in accordance with National Fire Protection Association (NFPA) 415.

**701-2.2 Pipe.** The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO R73      Standard Practice for Evaluation of Precast Concrete Drainage Productions

ASTM International (ASTM)

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C1479	Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
ASTM C1840	Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe

**701-2.3 Concrete.** Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi (13.8 MPa) at 28 days and conform to the requirements of ASTM C94.

**701-2.4 Rubber gaskets.** Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the “RE” closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

**701-2.5 Joint mortar.** Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

**701-2.6 Joint fillers.** Not used.

**701-2.7 Plastic gaskets.** Not used.

**701-2.8. Controlled low-strength material (CLSM).** Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used, all joints shall have gaskets.

**701-2.9 Precast box culverts.** Manufactured in accordance with and conforming to ASTM C1433.

**701-2.10 Precast concrete pipe.** Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or American Concrete Pipe Association QCast Plant Certification program.

## CONSTRUCTION METHODS

**701-3.1 Excavation.** The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 12 inches (300 mm) on each side. The trench walls shall be approximately vertical.

The Contractor shall comply with all current federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch (200 mm) or 1/2 inch (12 mm) for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade should be filled with granular material to form a uniform foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

**701-3.2 Bedding.** The bedding surface for the pipe shall provide a foundation of uniform density to support the pipe throughout its entire length.

**a. Rigid pipe.** The pipe bedding shall be constructed uniformly for the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 in when the bedding thickness is less than 6 inches, and 1-1/2 in when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed uncompacted material under the middle third of the pipe prior to placement of the pipe.

**b. Flexible pipe.** For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

### Flexible Pipe Bedding

Pipe Corrugation Depth		Minimum Bedding Depth	
inch	mm	inch	mm
1/2	12	1	25
1	25	2	50
2	50	3	75
2-1/2	60	3-1/2	90

**c. Other pipe materials.** For PVC, polyethylene, polypropylene, or fiberglass pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches (19 mm). For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches (150 mm) below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

**701-3.3 Laying pipe.** The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

**701-3.4 Joining pipe.** Joints shall be made with (1) cement mortar, (2) cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands as recommended by pipe manufacturer or as noted herein.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

**a. Concrete pipe.** Concrete pipe may be either bell and spigot or tongue and groove. Pipe sections at joints shall be fully seated and the inner surfaces flush and even. Concrete pipe joints shall be sealed with rubber gaskets meeting ASTM C443 when leak resistant joints are required.

**b. Metal pipe.** Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

**c. PVC, Polyethylene, or Polypropylene pipe.** Joints for PVC, Polyethylene, or Polypropylene pipe shall conform to the requirements of ASTM D3212 when leak resistant joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

**d. Fiberglass pipe.** Joints and fittings shall be as detailed on the plans and in accordance with the manufacturers recommendations.

**701-3.5 Embedment and Overfill.** Pipes shall be inspected before any fill material is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and re-laid or replaced at the Contractor's expense.

#### 701-3.5-1 Embedment Material Requirements

**a. Concrete Pipe.** Embedment material and compaction requirements shall be in accordance with the applicable Type of Standard Installation (Types 1, 2, 3, or 4) per ASTM C1479. If a concrete cradle or CLSM embedment material is used, it shall conform to the plan details.

**b. Plastic and fiberglass Pipe.** Embedment material shall meet the requirements of ASTM D3282, A-1, A-2-4, A-2-5, or A-3. Embedment material shall be free of organic material, stones larger than 1.5 inches in the greatest dimension, or frozen lumps. Embedment material shall extend to 12 inches above the top of the pipe.

**c. Metal Pipe.** Embedment material shall be granular as specified in the contract document and specifications, and shall be free of organic material, rock fragments larger than 1.5 inches in the greatest dimension and frozen lumps. As a minimum, backfill materials shall meet the requirements of ASTM D3282, A-1, A-2, or A-3. Embedment material shall extend to 12 inches above the top of the pipe.

#### **701-3.5-2 Placement of Embedment Material**

The embedment material shall be compacted in layers not exceeding 6 inches (150 mm) on each side of the pipe and shall be brought up one foot (30 cm) above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the embedment material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the embedment material shall be compacted in layers not exceeding 6 inches (150 mm) and shall be brought up evenly on each side of the pipe to one foot (30 cm) above the top of the pipe. All embedment material shall be compacted to a density required under Item P-152.

Concrete cradles and flowable fills, such as controlled low strength material (CLSM) or controlled density fill (CDF), may be used for embedment provided adequate flotation resistance can be achieved by restraints, weighing, or placement technique.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

#### **701-3.6 Overfill**

Pipes shall be inspected before any overfill is in place. Any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense. Evaluation of any damage to RCP shall be evaluated based on AASHTO R73.

Overfill material shall be placed and compacted in layers as required to achieve compaction to at least 95 percent standard proctor per ASTM D1557. The soil shall contain no debris, organic matter, frozen material, or stones with a diameter greater than one half the thickness of the compacted layers being placed.

#### **701-3.7 Inspection Requirements**

An initial post installation inspection shall be performed by the RPR no sooner than 30 days after completion of installation and final backfill. Clean or flush all lines prior to inspection.

Incorporate specific inspection requirements for the various types of pipes beneath the general inspection requirements.

Reinforced concrete pipe shall be inspected, evaluated, and reported on in accordance with ASTM C1840, "Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe." Any issues reported shall include still photo and video documentation. The zoom ratio shall be provided for all still or video images that document any issues of concern by the inspection firm.



## **METHOD OF MEASUREMENT**

**701-4.1** The length of pipe shall be measured in linear feet (m) of pipe in place, completed, and accepted. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The measurement shall identify each class, types and size of pipe and shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

**701-4.2.** Box Culvert. Not used.

**701-4.3** Pipe Cradles. Not used.

**701-4.4** Rock Excavation. Not used.

## **BASIS OF PAYMENT**

**701-5.0** These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

**701-5.1** Payment will be made at the contract unit price per linear foot (meter) for each size and class of Reinforced Concrete Pipe.

**701-5.2** Not used.

**701-5.3** Not used.

**701-5.4** Not used.

Payment will be made under:

Item 701-5.1A	4-inch SDR 35 PVC Pipe per linear foot
Item 701-5.1B	12-inch Class V Reinforced Concrete Pipe per linear foot (meter)
Item 701-5.1C	15-inch Class V Reinforced Concrete Pipe per linear foot (meter)
Item 701-5.1D	18-inch Class V Reinforced Concrete Pipe per linear foot (meter)
Item 701-5.2	Box Culvert. Not used.
Item 701-5.3	Pipe Cradles. Not used
Item 701-5.4	Rock Excavation Not used.

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter

### ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using

## Rubber Gaskets

ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3262	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D3282	Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage

ASTM F2736            Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe

ASTM F2764            Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications

ASTM F2881            Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

National Fire Protection Association (NFPA)

NFPA 415              Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways

**END ITEM D-701**

**ITEM D-705**  
**PIPE UNDERDRAINS FOR AIRPORTS**

**DESCRIPTION**

**705-1.1** This item shall consist of the construction of pipe drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

**MATERIALS**

**705-2.1 General.** Materials shall meet the requirements shown on the plans and specified below.

**705-2.2 Pipe.** The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M252            Standard Specification for Corrugated Polyethylene Drainage Pipe

AASHTO M294            Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter

AASHTO M304            Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter

AASHTO MP20            Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter

ASTM C444                Standard Specification for Perforated Concrete Pipe

ASTM C654                Standard Specification for Porous Concrete Pipe

ASTM F758                Standard Specification for Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

ASTM F794                Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter

**705-2.3 Joint mortar.** Pipe joint mortar shall consist of one part by volume of Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

**705-2.4 Elastomeric seals.** Elastomeric seals shall conform to the requirements of ASTM F477.

**705-2.5 Porous backfill.** Porous backfill shall be free of clay, humus, or other objectionable matter, and shall conform to the gradation in Table 1 when tested in accordance with ASTM C136.

**Table 1. Gradation of Porous Backfill**

<b>Sieve Designation (square openings)</b>	<b>Percentage by Weight Passing Sieves</b>
	<b>Porous Material No. 2</b>
1-1/2 inch (37.5 mm)	<b>100</b>
1 inch (25.0 mm)	<b>90 - 100</b>
3/8 inch (9.5 mm)	<b>25 - 60</b>
No. 4 (4.75 mm)	<b>5 - 40</b>
No. 8 (2.36 mm)	<b>0 - 20</b>
No. 16 (1.18 mm)	-
No. 50 (300 µm)	-
No. 100 (150 µm)	-

When two courses of porous backfill are specified in the plans, the finer of the materials shall conform to particle size tabulated herein for porous material No. 1. The coarser granular material shall meet the gradation given in the tabulation for porous material No. 2.

**705-2.6 Granular material.** Granular material used for backfilling shall conform to the requirements of ASTM D2321 for Class IA, IB, or II materials.

**705-2.7 Filter fabric.** The filter fabric shall conform to the requirements of AASHTO M288 Class 2 or equivalent.

**Table 2. Fabric Properties**

<b>Fabric Property</b>	<b>Test Method</b>	<b>Test Requirement</b>
<b>Grab Tensile Strength, lbs</b>	ASTM D4632	125 min
<b>Grab Tensile Elongation %</b>	ASTM D4632	50 min
<b>Burst Strength, psi</b>	ASTM D3785	125 min
<b>Trapezoid Tear Strength, lbs</b>	ASTM D4533	55 min
<b>Puncture Strength, lbs</b>	ASTM D4833	40 min
<b>Abrasion, lbs</b>	ASTM D4886	15 max loss
<b>Equivalent Opening Size</b>	ASTM D4751	70-100
<b>Permittivity sec<sup>-1</sup></b>	ASTM D4491	0.80
<b>Accelerated Weathering (UV Stability) (Strength Retained - %)</b>	ASTM D4355 *(500 hrs exposure)	70

**705-2.8 Controlled low-strength material (CLSM).** Controlled low-strength material shall conform to the requirements of Item P-153. All joints shall have elastomeric seals.

## CONSTRUCTION METHODS

**705-3.1 Equipment.** All equipment required for the construction of pipe underdrains shall be on the project, in good working condition, and approved by the RPR before construction is permitted to start.

**705-3.2 Excavation.** The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but shall not be less than the external diameter of the pipe plus 6 inches (150 mm) on each side of the pipe. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4 inches (100 mm). The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches (150 mm) in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the RPR. The excavation shall not be carried below the required depth; if this occurs, the trench shall be backfilled at the Contractor's expense with material approved by the RPR and compacted to the density of the surrounding material.

The pipe bedding shall be constructed uniformly over the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 inch when the bedding thickness is less than 6 inches, and 1-1/2 inch when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed, uncompacted material under the middle third of the pipe prior to placement of the pipe.

The Contractor shall do trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to federal, state and local laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the backfill has reached at least 12 inches (300 mm) over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot (meter) for the pipe.

### **705-3.3 Laying and installing pipe.**

**a. Concrete pipe.** The laying of the pipe in the finished trench shall be started at the lowest point and proceed upgrade. When bell and spigot pipe is used, the bells shall be laid upgrade. If tongue and groove pipe is used, the groove end shall be laid upgrade. Holes in perforated pipe shall be placed down, unless otherwise shown on the plans. The pipe shall be firmly and accurately set to line and grade so that the invert will be smooth and uniform. Pipe shall not be laid on frozen ground.

Pipe which is not true in alignment, or which shows any settlement after laying, shall be taken up and re-laid by the Contractor at no additional expense. Making adjustments in grade by exerting force on the barrel of the pipe with excavating equipment, by lifting and dropping the pipe, or by lifting the pipe and packing bedding material under it shall be prohibited. If the installed pipe section is not to grade, the pipe section shall be completely removed, the grade corrected, and the pipe rejoined."

**b. Metal pipe.** The metal pipe shall be laid with the separate sections joined firmly together with bands, with outside laps of circumferential joints pointing upgrade, and with longitudinal laps on the sides. Any metal in the pipe or bands that is not protected thoroughly by galvanizing shall be coated with a suitable asphaltum paint.

During installation, the asphalt-protected pipe shall be handled without damaging the asphalt coating. Any breaks in the bitumen or treatment of the pipe shall be refilled with the type and kind of bitumen used in coating the pipe originally.

**c. PVC, fiberglass, or polyethylene pipe.** PVC or polyethylene pipe shall be installed in accordance

with the requirements of ASTM D2321. Perforations shall meet the requirements of AASHTO M252 or AASHTO M294 Class 2, unless otherwise indicated on the plans. The pipe shall be laid accurately to line and grade. Fiberglass per ASTM D3839 Standard Guide for Underground Installation of "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Pipe.

**d. All types of pipe.** The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the RPR.

Unless otherwise shown on the plans, a 4-inch (100 mm) bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the plans.

**e. Filter fabric.** The filter fabric shall be installed in accordance with the manufacturer's recommendations, or in accordance with the AASHTO M288 Appendix, unless otherwise shown on the plans.

**705-3.4 Mortar.** The mortar shall be of the desired consistency for caulking and filling the joints of the pipe and for making connections to other pipes or to structures. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted.

**705-3.5 Joints in concrete pipe.** When open or partly open joints are required or specified, they shall be constructed as indicated on the plans. The pipe shall be laid with the ends fitted together as designed. If bell and spigot pipe is used, mortar shall be placed along the inside bottom quarter of the bell to center the following section of pipe.

The open or partly open joints shall be surrounded with granular material meeting requirements of porous backfill No. 2 in Table 1 or as indicated on the plans. This backfill shall be placed so its thickness will be not less than 3 inches (75 mm) nor more than 6 inches (150 mm), unless otherwise shown on the plans.

When the original material excavated from the trench is impervious, commercial concrete sand or granular material meeting requirements of porous backfill No. 1 shall surround porous backfill No. 2 (Table 1), as shown on the plans or as directed by the RPR.

When the original material excavated from the trench is pervious and suitable, it may be used as backfill in lieu of porous backfill No. 1, when indicated on the plans or as directed by the RPR.

#### **705-3.6 Embedment and Backfill**

**a. Earth.** All trenches and excavations shall be backfilled soon after the pipes are installed, unless additional protection of the pipe is directed. The embedment material shall be select material from excavation or borrow and shall be approved by the RPR. The select material shall be placed on each side of the pipe out to a distance of the nominal pipe diameter and one foot (30 cm) over the top of the pipe and shall be readily compacted. It shall not contain stones 3 inches (75 mm) or larger in size, frozen lumps, chunks of highly plastic clay, or any other material that is objectionable to the RPR. The material shall be moistened or dried, as required to aid compaction. Placement of the embedment material shall not cause displacement of the pipe. Thorough compaction under the haunches and along the sides to the top of the pipe shall be obtained.

The embedment material shall be placed in loose layers not exceeding 6 inches (150 mm) in depth under and around the pipe. Backfill material over the pipe shall be placed in lifts not exceeding 8 inches (200 mm). Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the RPR, until the trench is completely filled and brought to the planned elevation. Embedment



and backfilling shall be done to avoid damaging top or side of the pipe.

In embankments and other unpaved areas, the backfill shall be compacted per Item P-152 to the density required for embankments in unpaved areas. Under paved areas, the subgrade and any backfill shall be compacted per Item P-152 to the density required for embankments for paved areas.

**b. Granular backfill.** When granular backfill is required, placement in the trench and about the pipe shall be as shown on the plans. The granular backfill shall not contain an excessive amount of foreign matter, nor shall soil from the sides of the trench or from the soil excavated from the trench be allowed to filter into the granular backfill. When required by the RPR, a template shall be used to properly place and separate the two sizes of backfill. The backfill shall be placed in loose layers not exceeding 6 inches (150 mm) in depth. The granular backfill shall be compacted by hand and pneumatic tampers to the requirements as given for embankment. Backfilling shall be done to avoid damaging top or side pressure on the pipe. The granular backfill shall extend to the elevation of the trench or as shown on the plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the plans. If the original material excavated from the trench is pervious and suitable, it shall be used in lieu of porous backfill No. 1.

If porous backfill is placed in paved or adjacent to paved areas before grading or subgrade operations is completed, the backfill material shall be placed immediately after laying the pipe. The depth of the granular backfill shall be not less than 12 inches (300 mm), measured from the top of the underdrain. During subsequent construction operations, a minimum depth of 12 inches (300 mm) of backfill shall be maintained over the underdrains. When the underdrains are to be completed, any unsuitable material shall be removed exposing the porous backfill. Porous backfill containing objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any unsuitable material shall be at the Contractor's expense.

If a granular subbase blanket course is used which extends several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2 inches (50 mm) above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material that remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

**c. Controlled low-strength material (CLSM).** Controlled low-strength material shall conform to the requirements of Item P-153.

**705-3.7 Flexible Pipe Ring Deflection.** The flexible pipe shall be inspected by the Contractor during and after installation to ensure that the internal diameter of the pipe barrel has not been reduced by more than 5 percent. For guidance on properly sizing mandrels, refer to ASTM D3034 and ASTM F679 appendices.

**705-3.8 Connections.** When the plans call for connections to existing or proposed pipe or structures, these connections shall be watertight and made to obtain a smooth uniform flow line throughout the drainage system.

**705-3.9 Cleaning and restoration of site.** After the backfill is completed, the Contractor shall dispose of all surplus material, soil, and rubbish from the site. Surplus soil may be deposited in embankments, shoulders, or as directed by the RPR. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

## METHOD OF MEASUREMENT

**705-4.1** The length of pipe shall be the number of linear feet (meters) of pipe underdrains in place, completed, and approved; measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types, and sizes shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipeline being measured.

**705-4.2** Porous backfill. Not used.

**705-4.3** Filter fabric. Not used.

**705-4.4.** The quantity of pipe underdrains shall be made at the contract unit price per linear foot (meter) complete, including porous backfill and filter fabric.

## BASIS OF PAYMENT

**705-5.1** Payment will be made at the contract unit price per linear foot (meter) for pipe underdrains of the type, class, and size designated.

### **705-5.2 Porous backfill.**

b. Porous Backfill No. 2 shall be made at the contract unit price per cubic yard (cubic meter).

**705-5.3. Filter fabric.** Filter fabric shall be made at the contract unit price per square yard (square meter) for filter fabric.

**705-5.4 Pipe underdrains, Complete.** Pipe underdrains, complete (including porous backfill and filter fabric) shall be made at the contract unit price per linear foot (meter) complete (including porous backfill and filter fabric).

These prices shall be full compensation for furnishing all materials and for all preparation, excavation, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D-705-5.1	Not Used.
Item D-705-5.2b	Porous Backfill No. 2 - Not Used.
Item D-705-5.3	Filter Fabric - Not Used.
Item D-705-5.4	6-inch pipe (mm pipe) Double-Wall High Density Polyethylene (smooth interior/corrugated exterior) per linear foot (meter) complete, including porous backfill and filter fabric

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C444	Standard Specification for Perforated Concrete Pipe
ASTM C654	Standard Specification for Porous Concrete Pipe
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D3262	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F758	Standard Specification for Smooth Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage

### American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M190	Standard Specification for Bituminous - Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M288	Standard Specification for Geotextile Specification for Highway Applications
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter

AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel-Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) diameter
AASHTO	Standard Specifications for Highway Bridges

**END OF ITEM D-705**

**ITEM D-751**  
**MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES**

**DESCRIPTION**

**751-1.1** This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the RPR.

**MATERIALS**

**751-2.1 Brick.** The brick shall conform to the requirements of ASTM C32, Grade MS.

**751-2.2 Mortar.** Mortar shall consist of one part Portland cement and two parts sand. The cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

**751-2.3 Concrete.** Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

**751-2.4 Precast concrete pipe manhole rings.** Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches (90 cm) nor more than 48 inches (120 cm). There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole. Gaskets shall conform to the requirements of ASTM C443.

**751-2.5 Corrugated metal.** Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

**751-2.6 Frames, covers, and grates.** The castings shall conform to one of the following requirements:

- a. ASTM A48, Class 35B: Gray iron castings
- b. ASTM A47: Malleable iron castings
- c. ASTM A27: Steel castings
- d. ASTM A283, Grade D: Structural steel for grates and frames
- e. ASTM A536, Grade 65-45-12: Ductile iron castings
- f. ASTM A897: Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

**751-2.7 Steps.** The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of asphalt paint, when directed.

**751-2.8 Precast inlet structures.** Manufactured in accordance with and conforming to ASTM C913.

## CONSTRUCTION METHODS

### 751-3.1 Unclassified excavation.

**a.** The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the RPR may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

**b.** Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the RPR. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturbed and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

**c.** The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

**d.** All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

**e.** After excavation is completed for each structure, the Contractor shall notify the RPR. No concrete or reinforcing steel shall be placed until the RPR has approved the depth of the excavation and the character of the foundation material.

### 751-3.2 Brick structures.

**a. Foundations.** A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

**b. Laying brick.** All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and re-laid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

**c. Joints.** All joints shall be filled with mortar at every course. Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch (9 mm) thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch (6 mm) nor more than 1/2 inch (12 mm) wide and the selected joint width shall be maintained uniform throughout the work.

**d. Pointing.** Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

**e. Cleaning.** Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

**f. Curing and cold weather protection.** The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F (10°C) unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F (16°C) for the duration of the curing period.

**751-3.3 Concrete structures.** Concrete structures which are to be cast-in-place within the project boundaries shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

**751-3.4 Precast concrete structures.** Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program.

Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall: (1) be smoothed to a uniform surface on both interior and exterior of the structure or (2) utilize a rubber gasket per ASTM C443. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal or metal encapsulated steps that are embedded or built into the side walls shall be aligned and placed in accordance to ASTM C478. When a metal ladder replaces the steps, it shall be securely fastened into position.

**751-3.5 Corrugated metal structures.** Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

**751-3.6 Inlet and outlet pipes.** Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

**751-3.7 Placement and treatment of castings, frames, and fittings.** All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the RPR, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the RPR. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

**751-3.8 Installation of steps.** The steps shall be installed as indicated on the plans or as directed by the RPR. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures they shall meet the requirements of ASTM C478. The steps shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches (300 mm).

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the RPR.

### **751-3.9 Backfilling.**

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches (200 mm) in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

b. Backfill shall not be placed against any structure until approved by the RPR. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

**751-3.10 Cleaning and restoration of site.** After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the RPR. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.



## **METHOD OF MEASUREMENT**

**751-4.1** Manholes, catch basins, inlets, and inspection holes shall be measured by the unit.

## **BASIS OF PAYMENT**

**751-5.1** The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-5.1	Not Used
Item D-751-5.2	Catch Basins - per each
Item D-751-5.3	Adjust Structure Rim/Grate Elevation – per each
Item D-751-5.4	Concrete Headwall – per each

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections

ASTM C913                      Standard Specification for Precast Concrete Water and Wastewater Structures.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M36                      Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

**END OF ITEM D-751**

**ITEM T-901  
SEEDING**

**DESCRIPTION**

**901-1.1** This item shall consist of soil preparation, seeding, fertilizing, and liming the areas shown on the plans or as directed by the RPR in accordance with these specifications.

**MATERIALS**

**901-2.1 Seed.** The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the RPR duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be the USDA recommended MAA (Maryland Aviation Administration) seed mixture due to it not being a wildlife attractant and applied as follows:

<b>Seed</b>	<b>Minimum Seed Purity (Percent)</b>	<b>Minimum Germination (Percent)</b>	<b>Rate of Application lb./acre</b>	<b>Rate of Application lb./1000 SF</b>
Predator Hard Fescue	98	90	131.25 (75%)	3.0 (75%)
Seven Seas Chewing Fescue	98	90	35 (20%)	0.8 (20%)
Wildhorse Kentucky Blue Grass	90	80	8.75 (5%)	0.2 (5%)
<b>TOTAL</b>			<b>175 lbs/acre</b>	<b>4 lbs/1000 SF</b>

Seeding shall be performed during the period between April 1 and June 1 and August 15 and October 14 inclusive, unless otherwise approved by the RPR.

**901-2.2 Lime.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 (850 µm) mesh sieve and 50% will pass through a No. 100 (150 µm) mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate shown in Table 1. All liming materials shall conform to the requirements of ASTM C602.

**Table 1 – Supplemental Lime**

Existing Soil pH	Limestone to be Added	
	Tons/Acre	Pounds/1000 SF
4.0 – 4.4	3	138
4.5 – 4.9	2	92
5.0 – 5.4	1	46

**901-2.3 Fertilizer.** Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

- a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
- b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
- c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be commercial fertilizer and shall be spread at the rate as shown in Table 2.

**Table 2 – Fertilizer Application Information**

Percent of Nutrients		Minimum Application Rate (Lbs per 1000 Sq. Ft.)	Measurement Factor
Initial	Refertilization		
10-10-10		20.0	1.0
15-15-15		13.4	1.5
19-19-19		10.5	1.9
	10-3-6	20.0	1.0
	12-2-8	16.7	1.2
	12-4-8	16.7	1.2

**901-2.4 Soil for repairs.** The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the RPR before being placed.

## CONSTRUCTION METHODS

**901-3.1 Advance preparation and cleanup.** After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches (125 mm) as a result of grading operations and, if immediately prior to seeding, the top 3 inches (75 mm) of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches (125 mm). Clods shall be broken and the top 3 inches (75 mm) of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

### **901-3.2 Dry application method.**

**a. Liming.** Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top 3 inches (75 mm) of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.

**b. Fertilizing.** Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

**c. Seeding.** Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

**d. Rolling.** After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot (60 to 97 kg per meter) of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot (223 to 298 kg per meter) of width for sandy or light soils.

### **901-3.3 Wet application method.**

**a. General.** The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

**b. Spraying equipment.** The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons (190 liters) over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons (380 liters) per minute at a pressure of 100 lb / sq inches (690 kPa). The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch (16 mm) solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating

line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet (6 to 30 m). One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet (15 m) in length shall be provided to which the nozzles may be connected.

**c. Mixtures.** Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds (100 kg) of lime shall be added to and mixed with each 100 gallons (380 liters) of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds (100 kg) of these combined solids shall be added to and mixed with each 100 gallons (380 liters) of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. The Contractor shall identify to the RPR all sources of water at least two (2) weeks prior to use. The RPR may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the RPR following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

**d. Spraying.** Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches (75 mm), after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the RPR, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

**901-3.4 Maintenance of seeded areas.** The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the RPR. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the RPR. A grass stand shall be considered adequate when bare spots are one square foot (0.01 sq m) or less, randomly dispersed, and do not exceed 3% of the area seeded.

## **METHOD OF MEASUREMENT**

**901-4.1** The quantity of seeding to be paid for shall be the number of units 1,000 square feet (sq m) measured on the ground surface, completed and accepted.

## **BASIS OF PAYMENT**

**901-5.1** Payment shall be made at the contract unit price per 1,000 square feet (sq m) or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item 901-5.1	Seeding - per 1,000 square feet (sq m)
--------------	--

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C602	Standard Specification for Agricultural Liming Materials
-----------	--

Federal Specifications (FED SPEC)

FED SPEC	JJJ-S-181, Federal Specification, Seeds, Agricultural
----------	---

Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports
----------------	--

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel
--

**END OF ITEM T-901**

THIS PAGE INTENTIONALLY LEFT BLANK



## **ITEM T-905 TOPSOIL**

### **DESCRIPTION**

**905-1.1** This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the RPR.

### **MATERIALS**

**905-2.1 Topsoil.** Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches (50 mm) or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh (75  $\mu$ m) sieve as determined by the wash test in accordance with ASTM C117.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

**905-2.2 Inspection and tests.** Within 10 days following acceptance of the bid, the RPR shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

### **CONSTRUCTION METHODS**

**905-3.1 General.** Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the RPR before the various operations are started.

**905-3.2 Preparing the ground surface.** Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the RPR, to a minimum depth of 2 inches (50 mm) to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm) in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary

moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

**905-3.3 Obtaining topsoil.** Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the RPR. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the RPR. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the RPR. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoil purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the RPR. The Contractor shall notify the RPR sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

**905-3.4 Placing topsoil.** The topsoil shall be evenly spread on the prepared areas to a uniform depth of 2 inches (50 mm) after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches (50 mm) or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the RPR. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

## **METHOD OF MEASUREMENT**

**905-4.1** Topsoil obtained on the site shall be measured by the number of cubic yards (cubic meters) of topsoil measured in its original position and stripped or excavated. Topsoil stockpiled by others and removed for topsoil by the Contractor shall be measured by the number of cubic yards (cubic meters) of topsoil measured in the stockpile. Topsoil shall be measured by volume in cubic yards (cubic meters) computed by the method of end areas.

**905-4.2** Topsoil obtained off the site shall be measured by the number of cubic yards (cubic meters) of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards (meters) computed by the method of end areas.

## **BASIS OF PAYMENT**

**905-5.1** Payment will be made at the contract unit price per cubic yard (cubic meter) for topsoil (obtained on the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**905-5.2** Payment will be made at the contract unit price per cubic yard (cubic meter) for topsoil (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-905-5.1	Topsoil (Obtained on Site or Removed from Stockpile) - per cubic yard (cubic meter)
Item T-905-5.2	Topsoil (Furnished from Off the Site) - per cubic yard (cubic meter)

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117	Materials Finer than 75 $\mu\text{m}$ (No. 200) Sieve in Mineral Aggregates by Washing
-----------	--

Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports
----------------	--

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

**END OF ITEM T-905**

THIS PAGE INTENTIONALLY LEFT BLANK

## **ITEM T-908 MULCHING**

### **DESCRIPTION**

**908-1.1** This item shall consist of furnishing, hauling, placing, and securing mulch on surfaces indicated on the plans or designated by the RPR.

### **MATERIALS**

**908-2.1 Mulch material.** Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Mulch shall be free from noxious weeds, mold, and other deleterious materials. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding, or to surrounding farm land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

**a. Hay.** Hay shall be native hay in an air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Hay shall be sterile, containing no fertile seed.

**b. Straw.** Straw shall be the stalks from threshed plant residue of oats, wheat, barley, rye, or rice from which grain has been removed. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Straw shall contain no fertile seed.

**c. Manufactured mulch.** Cellulose-fiber or wood-pulp mulch shall be products commercially available for use in spray applications.

**d. Asphalt binder.** Asphalt binder material shall conform to the requirements of ASTM D977, Type SS-1 or RS-1.

**908-2.2 Inspection.** The RPR shall be notified of sources and quantities of mulch materials available and the Contractor shall furnish him with representative samples of the materials to be used 30 days before delivery to the project. These samples may be used as standards with the approval of the RPR and any materials brought on the site that do not meet these standards shall be rejected.

### **CONSTRUCTION METHODS**

**908-3.1 Mulching.** Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the area shown on the plans or designated by the RPR. Straw or hay shall be spread over the surface to a uniform thickness at the rate of 2 to 3 tons per acre (1800 - 2700 kg per acre) to provide a loose depth of not less than 1-1/2 inches (38 cm) nor more than 3 inches (75 mm). Other organic material shall be spread at the rate directed by the RPR. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95% of the mulch in place on the slope shall be 6 inches (150 mm) or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than one inch (25 mm) nor more than 2 inches (50 mm).

**908-3.2 Securing mulch.** The mulch shall be held in place by light discing, a very thin covering of topsoil,

pins, stakes, wire mesh, asphalt binder, or other adhesive material approved by the RPR. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied. When an application of asphalt binder material is used to secure the mulch, the Contractor must take every precaution to guard against damaging or disfiguring structures or property on or adjacent to the areas worked and will be held responsible for any such damage resulting from the operation.

If the “peg and string” method is used, the mulch shall be secured by the use of stakes or wire pins driven into the ground on 5-foot (1.5-m) centers or less. Binder twine shall be strung between adjacent stakes in straight lines and crisscrossed diagonally over the mulch, after which the stakes shall be firmly driven nearly flush to the ground to draw the twine down tight onto the mulch.

### **908-3.3 Care and repair.**

**a.** The Contractor shall care for the mulched areas until final acceptance of the project. Care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the RPR, and erecting any barricades that may be shown on the plans before or immediately after mulching has been completed on the designated areas.

**b.** The Contractor shall be required to repair or replace any mulch that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the RPR, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor.

**c.** If the “asphalt spray” method is used, all mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons (32 liters) per 1,000 square feet (100 sq m), or as directed by the RPR, with a minimum of 6 gallons (24 liters) and a maximum of 10 gallons (40 liters) per 1,000 square feet (100 sq m) depending on the type of mulch and the effectiveness of the binder securing it. Asphalt binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope. An approved spray nozzle shall be used. The nozzle shall be operated at a distance of not less than 4 feet (1.2 m) from the surface of the mulch and uniform distribution of the asphalt material shall be required. A pump or an air compressor of adequate capacity shall be used to ensure uniform distribution of the asphalt material.

**d.** If the “asphalt mix” method is used, the mulch shall be applied by blowing, and the asphalt binder material shall be sprayed into the mulch as it leaves the blower. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons (32 liters) per 1,000 square feet (100 sq m) or as directed by the RPR, with a minimum of 6 gallons (24 liters) and a maximum of 10 gallons (40 liters) per 1,000 square feet (100 sq m) depending on the type of mulch and the effectiveness of the binder securing it.

## **METHOD OF MEASUREMENT**

**908-4.1** Mulching shall be measured in square yards (square meters) on the basis of the actual surface area acceptably mulched.

## **BASIS OF PAYMENT**

**908-5.1** Payment will be made at the contract unit price per square yard (square meter) for mulching. The price shall be full compensation for furnishing all materials and for placing and anchoring the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-908-5.1	Mulching - per square yard (square meter)
----------------	---

## **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D977                      Standard Specification for Emulsified Asphalt

Advisory Circulars (AC)

AC 150/5200-33              Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

**END OF ITEM T-908**

THIS PAGE INTENTIONALLY LEFT BLANK



**ITEM L-107**  
**AIRPORT WIND CONES**

**DESCRIPTION**

**107-1.1** This item shall consist of removal of the existing airport wind cone and furnishing and installing an airport wind cone per these specifications and per the dimensions, design, and details shown in the plans.

The work shall include the furnishing and installation of a support for mounting the wind cone, the specified interconnecting wire, and a concrete foundation. The item shall also include all cable connections, conduit and conduit fittings, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation (as a completed unit) to the satisfaction of the RPR.

**EQUIPMENT AND MATERIALS**

**107-2.1 General.**

**a.** Airport lighting equipment and materials covered by advisory circulars (ACs) shall be certified in AC 150/5345-53, Airport Lighting Equipment Certification Program (ALECP) and listed in the ALECP Addendum.

**b.** All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

**c.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications, at the Contractor's cost.

**d.** All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

**e.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in electronic pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures, that do not meet the system design and the standards and codes, specified in this document.

**f.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**107-2.2 Wind cones.** The supplemental wind cone assembly shall be Type **L-806**, Style **I-B**, Size **1**.

**107-2.3 Electrical wire and cable.** Cable rated up to 5,000 volts in conduit shall conform to AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. For ratings up to

600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

**107-2.4 Conduit.** Rigid steel conduit and fittings shall conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242.

**107-2.5 Plastic conduit (for use below grade only).** Plastic conduit and fittings shall be per the following:

- UL 514B covers W-C-1094 - Conduit fittings all types, Classes 1 thru 3 and 6 thru 10
- UL 514C covers W-C-1094 - all types, Class 5 junction box and cover in plastic (polyvinyl chloride (PVC))
- UL 651 covers W-C-1094 - Rigid PVC Conduit, types I and II, Class 4
- UL 651A covers W-C-1094 - Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4

Underwriters Laboratories Standard UL-651 shall be one of the following, as shown in the plans:

- a. Type I—Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II—Schedule 40 PVC suitable for either above ground or underground use.

Plastic conduit adhesive shall be a solvent cement manufactured specifically for the purpose of gluing the type of plastic conduit and fitting.

**107-2.6 Concrete.** The concrete for foundations shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**107-2.7 Paint.**

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer compatible with the manufacturer's recommendations for the intermediate or topcoat.

b. Priming paint for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-DTL-24441C/19B. Use MIL-24441 thinner per paint manufacturer's recommendations.

c. Orange paint for the body and the finish coats on metal and wood surfaces shall consist of a ready-mixed non-fading paint per Master Painter's Institute (MPI) Reference #9 (gloss). The color shall be per Federal Standards 595, International Orange, Number 12197.

d. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the MPI, Reference #9, Exterior Alkyd, Gloss.

e. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified aviation-orange or white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

## **CONSTRUCTION METHODS**

**107-3.1 Installation.** The hinged support or hinged pole shall be installed on a concrete foundation per the plans.

**107-3.2 Support pole erection.** The Contractor shall erect the pole on the foundation following the manufacturer's requirements and erection details. The pole shall be level and secure.

**107-3.3 Electrical connection.** The Contractor shall furnish all labor and materials and shall make complete electrical connections per the wiring diagram furnished with the project plans. The electrical installation shall conform to the requirements of the latest edition of National Fire Protection Association, NFPA-70, National Electric Code (NEC).

Underground cable and duct for cable installation shall be installed in accordance with Item L-108, Underground Power Cables for Airports, and Item L-110, Airport Underground Electrical Duct Banks and Conduits in locations as shown on the plans.

**107-3.4 Booster transformer.** Not used.

**107-3.5 Ground connection and ground rod.** The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the “A” frame of the 12-foot (3.7-m) assembly or pipe support of the 8-foot (2.4-m) support near the base. The ground rod shall be of the type, diameter and length specified in Item L-108, Underground Power Cable for Airports. The ground rod shall be driven into the ground adjacent to the concrete foundation (minimum distance from foundation of 2 feet (60 cm)) so that the top is at least 6 inches (150 mm) below grade. The grounding cable shall consist of **No. 4** American wire gauge (AWG) minimum stranded copper wire or larger and shall be firmly attached to the ground rod by exothermic welding. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. The other end of the grounding cable shall be securely attached to a leg of the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms. If a single rod grounding electrode has a resistance to earth of over 25 ohms, then install one supplemental rod not less than 10 feet from the first rod. If desired resistance to ground levels are still not achieved, see FAA-STD-019 for guidance on the application of coke breeze.

**107-3.6 Painting.** Three coats of paint shall be applied (one prime, one body, and one finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if already painted upon receipt, shall be given one finish coat of paint in lieu of the three coats specified above. The paint shall be per MPI Reference #9 (gloss). The color shall be per Federal Standard 595, International Orange, Number 12197.

**107-3.7 Light sources.** The Contractor shall furnish and install lamps per the manufacturer’s instruction book.

**107-3.8 Chain and padlock.** The Contractor shall furnish and install a suitable operating chain for lowering and raising the hinged top section. The chain shall be attached to the pole support in a manner to prevent the light fixture assembly from striking the ground in the lowered position.

A padlock shall also be furnished by the Contractor on the 8-foot (2.4-m) wind cone for securing the hinged top section to the fixed lower section. Keys for the padlock shall be delivered to the RPR.

**107-3.9 Segmented circle.** The segmented circle shall be constructed as shown on the Plans.

#### **METHOD OF MEASUREMENT**

**107-4.1** The quantity to be paid shall be the number of wind cones installed as completed units in place, accepted, and ready for operation.

**107-4.2** The quantity of segmented circle airport marker systems to be paid for shall be the number of systems installed as completed units in place, accepted, and ready for operation.

#### **BASIS OF PAYMENT**

**107-5.1** Payment will be made at the contract unit price for each completed and accepted job. This price shall be full compensation for removal of existing airport wind cones and furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

**107-5.2** Payment will be made at the contract unit price for each segmented circle airport marker system. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-107-5.1	Type L-806 Style I-B Size 1 Wind Cone and Foundation, in Place -- per Each
Item L-107-5.2	Segmented Circle Marker System, in Place – <b>Not Used.</b>

### **REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### Advisory Circulars (AC)

AC 150/5340-5	Segmented Circle Airport Marker System
AC 150/5340-30	Design and Installation Details for airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-27	Specification for Wind Cone Assemblies
AC 150/5345-53	Airport Lighting Equipment Certification Program

#### Commercial Item Description

A-A-59544	Cable and Wire, Electrical (Power, Fixed Installation)
-----------	--

#### Federal Standard (FED STD)

FED STD 595	Colors Used in Government Procurement
-------------	---------------------------------------

#### Master Painter's Institute (MPI)

MPI Reference #9	Alkyd, Exterior, Gloss (MPI Gloss Level 6)
------------------	--

#### Mil Standard

MIL-DTL-24441C/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III
--------------------	--

#### Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit – Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
UL Standard 1242	Electrical Intermediate Metal Conduit - Steel

#### National Fire Protection Association (NFPA)

NFPA-70	National Electric Code (NEC)
---------	------------------------------

### **END OF ITEM L-107**

**ITEM L-108**  
**UNDERGROUND POWER CABLE FOR AIRPORTS**

**DESCRIPTION**

**108-1.1** This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

**EQUIPMENT AND MATERIALS**

**108-2.1 General.**

**a.** Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

**b.** All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the RPR.

**c.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

**d.** All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

**e.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format. The RPR reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

**f.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation

Resistance Test.

**108-2.2 Cable.** Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

**108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods).** Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare copper wire. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be copper or copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 8 feet (2.4 m) long and 5/8 inch (16 mm) in diameter.

**108-2.4 Cable connections.** In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

**a. The cast splice.** A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable.

**b. The field-attached plug-in splice.** Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be

in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

**c. The factory-molded plug-in splice.** Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

**d. The taped or heat-shrink splice.** Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

**108-2.5 Splicer qualifications.** Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

**108-2.6 Concrete.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**108-2.7 Flowable backfill.** Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

**108-2.8 Cable identification tags.** Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

**108-2.9 Tape.** Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

**108-2.10 Electrical coating.** Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

**108-2.11 Existing circuits.** Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the

circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

**108-2.12 Detectable warning tape.** Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

## CONSTRUCTION METHODS

**108-3.1 General.** The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

**108-3.2 Installation in duct banks or conduits.** This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.



Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the RPR, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

**108-3.3 Installation of direct-buried cable in trenches.** Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

**a. Trenching.** Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

- When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.
- Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill material may alternatively be used.

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

**b. Backfilling.** After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall encompass all cables ; be 3 inches (75 mm) deep, loose measurement; and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25.0 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent material. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfilled with controlled low strength material (CLSM) in accordance with P-153.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the RPR. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the

color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inches (200 mm) minimum below finished grade.

**c. Restoration.** Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the topsoiling, fertilizing, liming, seeding, and mulching as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfilled with controlled low strength material (CLSM) in accordance with P-153. Restoration shall be considered incidental to the pay item of which it is a component part.

**108-3.4 Cable markers for direct-buried cable.** The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep. Stencils shall be used for cable marker lettering; no hand lettering shall be permitted.

At the location of each underground cable connection/splice, except at lighting units, or isolation transformers, a concrete marker slab shall be installed to mark the location of the connection/splice. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the RPR. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the RPR. Furnishing and installation of cable markers is incidental to the respective cable pay item.

**108-3.5 Splicing.** Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

**a. Cast splices.** These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the RPR.

**b. Field-attached plug-in splices.** These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint or (3) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

**c. Factory-molded plug-in splices.** These shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) Wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint. (2) Covered with heat shrinkable

tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint. or (3) On connector kits so equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

**d. Taped or heat-shrink splices.** A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping, wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. The manufacturer's recommendation for stretching tape during splicing shall be followed. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminants prior to application.

**e. Assembly.** Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

**108-3.6 Bare counterpoise wire installation for lightning protection and grounding.** If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

**a. Equipotential.** The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches

(300 mm) maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

**b. Isolation.** Not used.

**c. Common Installation requirements.** When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

**d. Parallel Voltage Systems.** Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

**108-3.7 Counterpoise installation above multiple conduits and duct banks.** Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of

vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

**108-3.8 Counterpoise installation at existing duct banks.** When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

**108-3.9 Exothermic bonding.** Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

- a. All slag shall be removed from welds.
- b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.
- c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

**108-3.10 Testing.** The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

- a. Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.
- b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

- c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.
- d. That all affected circuits (existing and new) are free from unspecified grounds.
- e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 50 megohms. Verify continuity of all series airfield lighting circuits prior to energization.
- f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits

or circuit segments is not less than 100 megohms.

**g.** That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

**h.** That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

**i.** That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

## **METHOD OF MEASUREMENT**

**108-4.1** The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

**108-4.2** Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack. Cable and counterpoise slack is considered incidental to this item and is included in the Contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack.

**108-4.3** No separate payment will be made for ground rods.

## **BASIS OF PAYMENT**

**108-5.1** Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the RPR. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit - per linear foot (meter)
Item L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above the Duct Bank or Conduit, Including Connections/Terminations - per linear foot (meter)

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

### Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

### ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

### Mil Spec

MIL-PRF-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

### National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems

### American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
------------------	---

### Federal Aviation Administration Standard

FAA STD-019E	Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment
--------------	--

**END OF ITEM L-108**



**ITEM L-109**  
**AIRPORT TRANSFORMER VAULT AND VAULT EQUIPMENT**

**DESCRIPTION**

**109-1.1** This item shall consist of constructing an airport transformer vault or a prefabricated metal housing per these specifications and per the design and dimensions shown in the plans. This work shall also include the installation of conduits in the floor and foundation, painting and lighting of the vault or metal housing, and the furnishing of all incidentals that are necessary to produce a completed unit. Included as a separate part under this item or as a separate item where an existing vault is to be used shall be the furnishing of all vault equipment, wiring, electrical buses, cable, conduit, potheads, and grounding systems. This work shall also include the painting of equipment and conduit; the marking and labeling of equipment and the labeling or tagging of wires; the testing of the installation; and the furnishing of all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the RPR.

**EQUIPMENT AND MATERIALS**

**109-2.1 General.**

**a.** Airport lighting equipment and materials covered by advisory circulars (AC) shall be certified in AC 150/5345-53, Airport Lighting Equipment Certification Program (ALECP) and listed in the ALECP Addendum.

**b.** All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

**c.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

**d.** All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

**e.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be provided in electronic pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

**f.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

## CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING

**109-3.1 Electrical vault building.** The electrical vault building must comply with NEC Article 110.31, Enclosure for Electrical Installations, Item (A) Electrical Vaults. Construct the building of materials having adequate structural strength for the conditions and installed location, has a minimum fire rating of two or three hours as determined by the authority having jurisdiction (AHJ), and is bullet resistant to minimum UL 752 Level 4. **Existing vault building to be re-used, no new structure.**

**109-3.2 Concrete.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**109-3.3 Precast concrete structures.** Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

**109-3.4 Reinforcing steel.** Reinforcing steel bars shall be intermediate or structural grade deformed-type bars and shall be per ASTM A615.

**109-3.5 Brick.** Brick shall be per ASTM C62, Grade SW.

**109-3.6 Rigid steel conduit.** Rigid steel conduit and fittings shall be per Underwriters Laboratories Standards 6 and 514B.

**109-3.7 Plastic Conduit and fittings.** Plastic Conduit and fittings shall conform to the requirements of UL-651 and UL-654 schedule 40 polyvinyl chloride (PVC) suitable for use above or below ground.

**109-3.8 Lighting.** Vault or metal-housing light fixtures shall be of a vapor-proof type.

**109-3.9 Outlets.** Convenience outlets shall be heavy-duty duplex units designed for industrial service.

**109-3.10 Switches.** Vault or metal-housing light switches shall be single-pole switches.

### **109-3.11 Paint.**

a. Priming paint for non-galvanized metal surfaces shall be a high solids alkyd primer compatible with the manufacturer's recommendations for the intermediate or topcoat.

b. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the Master Painter's Institute (MPI), Reference #9, Exterior Alkyd, Gloss.

c. Priming paint for wood surfaces shall be mixed on the job by thinning the specified white paint by adding 1/2 pint (0.24 liter) of raw linseed oil to each gallon (liter).

d. Paint for the floor, ceiling, and inside walls shall be per Porter Paint Company 69, 71, and 79 or equivalent. Walls and ceiling shall be light gray and the floor shall be medium gray.

e. The roof coating shall be hot asphalt material per ASTM D2823. Asbestos-free roof coating per ASTM D4479 may be substituted if required by local codes.

**109-3.12 Ground bus.** Ground bus shall be 1/8 × 3/4 inch (3 × 19 mm) minimum copper bus bar.

**109-3.13 Square duct.** Duct shall be square similar to that manufactured by the Square D Company (or equivalent), or the Trumbull Electric Manufacturing Company (or equivalent). The entire front of the duct on each section shall consist of hinged or removable cover for ready access to the interior. The cross-section of the duct shall be not less than 4 × 4 inch (100 × 100 mm) except where otherwise shown in the plans.

**109-3.14 Ground rods.** Ground rods shall be in accordance with Item L-108.

**109-3.15 Vault prefabricated metal housing.** The prefabricated metal housing shall be a commercially available unit. **Not applicable, re-using existing vault structure.**

**109-3.16 FAA-approved equipment.** Certain items of airport lighting equipment installed in vaults are

covered by individual ACs listed below:

AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits.
AC 150/5345-49	Specification for L-854, Radio Control Equipment
AC 150/5345-56	Specification for L-890 Airport Lighting Control and Monitoring System (ALCMS)

**109-3.17 Other electrical equipment.** Distribution transformers, oil switches, cutouts, relays, terminal blocks, transfer relays, circuit breakers, and all other regularly used commercial items of electrical equipment not covered by FAA equipment specifications and ACs shall conform to the applicable rulings and standards of the Institute of Electrical and Electronic Engineers (IEEE) or the National Electrical Manufacturers Association (NEMA). When specified, test reports from a testing laboratory indicating that the equipment meets the specifications shall be supplied. In all cases, equipment shall be new and a first-grade product. This equipment shall be supplied in the quantities required for the specific project and shall incorporate the electrical and mechanical characteristics specified in the proposal and plans. Equipment selected and installed by the Contractor shall maintain the interrupting current rating of the existing systems or specified rating whichever is greater.

**109-3.18 Wire.** Wire (in conduit) rated up to 5,000 volts shall be per AC 150/5345-7, Specification for L-824 Underground Electrical Cables for Airport Lighting Circuits. For ratings up to 600 volts, moisture and heat resistant thermoplastic wire conforming to Commercial Item Description A-A-59544A Type THWN-2 shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the plans or in the proposal.

**a. Control circuits.** Unless otherwise indicated on the plans, wire shall be not less than No. 12 American wire gauge (AWG) and shall be insulated for 600 volts. If telephone control cable is specified, No. 19 AWG telephone cable per ANSI/Insulated Cable Engineers Association (ICEA) S-85-625 specifications shall be used.

**b. Power circuits.**

- (1) 600 volts maximum – Wire shall be No. 6 AWG or larger and insulated for at least 600 volts.
- (2) 3,000 volts maximum – Wire shall be No. 6 AWG or larger and insulated for at least 3,000 volts.
- (3) Over 3,000 volts-Wire shall be No. 6 AWG or larger and insulated for at least the circuit voltage.

**109-3.19 Short circuit / coordination / device evaluation / arc flash analysis.** The Contractor shall, based upon the equipment provided, include as a part of the submittal process the electrical system “Short Circuit / Coordination / Device evaluation / Arc Flash Analysis”. The analysis shall be performed by the equipment manufacturer and submitted in a written report. The analysis shall be signed and sealed by a registered professional Engineer from the state in which the project is located. The analysis shall comply with NFPA-70E and IEEE 1584.

The analysis will include: one line diagrams, short circuit analysis, coordination analysis, equipment evaluation, arc flash analysis and arc flash labels containing at a minimum, equipment name,

voltage/current rating, available incident energy and flash protection boundary.

The selected firms field service Engineer shall perform data gathering for analysis completion and device settings, perform device setting as recommended by the analysis and will furnish and install the arc flash labels. The components worst case incident energy will be considered the available arc flash energy at that specific point in the system. Submit three written copies and one electronic copy of the report.

### **CONSTRUCTION METHODS**

#### **CONSTRUCTION OF VAULT AND PREFABRICATED METAL HOUSING**

##### **(NOT APPLICABLE – RE-USE EXISTING VAULT BUILDING)**

**109-4.1 General.** The Contractor shall construct the transformer vault or prefabricated metal housing at the location indicated in the plans. Vault construction shall be reinforced concrete, concrete masonry, or brick wall as specified. The metal housing shall be prefabricated equipment enclosure to be supplied in the size specified. The mounting pad or floor details, installation methods, and equipment placement are shown in the plans. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program.

The Contractor shall clear, grade, and seed the area around the vault or metal housing for a minimum distance of 10 feet (3 m) on all sides. The slope shall be not less than 1/2 inch per foot (12 mm per 0.3 m) away from the vault or metal housing in all directions.

The vault shall provide adequate protection against weather elements, including rain, wind-driven dust, snow, ice and excessive heat. The vault shall have sufficient filtered ventilation, to assure that the interior room temperatures and conditions do not exceed the recommended limits of the electrical equipment to be installed in the vault. The Contractor is responsible for contacting the manufacturer of the equipment to be installed to obtain environmental limitations of the equipment to be installed.

#### **109-4.2 Foundation and walls.**

**a. Reinforced concrete construction.** The Contractor shall construct the foundation and walls per the details shown in the plans. Unless otherwise specified, internal ties shall be of the mechanical type so that when the forms are removed the ends of the ties shall be at least one inch (25 mm) beneath the concrete surface; the holes shall be plugged and finished to prevent discoloration. Reinforcing steel shall be placed, as shown in the drawings, and secured in position to prevent displacement during the concrete placement.

The external surfaces of the concrete shall be thoroughly worked during the placing operation to force all coarse aggregate from the surface. Thoroughly work the mortar against the forms to produce a smooth finish free from air pockets and honeycomb.

The surface film of all pointed surfaces shall be removed before setting occurs. As soon as the pointing has set sufficiently, the entire surface inside and outside of the vault shall be thoroughly wet with water and rubbed with a No. 16 carborundum stone, or equivalent quality abrasive, bringing the surface to a paste. All form marks and projections shall be removed. The surface produced shall be smooth and dense without pits or irregularities. The materials which have been ground into a paste during the rubbing process shall be spread or brushed uniformly over the entire surface (except the interior surfaces that are to be painted shall have all paste removed by washing before painting) and permitted to reset. Final exterior finish shall be obtained by rubbing with No. 30 carborundum stone, or an equivalent quality abrasive. The surface shall be rubbed until the entire surface is smooth and uniform in color.

**b. Brick and concrete construction.** When this type of construction is specified, the foundation shall be concrete conforming to the details shown in the plans. The outer edge of the foundation at the floor level shall be beveled 1-1/2 inches (38 mm) at 45 degrees. Brick walls shall be 8 inches (200 mm) thick, laid in running bond with every sixth course a header course. Brick shall be laid in cement mortar (one part masonry cement and 3 parts sand) with full mortar bed and shoved joints. All joints shall be completely

filled with mortar, and facing brick shall be back-parged with mortar as work progresses. All joints shall be 3/8 inch (9 mm) thick, exterior joints tooled concave, and interior joints struck flush. Both interior and exterior brick surfaces shall be cleaned and nail holes, cracks and other defects filled with mortar. When specified, a nonfading mineral pigment mortar coloring shall be added to the mortar. Steel reinforcing bars, 3/8 inch (9 mm) in diameter and 12 inches (300 mm) long, shall be set vertically in the center of the brick wall on not more than 2 feet (60 cm) centers to project 2-1/2 inches (60 mm) into the concrete roof slab. Lintels for supporting the brickwork over doors, windows, and louvers shall consist of two 4 × 3 × 3/8 inch (100 × 75 × 9 mm) steel angles. Lintels shall be painted with one coat of corrosion-inhibiting primer before installation, and all exposed parts shall be painted similar to doors and window sash after installation.

Window sills may be concrete poured in place or precast concrete as indicated in the plans. All exposed surfaces shall have a rubbed finish as specified under reinforced concrete construction. After completion, all interior and exterior faces of walls shall be scrubbed with a solution of muriatic acid and water in the proportions of not less than one part acid to 10 parts of water. All traces of efflorescence, loose mortar, and mortar stain shall be removed, and the walls washed down with clear water.

**c. Concrete masonry construction.** When this type of construction is specified, the foundation shall be concrete conforming to the details shown in the plans. The concrete masonry units shall be standard sizes and shapes and shall conform to ASTM C90 and shall include the closures, jambs, and other shapes required by the construction as shown in the plans. Standard construction practice shall be followed for this type of work including mortar, joints, reinforcing steel for extensions into roof slab, etc. Plaster for interior walls, if specified, shall be Portland cement plaster.

**109-4.3 Roof.** The roof shall be reinforced concrete as shown in the plans. Reinforcing steel shall be placed as shown in the drawing and secured in position to prevent displacement during the pouring of the concrete. The concrete shall be poured monolithically and shall be free of honeycombs and voids. The surface shall have a steel-troweled finish and shall be sloped as shown in the drawing. The underside of the roof slab shall be finished in the same manner as specified for walls.

One brush or mop coat of hot asphalt roof coating shall be applied to the top surface of the roof slab. The asphalt material shall be heated to within the range specified by the manufacturer and immediately applied to the roof. The finished coat shall be continuous over the roof surface and free from holidays and blisters. Smears and dribbles of asphalt on the roof edges and building walls shall be removed.

**109-4.4 Floor.** Construct building foundation in accordance with the details shown in the plans. The floor shall be reinforced concrete as shown in the drawings. When present, all sod, roots, refuse, and other perishable material shall be removed from the area under the floor to a depth of 8 inches (200 mm), unless a greater depth is specified in the invitation for bids. This area shall be backfilled with materials consisting of sand, cinders, gravel, or stone. Fill shall be placed in layers not to exceed 4 inches (100 mm) and shall be thoroughly compacted by tamping or rolling. A layer of building paper shall be placed over the fill prior to placing concrete. The floor surfaces shall have a steel-troweled finish. The floor shall be level unless a drain is specified, in which case the floor shall be pitched 1/4 inch (6 mm) per foot downward toward the drain. A 1/4-inch (6-mm) asphalt felt expansion joint shall be placed between floor and foundation walls. The floor shall be poured monolithically and shall be free of honeycombs and voids.

**109-4.5 Floor drain.** If shown in the plans, a floor drain and dry well shall be installed in the center of the floor of the equipment room. The dry well shall be excavated 4 × 4 feet (1.2 × 1.2 m) square and to a depth of 4 feet (1.2 m) below the finished floor elevation and shall be backfilled to the elevation of the underside of the floor with gravel - which shall all pass a 2-inch (50 mm) mesh sieve and shall all be retained on a 1/4-inch (6.3 mm) mesh sieve. The gravel backfill shall be placed in 6 inch (150 mm) maximum layers, and the entire surface of each layer shall be tamped either with a mechanical tamper or with a hand tamper weighing not less than 25 pounds (11 kg) and having a face area of not more than 36 square inches (232 square cm) nor less than 16 square inches (103 square cm). The drain inlet shall be set flush in the concrete floor. The drain shall have a clear opening of not less than 8 inches (200 mm) in diameter.

**109-4.6 Conduits in floor and foundation.** Conduits shall be installed in the floor and through the foundation walls per the details shown in the plans. All underground conduit shall be painted with an asphalt compound. Conduit shall be installed with a coupling or metal conduit adapter flush with the top of the floor. All incoming conduit shall be closed with a pipe plug to prevent the entrance of foreign material during construction. Space conduit entrances shall be left closed.

**109-4.7 Doors.** Doors shall be metal-clad fireproof Class A (three (3) hour rated) doors conforming to requirements of the National Electrical Code (NEC) and local electrical codes. Panic bar exit hardware shall be installed per NEC requirements. Refer to the new electrical vault detail plan sheets for construction requirements.

**109-4.8 Painting.** The floor, ceiling, and inside walls of concrete construction shall first be given a hardening treatment, after which the Contractor shall apply two coats of paint as specified below, except that interior face brick walls need not be painted. The hardening treatment shall consist of applying two coats of either a commercial floor hardener or a solution made by dissolving 2 pounds (0.9 kg) of magnesium fluorosilicate or zinc sulfate crystals in one gallon (liter) of water. Each coat shall be allowed to dry at least 48 hours before the next application. After the second treating coat has dried, the surfaces shall be brushed clean of all crystals and thoroughly washed with clear water. Paint for walls and ceiling shall be a light gray color approved by the RPR. The floor paint shall be a medium gray color approved by the RPR. Before painting, the surfaces shall be dry and clean. The first coat shall be thinned by adding 2/3-quart (0.63 liters) of spar varnish and 1/3-quart (0.31 liters) of turpentine to each gallon (liter) of paint. The second coat shall be applied without thinning. All doors, lintels, and windows shall be cleaned to remove any rust or foreign material and shall be given one body and one finish coat of white paint. Bare metal surfaces shall be given a prime coat of corrosion-inhibiting primer prior to the body and finish coats.

**109-4.9 Lights and switches.** The Contractor shall furnish and install a minimum of two duplex convenience outlets in the vault room. Where a control room is specified, at least two duplex outlets shall be installed.

## **INSTALLATION OF EQUIPMENT IN VAULT OR PREFABRICATED METAL HOUSING**

**109-5.1 General.** The Contractor shall furnish, install, and connect all equipment, equipment accessories, conduit, cables, wires, buses, grounds, and support necessary to ensure a complete and operable electrical distribution center for the airport lighting system as specified herein and shown in the plans. When specified, an emergency power supply and transfer switch shall be provided and installed.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and local code agency having jurisdiction. All electrical work shall comply with the NEC and local code agency having jurisdiction including the separation of under 600V work from 5,000V work.”

**109-5.2 Power supply equipment.** Transformers, regulators, booster transformers, and other power supply equipment items shall be furnished and installed at the location shown in the plans or as directed by the RPR. The power supply equipment shall be set on steel “H” sections, “I” beams, channels, or concrete blocks to provide a minimum space of 1-1/2 inch (38 mm) between the equipment and the floor. The equipment shall be placed so as not to obstruct the oil-sampling plugs of the oil-filled units; and nameplates shall, so far as possible, not be obscured.

If specified in the plans and specifications, equipment for an alternate power source or an emergency power generator shall be furnished and installed. The alternate power supply installation shall include all equipment, accessories, an automatic changeover switch, and all necessary wiring and connections. The emergency power generator set shall be the size and type specified.

**109-5.3 Switchgear and panels.** Oil switches, fused cutouts, relays, transfer switches, panels, panel boards, and other similar items shall be furnished and installed at the location shown in the plans or as directed by

the RPR. Wall or ceiling mounted items shall be attached to the wall or ceiling with galvanized bolts of not less than 3/8-inch (9 mm) diameter engaging metal expansion shields or anchors in masonry or concrete vaults.

**109-5.4 Duct and conduit.** The Contractor shall furnish and install square-type exposed metallic ducts with hinged covers for the control circuits in the vault. These shall be mounted along the walls behind all floor-mounted equipment and immediately below all wall-mounted equipment. The hinged covers shall be placed to open from the front side with the hinges at the front bottom.

Wall brackets for square ducts shall be installed at all joints 2 feet (60 cm) or more apart with intermediate brackets as specified. Conduit shall be used between square ducts and equipment or between different items of equipment when the equipment is designed for conduit connection. When the equipment is not designed for conduit connection, conductors shall enter the square-type control duct through insulating bushings in the duct or on the conduit risers.

**109-5.5 Wiring and connections.** The Contractor shall make all necessary electrical connections in the vault per the wiring diagrams furnished and as directed by the RPR. In wiring to the terminal blocks, the Contractor shall leave sufficient extra length on each control lead to make future changes in connections at the terminal block. This shall be accomplished by running each control lead the longest way around the box to the proper terminal. Leads shall be neatly laced in place.

**109-5.6 Marking and labeling.** All equipment, control wires, terminal blocks, etc., shall be tagged, marked, or labeled as specified below:

**a. Wire identification.** The Contractor shall furnish and install self-sticking wire labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks. Wire labels, if used, shall be of the self-sticking preprinted type and of the manufacturer's recommended size for the wire involved. Identification -markings designated in the plans shall be followed. Tags, if used, shall be of fiber not less than 3/4 inch (19 mm) in diameter and not less than 1/32 inch (1 mm) thick. Identification markings designated in the plans shall be stamped on tags by means of small tool dies. Each tag shall be securely tied to the proper wire by a nonmetallic cord.

**b. Labels.** The Contractor shall stencil identifying labels on the cases of regulators, breakers, and distribution and control relay cases with white oil paint as designated by the RPR. The letters and numerals shall be not less than one inch (25 mm) in height and shall be of proportionate width. The Contractor shall also mark the correct circuit designations per the wiring diagram on the terminal marking strips, which are a part of each terminal block.

## **METHOD OF MEASUREMENT**

**109-6.1** The quantity of vaults to be paid for under this item shall consist of the number of vaults constructed in place and accepted as a complete unit.

**109-6.2** The quantity of prefabricated metal housings to be paid for under this item shall consist of the number of housings constructed in place and accepted as a complete unit.

**109-6.3** The quantity of equipment to be paid for under this item shall consist of all equipment installed, connected and accepted as a complete unit ready for operation within an existing vault or prefabricated metal housing.

## **BASIS OF PAYMENT**

**109-7.1** Payment will be made at the contract unit price for each completed and accepted vault or prefabricated metal housing equipment installation. This price shall be full compensation for furnishing all

materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item L-109-7.1	Not Used
Item L-109-7.2	Not Used
Item L-109-7.3	Not Used
Item L-109-7.4A	Installation of Equipment within existing vault or prefabricated metal housing in Place, 15kW L-829 CCR – TW K Centerline - per unit
Item L-109-7.4B	Installation of Equipment within existing vault or prefabricated metal housing in Place, 10kW L-829 CCR – TW K Edge - per unit

### REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-3	Specification for L-821, Panels for Remote Control of Airport Lighting
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Specification for Constant Current Regulators and Regulator Monitors
AC 150/5345-13	Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits
AC 150/5345-49	Specification L-854, Radio Control Equipment;
AC 150/5345-53	Airport Lighting Equipment Certification Program

#### American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

ANSI/ICEA S-85-625	Standard for Telecommunications Cable Aircore, Polyolefin Insulated, Copper Conductor Technical Requirements
--------------------	--

#### ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C62	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C90	Standard Specification for Loadbearing Concrete Masonry Units
ASTM D2823	Standard Specification for Asphalt Roof Coatings, Asbestos Containing
ASTM D4479	Standard Specification for Asphalt Roof Coatings – Asbestos-Free

#### Commercial Item Description (CID)

A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)
-----------	--



IEEE 1584	Institute of Electrical and Electronic Engineers (IEEE) Guide for Performing Arc-Flash Hazard Calculations
Master Painter's Institute (MPI)	
MPI Reference #9	Alkyd, Exterior, Gloss (MPI Gloss Level 6)
Underwriters Laboratories (UL)	
UL Standard 6	Electrical Rigid Metal Conduit – Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit
National Fire Protection Association (NFPA)	
NFPA-70	National Electrical Code (NEC)
NFPA-70E	Standard for Electrical Safety in the Workplace
NFPA-780	Standard for the Installation of Lightning Protection Systems

**END OF ITEM L-109**

THIS PAGE INTENTIONALLY LEFT BLANK

**ITEM L-110**  
**AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS**

**DESCRIPTION**

**110-1.1** This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits and removal of existing duct banks. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

**EQUIPMENT AND MATERIALS**

**110-2.1 General.**

**a.** All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

**b.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

**c.** All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

**d.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

**e.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**110-2.2 Steel conduit.** Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other

similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

**110-2.3 Plastic conduit.** Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I–Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

**110-2.4 Split conduit.** Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

**110-2.5 Conduit spacers.** Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

**110-2.6 Concrete.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**110-2.7 Precast concrete structures.** Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

**110-2.8 Flowable backfill.** Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

**110-2.9 Detectable warning tape.** Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

## CONSTRUCTION METHODS

**110-3.1 General.** The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill may alternatively be used.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

- a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

- b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable. In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

**110-3.2 Duct banks.** Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans,

all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

**110-3.3 Conduits without concrete encasement.** Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6.3 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6

inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

**110-3.4 Markers.** The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

**110-3.5 Backfilling for conduits.** For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

**110-3.6 Backfilling for duct banks.** After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.



The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

**110-3.7 Restoration.** Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include topsoiling, fertilizing, liming, seeding, and mulching shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

**110-3.8 Ownership of removed cable.** The Contractor shall obtain ownership of removed cable and shall properly disposed of the cable materials off the Airport site.

### **METHOD OF MEASUREMENT**

**110-4.1** Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

### **BASIS OF PAYMENT**

**110-5.1** Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Concrete Encased Electrical Conduit, 1-Way-2-inch Sch 40 PVC - per linear foot (meter)
Item L-110-5.2A	Concrete Encased Electrical Duct Bank, 2-Way-4-inch Sch 40 PVC - per linear foot (meter)
Item L-110-5.2B	Concrete Encased Electrical Duct Bank, 4-Way-4-inch Sch 40 PVC - per linear foot (meter)
Item L-110-5.3	Non-Encased Electrical Conduit, 1-Way-2-inch - per linear foot (meter)
Item L-110-5.4	Removal of Concrete Encased or Non-Encased Electrical Conduit/Duct and Cable - per linear foot (meter)

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

### ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
-----------	--

### National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
---------	--------------------------------

### Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

**END OF ITEM L-110**

**ITEM L-115**  
**ELECTRICAL MANHOLES AND JUNCTION STRUCTURES**

**DESCRIPTION**

**115-1.1** This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the RPR. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the RPR including removal of existing manholes and junction structures as shown on the plans.

**EQUIPMENT AND MATERIALS**

**115-2.1 General.**

**a.** All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the RPR.

**b.** Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

**c.** All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

**d.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

**e.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

**115-2.2 Concrete structures.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures. Cast-in-place concrete structures shall be as shown on the plans.

**115-2.3 Precast concrete structures.** Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program. Provide precast concrete structures where shown on the plans.

Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand **100,000 lb aircraft wheel loads**, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown on the plans.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the RPR shall be submitted by the Contractor to allow for a full evaluation by the RPR. The RPR shall review per the process defined in the General Provisions.

**115-2.4 Junction boxes.** Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a L-894 blank cover, gasket, and stainless steel hardware. All bolts, studs, nuts, lock washers, and other similar fasteners used for the light fixture assemblies must be fabricated from 316L (equivalent to EN 1.4404), 18-8, 410, or 416 stainless steel. If 18-8, 410, or 416 stainless steel is utilized it shall be passivated and be free from any discoloration. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868. All junction boxes shall be provided with both internal and external ground lugs.

**115-2.5 Mortar.** The mortar shall be composed of one part of cement and two parts of mortar sand, by volume. The cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C206. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

**115-2.6 Concrete.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**115-2.7 Frames and covers.** The frames shall conform to one of the following requirements:

- |                       |  |
|-----------------------|--|
| a. ASTM A48           | Gray iron castings                     |
| b. ASTM A47           | Malleable iron castings                |
| c. ASTM A27           | Steel castings                         |
| d. ASTM A283, Grade D | Structural steel for grates and frames |
| e. ASTM A536          | Ductile iron castings                  |
| f. ASTM A897          | Austempered ductile iron castings      |

All castings specified shall withstand a maximum tire pressure of **250 psi** and maximum load of **100,000 lbs.**

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA

1910.146 (c)(2).

**115-2.8 Ladders.** Ladders, if specified, shall be galvanized steel or as shown on the plans.

**115-2.9 Reinforcing steel.** All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

**115-2.10 Bedding/special backfill.** Bedding or special backfill shall be as shown on the plans.

**115-2.11 Flowable backfill.** Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

**115-2.12 Cable trays.** Cable trays shall be of plastic. Cable trays shall be located as shown on the plans.

**115-2.13 Plastic conduit.** Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

**115-2.14 Conduit terminators.** Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

**115-2.15 Pulling-in irons.** Pulling-in irons shall be manufactured with 7/8-inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2-inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 MPa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

**115-2.16 Ground rods.** Ground rods shall be one piece, copper clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

## CONSTRUCTION METHODS

**115-3.1 Unclassified excavation.** It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the RPR without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to Item L-115. Dewatering necessary for structure installation and erosion per federal, state, and local requirements is incidental to Item L-115.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the RPR. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the RPR. Structures shall be placed after the RPR has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the RPR as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

**115-3.2 Concrete structures.** Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

**115-3.3 Precast unit installations.** Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

**115-3.4 Placement and treatment of castings, frames and fittings.** All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the RPR and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written approval is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the RPR and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

**115-3.5 Installation of ladders.** Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.

**115-3.6 Removal of sheeting and bracing.** In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The RPR may direct the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

**115-3.7 Backfilling.** After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

Backfill shall not be placed against any structure until approval is given by the RPR. In the case of concrete, such approval shall not be given until tests made by the laboratory under supervision of the RPR establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the RPR may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

**115-3.8 Connection of duct banks.** To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

**115-3.9 Grounding.** A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtailed shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

**115-3.10 Cleanup and repair.** After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

**115-3.11 Restoration.** After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective Item L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

**115-3.12 Inspection.** Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

**115-3.13 Manhole elevation adjustments.** The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise or lower the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. The precast sections be designed per paragraph 115-2.3. The Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

**115-3.14 Duct extension to existing ducts.** Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

## **METHOD OF MEASUREMENT**

**115-4.1** Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and dewatering;; sheeting and bracing; all required backfilling with on-site materials; restoration of all surfaces and finished grading and turfing; all required connections; temporary cables and connections; and ground rod testing

**115-4.2 Manhole elevation adjustments** shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

## **BASIS OF PAYMENT**

**115-5.1** The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

**115-5.2** Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the RPR.

Payment will be made under:



Item L-115-5.1	Electrical Manhole - <b>Not Used</b>
Item L-115-5.2	Electrical Junction Structure - <b>Not Used</b>
Item L-115-5.3	Existing Electrical Manhole/Junction Structure Elevation Adjustment – Per Each
Item L-115-5.4	Electrical Handhole (4' x 4' Precast Concrete) - Per Each

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
------------------	---

Advisory Circular (AC)

AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description (CID)

A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)
-----------	--

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement

ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA Engineering Brief (EB)	
EB #83	In Pavement Light Fixture Bolts
Mil Spec	
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
National Fire Protection Association (NFPA)	
NFPA-70	National Electrical Code (NEC)

**END OF ITEM L-115**

**ITEM L-125**  
**INSTALLATION OF AIRPORT LIGHTING SYSTEMS**

**DESCRIPTION**

**125-1.1** This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

**EQUIPMENT AND MATERIALS**

**125-2.1 General.**

**a.** Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not perform as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

**b.** Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

**c.** All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

**d.** The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR's opinion, does not meet the system design and the standards and codes, specified herein.

**e.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. All LED light fixtures, with the exception of obstruction lighting (AC 150/5345-43) must be warranted by the manufacturer for a minimum of 4 years after date of installation inclusive of all electronics. Obstruction lighting warranty is set by the individual manufacturer.

**EQUIPMENT AND MATERIALS**

**125-2.2 Conduit/Duct.** Conduit shall conform to Specification Item L-110 Airport Underground Electrical

Duct Banks and Conduits.

**125-2.3 Cable and Counterpoise.** Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

**125-2.4 Tape.** Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

**125-2.5 Cable Connections.** Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

**125-2.6 Retroreflective Markers.** Not required.

**125-2.7 Runway and Taxiway Lights.** Runway and taxiway lights shall conform to the requirements of AC 150/5345-46. Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

#### Lights

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-850C	2	1	3		L-868	White/White White/Yellow	L-830	See note 2, 3 below
L-852C(L)	2	1	3	5-Bidirectional	L-868	Green/Green	L-830	See note 1, 2, 3 below
L-852K(L)	2	1	3	5-Bidirectional	L-868	Green/Green	L-830	See note 1, 2, 3 below
L-852G(L)	2	1	3		L-868	Yellow	L-830	See note 1, 2, 3 below
L-804(L)	2	1	N/A		L-867	Yellow	L-830	See note 4 below
L-861T	2	1	N/A		L-867	Blue	L-830	20" Ht.

**Note 1: Provide fixture with arctic kit**

**Note 2: Provide fixture with one (1) L-823 cord set**

**Note 3: Provide snow plow ring compatible with fixture**

**Note 4: Provide incoming power on/off switch**

**125-2.8 Runway and Taxiway Signs.** Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44.

#### Signs

Type	Size	Style	Class	Mode	Notes
L-858Y(L)	3	2	2	2	TW Direction Type – Refer to Sign Schedule for Modules
L-858Y(L)	3	3	2	2	RW Direction Type – Refer to Sign Schedule for Modules
L-858R(L)	3	3	2	2	RW Mandatory Type – Refer to Sign Schedule for Modules
L-858L(L)	3	3	2	2	RW Location Type – Refer to Sign Schedule for Modules
L-858L(L)	3	2	2	2	TW Location Type – Refer to Sign Schedule for Modules

**There will also be replacement of existing sign panels and panels shall match the existing curved configuration guidance signs.**

**125-2.9 Runway End Identifier Light (REIL).** Not required.

**125-2.10 Precision Approach Path Indicator (PAPI).** Not required.

**125-2.11 Circuit Selector Cabinet.** Not required.

**125-2.12 Light Base and Transformer Housings.** Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Light Duty Light bases shall be Type L-867, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Aircraft and Heavy Vehicle Loading Light bases shall be Type L-868, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

**125-2.13 Isolation Transformers.** Isolation Transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47.

## **INSTALLATION**

**125-3.1 Installation.** The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

The Contractor shall salvage all specified removed equipment, not being relocated, to the Owner as noted on the plans.

**125-3.2 Testing.** All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

**125-3.3 Shipping and Storage.** Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the RPR, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer's recommendations.

**125-3.4 Elevated and In-pavement Lights.** Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper

elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

## **METHOD OF MEASUREMENT**

**125-4.1** Runway and taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR. Guidance sign panel relocations will be measured by the number of each installed as completed units, in place, ready for operation, and accepted by the RPR.

## **BASIS OF PAYMENT**

**125-5.1** Payment will be made at the Contract unit price for each complete runway or taxiway light or guidance sign panel relocation installed by the Contractor and accepted by the RPR. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item L-125-5.1	New L-861T Elevated Taxiway Edge Light – per each
Item L-125-5.2	New L-852C(L) In-Pavement Taxiway Centerline Light – per each
Item L-125-5.3	New L-852K(L) In-Pavement Taxiway Centerline Light – per each
Item L-125-5.4	New L-852G(L) In-Pavement Runway Guard Light – per each
Item L-125-5.5	New L-804(L) Elevated Runway Guard Light – per each
Item L-125-5.6A	New L-850C In-Pavement Runway Edge Light – per each
Item L-125-5.6B	Replace L-850C In-Pavement Runway Edge Light on Existing Can – per each
Item L-125-5.7A	New L-858(L) Airfield Guidance Sign – 1 Module – per each
Item L-125-5.7B	New L-858(L) Airfield Guidance Sign – 2 Module – per each
Item L-125-5.7C	New L-858(L) Airfield Guidance Sign – 3 Module – per each
Item L-125-5.8	Replace Airfield Guidance Sign Panels – per each
Item L-125-5.9	Remove Airfield Guidance Sign & Foundation – per each
Item L-125-5.10	Remove Elevated Runway/Taxiway Edge Light – per each
Item L-125-5.11	Remove Elevated Runway Guard Light – per each
Item L-125-5.12	Remove In-Pavement Runway Guard Light – per each
Item L-125-5.13	Remove, Store and Reinstall Elevated Runway End/Threshold Light – per each
Item L-125-5.14	Remove, Store and Reinstall FAA In-Pavement Runway Threshold Light – per each

## REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

### Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series to Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program

### Engineering Brief (EB)

EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures
-----------	---

**END OF ITEM L-125**

PAGE LEFT BLANK INTENTIONALLY