

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

**GREEN DRIVE CARGO FACILITY APRON
AND
ACCESS ROAD CONSTRUCTION**

**FAA AIP No. 3-33-0011-xxx-2022
Bid # FY22-805-48**



**ISSUED FOR BIDDING
MARCH 2022**

PREPARED BY:



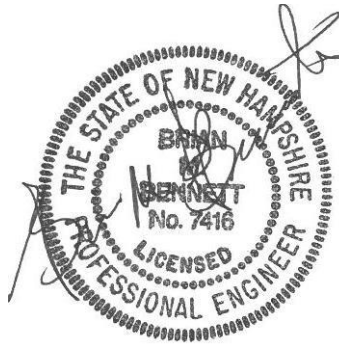
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**ADVERTISEMENT FOR BIDS
CITY OF MANCHESTER - DEPARTMENT OF AVIATION**

**REQUEST FOR BIDS FOR
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION**

At
MANCHESTER-BOSTON REGIONAL AIRPORT
AIP # 3-33-0011-xxx-2022
City Bid # FY22-805-48

The City of Manchester, New Hampshire, Department of Aviation is seeking bids for the completion of the apron for the proposed Green Drive Cargo Facility and the access road to the new cargo facility. The scope of work for the cargo apron area includes all of the associated work with the following components: site work demolition relating to the proposed site improvements; Portland Cement Concrete (PCC) Pavement Apron; Asphalt Pavement Apron, Taxilane and vehicle service road; high mast lighting; MHT fiber data system extension; MHT security equipment for the new facility and site and coordination with the MHT term-contract security integrator and maintenance vendor; taxiway edge light and signage modifications; electric supply system relocations/modifications and coordination with electric utility provider (Eversource); Automatic Surface Observation System site preparation and equipment relocation for new site and existing site demolition; snow melter facility; water line extension; coordination of gas service extension; drainage improvements; relocation of the perimeter security fence; pavement markings; other incidental work. In addition, coordination with the cargo facility development team for the complete installation of the scope of work located within the proposed building and lease line or the adjacent site work.

The project includes two alternates for the installation for the access road scope of work. Option 1 includes the reconstruction for a portion of the current temporary access road realignment from the original Green Drive to the proposed alignment of Green Drive along the front of the Cargo Facility lease lot installed during the building demolition phase of the overall project, while Option 2 includes the reconstruction a new roadway alignment from a new intersection on Ammon Drive through the edge of the existing Lot C Long Term Parking which intersects with the Green Drive re-alignment along the front of the Cargo Facility lease lot. The scope of work for both of the access road options include all of the associated work with the following components: roadway horizontal and vertical geometric re-alignments; full-depth reclamation of existing pavement and base material for use as new base material; asphalt pavement; drainage improvements; fencing improvements; pavement markings; turf establishment; and other incidental work. The access road option will be awarded based on available funding.

The project also has two Additive Alternates which include the construction of a second taxilane to the proposed apron and all its associated work similar to the other taxilane, as well as additional existing pavement rehabilitation of milling and in-lay pavement around the Terminal Building Loading Dock and Guard Shack areas. These additive alternates will be awarded based on available funding.

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 **Tuesday, 9:00 AM on March 8, 2022** 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 **Tuesday, March 8, 2022**, the documents may also be examined, by appointment, at:

- Manchester Boston Regional Airport – Airport Administration Offices, Terminal Building 3rd 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 **Tuesday, March 15, 2022 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.

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 **Wednesday, April 6, 2022 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%** Town of Londonderry, County of Rockingham

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.**

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.

2022 Aviation projects sponsored by the City of Manchester – Department of Aviation, Manchester, New Hampshire **utilize race-neutral DBE procedures. There is no specific DBE goal for this project.** Bidders must comply with the requirements of 49 CFR Part 26, including Appendix A, which discusses making good-faith efforts, to ensure that all DBE's and Small Businesses are afforded the maximum opportunity to work with them on federally funded projects. The City of Manchester – Department of Aviation, Manchester, New Hampshire **has an overall DBE goal of 6.5% for FAA funded projects** in Federal Fiscal Year (FFY) 2022.

The Bidder/Offeror shall make good faith efforts, as defined in Appendix A, 49 CRF Part 26 (Attachment 1), to meet the FFY 2022 overall DBE goal for DBE participation in the performance of this contract. The successful Bidder or Offeror must provide written confirmation of participation from each of the DBE firms the Bidder or Offeror lists in its commitment within five (5) days after bid opening.

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: David Brouillet, McFarland Johnson, located at 53 Regional Drive, Concord, NH 03301, by email @ dbrouillet@mjinc.com with a cc: copy to Luis Elguezabal, Assistant Airport Director for Operations and Facilities, by email @ lelguezabal@flymanchester.com.

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INFORMATION FOR BIDDERS

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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 6, 2022 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:

GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION

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

The work involves the completion of the apron for the proposed Green Drive Cargo Facility and an access road to the new cargo facility. The scope of work for the cargo apron area includes all of the associated work with the following components: site work demolition relating to the proposed site improvements; Portland Cement Concrete (PCC) Pavement Apron; Asphalt Pavement Apron, Taxilane and vehicle service road; high mast lighting; MHT fiber data system extension; MHT security equipment for the new facility and site and coordination with the MHT term-contract security integrator and maintenance vendor; taxiway edge light and signage modifications; electric supply system relocations/modifications and coordination with electric utility provider (Eversource); Automatic Surface Observation System site preparation and equipment relocation; snow melter facility; water line extension; drainage improvements; relocation of the perimeter security fence; pavement markings; other incidental work: and coordination with the cargo facility development team for the complete installation of the scope of work located within the proposed building and lease line or the adjacent site work.

The project includes two alternates for the installation for the access road scope of work. Option 1 includes the reconstruction for a portion of the current temporary access road realignment from the original Green Drive to the proposed alignment of Green Drive along the front of the Cargo Facility lease lot installed during the building demolition phase of the overall project, while Option 2 includes the reconstruction a new roadway alignment from a new intersection on Ammon Drive through the edge of the existing Lot C Long Term Parking which intersects with the Green Drive re-alignment along the front of the Cargo Facility lease lot. The scope of work for both of the access road options includes all of the associated work with the following components: roadway horizontal and vertical geometric re-alignments; full-depth reclamation of existing pavement and base material for use as new base material; asphalt pavement; drainage improvements; fencing improvements; pavement markings; turf establishment; and other incidental work. The access road option will be awarded based on available funding.

The project also has a couple of Additive Alternates which include the construction of a second taxilane to the proposed apron and all its associated work similar to the other taxilane, as well as additional existing pavement rehabilitation of milling and in-lay pavement around the Terminal Building Loading Dock and Guard Shack areas. These additive alternates will be awarded based on available funding.

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 the overall project will have a Notice to Proceed issued during the month of early May for the work and to be constructed during Summer 2022. The scheduling of the subphases noted below will be determined by the Contractor, but in accordance with other limitations noted in the Contract Documents. The determination which Road Access Option (Option 1 or Option 2) will be constructed to be dependent on project funding. The two Additive Alternates will only be performed if the project funding is available.

Overall Project Completion

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 **one hundred thirty (130) calendar days, but the**

substantial completion date for functional use shall be no later than September 30, 2022. However due to an anticipated long lead procurement time for the Snow Melter Equipment, the final completion date may possibly extend outside of the contract limits. Bidders 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 all work to obtain substantial completion for function use, except as noted for only the final Snow Melter Equipment Installation, or after the date certain noted above, including either of the access road alternatives, Additive Alternate work, and all of the Snow Melter Site Improvements other than the final Snow Melter Equipment installation.

If the Snow Melter Equipment delivery requires work outside of the contract time limit, the allowable time for the installation of the Snow Melter Equipment will be based upon an Owner modification to the time limits for the CONTRACT DOCUMENTS.

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 David Brouillet, Project Manager with McFarland Johnson, 53 Regional Drive, Concord, NH 03301, by fax at (603) 225-0095 or email dbrouillet@mjinc.com and to be given consideration, **must be received no later than 5:00 PM (EDT) on Tuesday, March 29, 2022.** 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 emailed (or faxed upon request) to all prospective bidders (at email address furnished for such purposes or the provided fax number), **not later than 5:00 PM (EDT) on Friday, April 1, 2022.** 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.

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.

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

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BID PROPOSAL

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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:

Green Drive Cargo Facility Apron and Access Road Construction

MHT Bid No. FY22-805-48

(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**

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BID PROPOSAL

for

GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION

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:

Green Drive Cargo Facility Apron and Access Road Construction: One Hundred Twenty (120) calendar days.

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

For the project, 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.***

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
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE A – BASE BID – PROPOSAL 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 (3%) _____ Dollars and _____ Cents				
C-100-1	1 LS	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP) _____ Dollars and _____ Cents				
C-102-5.1	14 EA	INSTALLATION AND REMOVAL OF INLET PROTECTION FILTER BAGS _____ Dollars and _____ Cents				
C-102-5.2	600 LF	INSTALLATION AND REMOVAL OF EROSION CONTROL LOGS _____ Dollars and _____ Cents				
C-102-5.3	2 EA	INSTALLATION AND REMOVAL OF STABILIZED CONSTRUCTION ENTRANCE _____ Dollars and _____ Cents				
C-102-5.4	1 LS	STORM WATER POLLUTION PREVENTION PLAN AND MONITORING _____ Dollars and _____ Cents				
M-100-1	1 ALL	ALLOWANCE – GATE GUARDS <u>Twenty Thousand</u> Dollars and <u>Zero</u> Cents	\$20,000	00	\$20,000	00
M-105-1	1 LS	ENGINEER FIELD OFFICE _____ Dollars and _____ Cents				
M-200-1	1 LS	MAINTENANCE AND PROTECTION OF TRAFFIC (AIRFIELD) _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-200-3	1 LS	TEMPORARY VEHICLE SERVICE ROAD _____ Dollars and _____ Cents				
M-250-1	1 LS	RECORD DOCUMENTS _____ Dollars and _____ Cents				
M-250-2	1 LS	FIELD DATA COLLECTION FOR GIS SURVEY CONVERSION _____ Dollars and _____ Cents				
M-400-5.1a	1,800 LF	NO. 12 AWG, 600V COPPER WIRE, INSTALLED IN DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/ TERMINATIONS _____ Dollars and _____ Cents				
M-400-5.1b	1,500 LF	NO. 10 AWG, 600V COPPER WIRE, INSTALLED IN DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/ TERMINATIONS _____ Dollars and _____ Cents				
M-400-5.1c	2,700 LF	NO. 6 AWG, 600V COPPER WIRE, INSTALLED IN DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/ TERMINATIONS _____ Dollars and _____ Cents				
M-400-5.1d	900 LF	NO. 10G AWG, 600V COPPER WIRE, INSTALLED IN DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/ TERMINATIONS _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport</p> <p style="text-align: center;">GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION</p> <p style="text-align: center;">SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-400-5.1e	1,400 LF	NO. 8G AWG, 600V COPPER WIRE, INSTALLED IN DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/ TERMINATIONS _____ Dollars and _____ Cents				
M-400-5.2b	900 LF	2 STRAND FIBER CABLE INSTALLED IN CONDUIT, INCLUDING CONNECTIONS/ TERMINATIONS _____ Dollars and _____ Cents				
M-400-5.2c	600 LF	CAT 6 CABLE INSTALLED IN CONDUIT, INCLUDING CONNECTIONS/TERMINATIONS _____ Dollars and _____ Cents				
M-400-5.4e	780 LF	CONCRETE ENCASED 1" CONDUIT – TYPE III, SCH 40 PVC _____ Dollars and _____ Cents				
M-400-5.5	4 EA	MAST LIGHT POLE AND FIXTURE INSTALLATION _____ Dollars and _____ Cents				
M-400-5.6a	2 EA	MAST LIGHT CAMERA WITH INSTALLATION _____ Dollars and _____ Cents				
M-400-5.6b	3 EA	BUILDING MOUNTED CAMERA WITH INSTALLATION _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-400-5.6c	2 EA	CAMERA 4-PORT PoE ENCLOSURE AND SWITCH WITH INSTALLATION _____ Dollars and _____ Cents				
M-400-5.6d	1 ALL	SECURITY CAMERA INTEGRATOR INSTALLATION - ALLOWANCE Twenty Thousand Dollars and Zero Cents	\$20,000	00	\$20,000	00
M-400-5.7e	2 EA	MAST LIGHT POLE FOUNDATION INSTALLATION _____ Dollars and _____ Cents				
M-400-5.9b	1 LS	LOT D (SOUTH) SITE LIGHTING REMOVAL _____ Dollars and _____ Cents				
M-500-1	1 LS	EXISTING ASOS SITE REMOVAL WORK _____ Dollars and _____ Cents				
M-500-2	1 LS	COORDINATION AND REMOVAL AND TRANSPORTATION ASSISTANCE OF EQUIPMENT RELOCATION WITH THE NATIONAL WEATHER SERVICE _____ Dollars and _____ Cents				
M-500-3	1 LS	RELOCATED ASOS SITE IMPROVEMENT INSTALLATION WORK _____ Dollars and _____ Cents				
M-700-5.3a	2 EA	TRAFFIC SIGN – NHDOT TYPE C _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport</p> <p style="text-align: center;">GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION</p> <p style="text-align: center;">SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-900-1	1 EA	OIL-WATER SEPARATOR _____ Dollars and _____ Cents				
P-101-5.1	36,200 SY	PAVEMENT REMOVAL _____ Dollars and _____ Cents				
P-101-5.2	1,800 LF	JOINT AND CRACK REPAIR _____ Dollars and _____ Cents				
P-101-5.6	6,200 SY	COLD MILLING _____ Dollars and _____ Cents				
P-101-5.7A	1,770 LF	REMOVAL OF PIPE _____ Dollars and _____ Cents				
P-101-5.7B	9 EA	REMOVAL OF DRAIN INLET/MANHOLE _____ Dollars and _____ Cents				
P-152-4.1	37,800 CY	UNCLASSIFIED EXCAVATION _____ Dollars and _____ Cents				
P-152-4.2	3,780 CY	UNSUITABLE EXCAVATION _____ Dollars and _____ Cents				
P-154-5.1	22,100 CY	SUBBASE COURSE _____ Dollars and _____ Cents				
P-209-5.1	6,200 CY	CRUSHED AGGREGATE BASE COURSE _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport</p> <p style="text-align: center;">GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION</p> <p style="text-align: center;">SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-401-8.1	6,000 TON	ASPHALT SURFACE COURSE _____ Dollars and _____ Cents				
P-403-8.1	12,300 TON	ASPHALT BASE COURSE/SHOULDER PAVEMENT _____ Dollars and _____ Cents				
P-501-8.1	13,100 SY	CONCRETE PAVEMENT _____ Dollars and _____ Cents				
P-603-5.1	5,750 GAL	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				
P-605-5.1	3,950 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				
P-620-5.1a	580 SF	SURFACE PREPARATION _____ Dollars and _____ Cents				
P-620-5.2b	13,630 SF	MARKING _____ Dollars and _____ Cents				
P-620-5.3c	330 LBS	REFLECTIVE MEDIA _____ Dollars and _____ Cents				
F-162-5.1a	930 LF	10-FT. HEIGHT CHAIN-LINK FENCE WITH BARBED WIRE _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE A – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
F-162-5.1c	600 LF	TEMPORARY CHAIN-LINK FENCE ON CONCRETE BARRIER WITH BARBED WIRE _____ Dollars and _____ Cents				
F-162-5.2a	1 EA	TEMPORARY 25' WIDE VEHICLE GATE _____ Dollars and _____ Cents				
F-162-5.3	1,480 LF	REMOVAL OF FENCE _____ Dollars and _____ Cents				
D-701-5.1A	70 LF	12-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-701-5.1B	540 LF	15-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-701-5.1C	540 LF	18-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-701-5.1D	760 LF	48-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-751-5.1A	7 EA	DRAINAGE MANHOLE - AIRCRAFT RATED _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport</p> <p style="text-align: center;">GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION</p> <p style="text-align: center;">SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
D-751-5.1B	1 EA	DRAINAGE DIVERSION MANHOLE - AIRCRAFT RATED _____ Dollars and _____ Cents				
D-751-5.2A	1 EA	CATCH BASIN - AIRCRAFT RATED _____ Dollars and _____ Cents				
D-751-5.2B	1 EA	CATCH BASIN – H-20 RATED _____ Dollars and _____ Cents				
D-751-5.3	560 LF	TRENCH DRAIN _____ Dollars and _____ Cents				
D-751-5.4	1 EA	ADJUST STRUCTURE RIM/GRATE ELEVATION _____ Dollars and _____ Cents				
D-751-5.5	1 EA	REPLACE FRAME/COVER AND ADJUST STRUCTURE RIM ELEVATION _____ Dollars and _____ Cents				
T-901-5.1	100 KSF	SEEDING _____ Dollars and _____ Cents				
T-905-5.1	215 CY	TOPSOIL (OBTAINED ON SITE OR REMOVED FROM STOCKPILE) _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport</p> <p style="text-align: center;">GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION</p> <p style="text-align: center;">SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
T-905-5.2	305 CY	TOPSOIL (FURNISHED FROM OFF THE SITE) _____ Dollars and _____ Cents				
T-908-5.1	9,270 SY	MULCHING _____ Dollars and _____ Cents				
L-108-5.1	3,200 LF	No. 8 AWG, 5 KV, L-824, TYPE C CABLE INSTALLED IN TRENCH, DUCT BANK OR CONDUIT _____ Dollars and _____ Cents				
L-108-5.2	1,770 LF	No. 6 AWG, SOLID, BARE COPPER COUNTERPOISE WIRE, INSTALLED ABOVE THE DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/TERMINATIONS _____ Dollars and _____ Cents				
L-110-5.1	1,620 LF	CONCRETE ENCASED ELECTRICAL CONDUIT – 1 WAY - 2-INCH SCH 40 PVC _____ Dollars and _____ Cents				
L-110-5.4	1,030 LF	REMOVAL OF CONCRETE ENCASED OR NON-ENCASED ELECTRICAL CONDUIT/DUCT AND CABLE _____ Dollars and _____ Cents				
L-110-5.5	190 LF	REMOVAL OF CABLE IN EXISTING ELECTRICAL CONDUIT/DUCT TO REMAIN _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport</p> <p style="text-align: center;">GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION</p> <p style="text-align: center;">SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-115-5.1	2 EA	ELECTRICAL MANHOLE (AIRCRAFT RATED) _____ Dollars and _____ Cents				
L-115-5.2	2 EA	REMOVAL OF ELECTRICAL MANHOLE/JUNCTION STRUCTURE _____ Dollars and _____ Cents				
L-115-5.3	2 EA	EXISTING ELECTRICAL MANHOLE/JUNCTION STRUCTURE ELEVATION ADJUSTMENT _____ Dollars and _____ Cents				
L-125-5.1	10 EA	NEW L-861T ELEVATED TAXIWAY EDGE LIGHT _____ Dollars and _____ Cents				
L-125-5.2A	2 EA	NEW L-858(L) AIRFIELD GUIDANCE SIGN – 2 MODULE _____ Dollars and _____ Cents				
L-125-5.2B	1 EA	NEW L-858(L) AIRFIELD GUIDANCE SIGN – 3 MODULE _____ Dollars and _____ Cents				
L-125-5.4	2 EA	REMOVE, STORE AND REINSTALL ELEVATED TAXIWAY EDGE LIGHT ON EXISTING BASE CAN _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION SCHEDULE A – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-125-5.5	6 EA	REMOVE, STORE AND REINSTALL ELEVATED TAXIWAY EDGE LIGHT ON NEW BASE CAN AND REMOVE EXISTING BASE CAN _____ Dollars and _____ Cents				
L-125-5.6	4 EA	REMOVE ELEVATED TAXIWAY EDGE LIGHT AND BASE CAN _____ Dollars and _____ Cents				
L-125-5.7A	2 EA	NEW L-852C(L) IN-PAVEMENT TAXIWAY CENTERLINE LIGHT _____ Dollars and _____ Cents				
L-125-5.7B	2 EA	NEW L-852C(L) IN-PAVEMENT TAXIWAY CENTERLINE LIGHT ON EXISTING CONDUIT _____ Dollars and _____ Cents				
L-125-5.7C	10 EA	NEW L-852K(L) IN-PAVEMENT TAXIWAY CENTERLINE LIGHT _____ Dollars and _____ Cents				
L-125-5.7D	4 EA	REMOVE, STORE AND REINSTALL TAXIWAY CENTERLINE LIGHT ON EXISTING BASE CAN _____ Dollars and _____ Cents				

SCHEDULE A – BASE BID SUBTOTAL (Pages BP-7 to BP-17)

(Transfer the Amount to Page BP-41)

\$ _____

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
C-102-5.1	9 EA	INSTALLATION AND REMOVAL OF INLET PROTECTION FILTER BAGS _____ Dollars and _____ Cents				
C-102-5.2	100 LF	INSTALLATION AND REMOVAL OF EROSION CONTROL LOGS _____ Dollars and _____ Cents				
M-300-1	1 LS	SNOW MELTER EQUIPMENT PACKAGE _____ Dollars and _____ Cents				
M-300-2A	1 LS	SNOW MELTER EQUIPMENT MANUFACTURER INSTALLATION ASSISTANCE _____ Dollars and _____ Cents				
M-300-2B	1 LS	CONTRACTOR SNOW MELTER EQUIPMENT FINAL DESIGN AND INSTALLATION _____ Dollars and _____ Cents				
M-300-3	1 LS	CONTRACTOR SNOW MELTER SITE PREPARATION AND SITE INFRASTRUCTURE WORK _____ Dollars and _____ Cents				
M-300-4	1 LS	SNOW MELTER BUILDING AND INSTALLATION _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-300-5A	120 LF	SNOW MELTER UTILITY – 2” POLYETHYLENE WATER LINE _____ Dollars and _____ Cents				
M-300-5B	300 LF	SNOW MELTER UTILITY – 8” DUCTILE IRON WATER LINE _____ Dollars and _____ Cents				
M-300-5C	2 EA	SNOW MELTER UTILITY – 2” SERVICE TAP (SADDLE & CORPORATION) _____ Dollars and _____ Cents				
M-300-5D	2 EA	SNOW MELTER UTILITY – 2” CURB STOP WITH CURB BOX _____ Dollars and _____ Cents				
M-300-5E	1 EA	SNOW MELTER UTILITY – 12” X 8” TAPPING SLEEVE AND 8” GATE VALVE _____ Dollars and _____ Cents				
M-300-5F	1 EA	SNOW MELTER UTILITY – HYDRANT AND 6” GATE VALVE ASSEMBLY _____ Dollars and _____ Cents				
M-300-6A	1 LS	SNOW MELTER UTILITY – NATURAL GAS SERVICE SUPPLIER COORDINATION AND INSTALLATION _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-300-6B	350 LF	SNOW MELTER UTILITY – NATURAL GAS SERVICE PIPE TRENCHING _____ Dollars and _____ Cents				
M-400-5.2a	2,500 LF	144 STAND FIBER CABLE WITH INNERDUCT, INSTALLED IN DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS AND TERMINATIONS _____ Dollars and _____ Cents				
M-400-5.3a	1 LS	DEMARC ROOM FIBER EQUIPMENT & FIBER CABLE INTERCONNECTIONS _____ Dollars and _____ Cents				
M-400-5.3b	1 LS	SNOW MELTER BUILDING FIBER EQUIPMENT & FIBER CABLE INTERCONNECTIONS _____ Dollars and _____ Cents				
M-400-5.4a	1,600 LF	CONCRETE ENCASED 5” CONDUIT – TYPE III SCH 40 PVC _____ Dollars and _____ Cents				
M-400-5.4b	60 LF	EVERSOURCE RISER 5” CONDUIT – RIGID _____ Dollars and _____ Cents				
M-400-5.4c	1,250 LF	CONCRETE ENCASED DUCT BANK 2-WAY X 4” – TYPE III, SCH 40 PVC _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-400-5.4d	320 LF	CONCRETE ENCASED DUCT BANK 2-WAY X 3" – TYPE III, SCH 40 PVC _____ Dollars and _____ Cents				
M-400-5.7a	1 EA	500 kVA EVERSOURCE TRANSFORMER PAD _____ Dollars and _____ Cents				
M-400-5.7b	4 EA	ELECTRICAL MANHOLE (H-20 RATED) _____ Dollars and _____ Cents				
M-400-5.7c	5 EA	FIBER/ELECTRICAL HANDHOLE (H-20 RATED) _____ Dollars and _____ Cents				
M-400-5.7d	3 EA	EXISTING HANDHOLE REMOVAL _____ Dollars and _____ Cents				
M-400-5.8a	1 ALL	UTILITY SUPPLIER RELOCATION WORK - ALLOWANCE <u>One Hundred Thousand</u> Dollars and <u>Zero</u> Cents	\$100,000	00	\$100,000	00
M-400-5.8b	1 ALL	UTILITY SUPPLIER CABLE INSTALLATION - ALLOWANCE <u>Twenty Thousand</u> Dollars and <u>Zero</u> Cents	\$20,000	00	\$20,000	00
M-400-5.9a	1 LS	LOT D (NORTH) SITE LIGHTING REMOVAL _____ Dollars and _____ Cents				
M-400-5.9c	1 LS	ACCESS ROADWAY SITE LIGHTING REMOVAL _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-600-1	390 TON	NHDOT HOT BITUMINOUS PAVEMENT – ½” WEARING COURSE _____ Dollars and _____ Cents				
M-600-2	480 TON	NHDOT HOT BITUMINOUS PAVEMENT – ¾” BINDER COURSE _____ Dollars and _____ Cents				
M-700-5.1a	160 CY	BASE COURSE MATERIAL _____ Dollars and _____ Cents				
M-700-5.2a	100 LF	GRANTITE CURB (STRAIGHT) _____ Dollars and _____ Cents				
M-700-5.2b	30 LF	GRANTITE SLOPE CURB (STRAIGHT AND RADIAL) _____ Dollars and _____ Cents				
M-700-5.2c	200 LF	REMOVE, SALVAGE AND RESET GRANTITE CURB (STRAIGHT) _____ Dollars and _____ Cents				
M-700-5.2d	280 LF	REMOVE, SALVAGE AND RESET GRANTITE SLOPE CURB (STRAIGHT AND RADIAL JOINTS) _____ Dollars and _____ Cents				
M-700-5.3b	5 EA	WAYFINDING SIGNAGE – NHDOT TYPE C _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-700-5.4	1 LS	WALKWAY MODIFICATION _____ Dollars and _____ Cents				
M-700-5.5	1 LS	OLD ACCESS GATE AND ISLAND AREA REMOVAL _____ Dollars and _____ Cents				
M-700-5.9a	1 LS	1" COPPER WATER SERVICE REMOVAL & DECOMMISSIONING _____ Dollars and _____ Cents				
M-700-5.9b	1 LS	8" CAST IRON WATER SERVICE REMOVAL & DECOMMISSIONING _____ Dollars and _____ Cents				
M-750-1	1 LS	STORMWATER INFILTRATION TREATMENT SYSTEM _____ Dollars and _____ Cents				
M-800-5.1	2,400 SY	RECLAIMED BASE COURSE _____ Dollars and _____ Cents				
M-800-5.2	140 TON	SUPPLEMENTAL AGGREGATE MATERIAL _____ Dollars and _____ Cents				
P-101-5.1	1,420 SY	PAVEMENT REMOVAL _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-101-5.2	330 LF	JOINT AND CRACK REPAIR _____ Dollars and _____ Cents				
P-101-5.6	2,830 SY	COLD MILLING _____ Dollars and _____ Cents				
P-101-5.7A	100 LF	REMOVAL OF PIPE _____ Dollars and _____ Cents				
P-101-5.7B	2 EA	REMOVAL OF DRAIN INLET/MANHOLE _____ Dollars and _____ Cents				
P-154-5.1	120 CY	SUBBASE COURSE _____ Dollars and _____ Cents				
P-403-8.1	300 TON	ASPHALT BASE COURSE/SHOULDER PAVEMENT _____ Dollars and _____ Cents				
P-603-5.1	370 GAL	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				
P-605-5.1	190 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				
P-620-5.2b	830 SF	MARKING _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE B – BASE BID – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-620-5.3c	60 LBS	REFLECTIVE MEDIA _____ Dollars and _____ Cents				
F-162-5.1a	320 LF	10-FT. HEIGHT CHAIN-LINK FENCE WITH BARBED WIRE _____ Dollars and _____ Cents				
F-162-5.1b	230 LF	4-FT HEIGHT CHAIN-LINK FENCE _____ Dollars and _____ Cents				
F-162-5.3	530 LF	REMOVAL OF FENCE _____ Dollars and _____ Cents				
D-701-5.1B	390 LF	15-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-701-5.1C	30 LF	18-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-701-5.1E	30 LF	12-INCH HIGH-DENSITY POLYETHYLENE PIPE _____ Dollars and _____ Cents				
D-751-5.2B	3 EA	CATCH BASIN – H-20 RATED _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION SCHEDULE B – BASE BID – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
D-751-5.4	1 EA	ADJUST STRUCTURE RIM/GRATE ELEVATION _____ Dollars and _____ Cents				
D-751-5.6	1 EA	INSTALL DIVERSION WEIR IN EXISTING CATCH BASIN _____ Dollars and _____ Cents				
T-901-5.1	20 KSF	SEEDING _____ Dollars and _____ Cents				
T-905-5.2	80 CY	TOPSOIL (FURNISHED FROM OFF THE SITE) _____ Dollars and _____ Cents				
T-908-5.1	1,440 SY	MULCHING _____ Dollars and _____ Cents				

SCHEDULE B – BASE BID SUBTOTAL (Pages BP-18 to BP-26)

(Transfer the Amount to Page BP-41)

\$ _____

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE C1 – ACCESS ROAD ALTERNATE 1 - PROPOSAL 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 (10%) _____. Dollars and _____. Cents				
C-100-1	1 LS	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP) _____. Dollars and _____. Cents				
C-102-5.1	3 EA	INSTALLATION AND REMOVAL OF INLET PROTECTION FILTER BAGS _____. Dollars and _____. Cents				
C-102-5.2	100 LF	INSTALLATION AND REMOVAL OF EROSION CONTROL LOGS _____. Dollars and _____. Cents				
M-200-1	1 LS	MAINTENANCE AND PROTECTION OF TRAFFIC (ACCESS ROAD) _____. Dollars and _____. Cents				
M-250-1	1 LS	RECORD DOCUMENTS _____. Dollars and _____. Cents				
M-600-1	150 TON	NHDOT HOT BITUMINOUS PAVEMENT – ½” WEARING COURSE _____. Dollars and _____. Cents				
M-600-2	240 TON	NHDOT HOT BITUMINOUS PAVEMENT – ¾” BINDER COURSE _____. Dollars and _____. Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE C1 – ACCESS ROAD ALTERNATE 1 - PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-700-5.3a	1 EA	TRAFFIC SIGN – NHDOT TYPE C _____ Dollars and _____ Cents				
M-800-5.1	1,730 SY	RECLAIMED BASE COURSE _____ Dollars and _____ Cents				
M-800-5.2	100 TON	SUPPLEMENTAL AGGREGATE MATERIAL _____ Dollars and _____ Cents				
P-101-5.1	2,840 SY	PAVEMENT REMOVAL _____ Dollars and _____ Cents				
P-154-5.1	240 CY	SUBBASE COURSE _____ Dollars and _____ Cents				
P-603-5.1	110 GAL	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				
P-605-5.1	50 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				
P-620-5.2b	540 SF	MARKINGS _____ Dollars and _____ Cents				
P-620-5.3c	40 LBS	REFLECTIVE MEDIA _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION SCHEDULE C1 – ACCESS ROAD ALTERNATE 1 - PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
F-162-5.1b	270 LF	4-FT. HEIGHT CHAIN-LINK FENCE _____ Dollars and _____ Cents				
D-701-5.1B	120 LF	15-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-751-5.2B	1 EA	CATCH BASIN - H-20 RATED _____ Dollars and _____ Cents				
T-901-5.1	30 KSF	SEEDING _____ Dollars and _____ Cents				
T-905-5.2	160 CY	TOPSOIL (FURNISHED FROM OFF THE SITE) _____ Dollars and _____ Cents				
T-908-5.1	2,840 SY	MULCHING _____ Dollars and _____ Cents				

SCHEDULE C1 – ACCESS ROAD ALTERNATE 1 SUBTOTAL (Pages BP-27 to BP-29)
(Transfer the Amount to Page BP-41)

\$ _____

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE C2 – ACCESS ROAD ALTERNATE 2 – PROPOSAL 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 (10%) _____. Dollars and _____. Cents				
C-100-1	1 LS	CONTRACTOR QUALITY CONTROL PROGRAM ((CQCP) _____. Dollars and _____. Cents				
C-102-5.1	15 EA	INSTALLATION AND REMOVAL OF INLET PROTECTION FILTER BAGS _____. Dollars and _____. Cents				
C-102-5.2	100 LF	INSTALLATION AND REMOVAL OF EROSION CONTROL LOGS _____. Dollars and _____. Cents				
M-200-1	1 LS	MAINTENANCE AND PROTECTION OF TRAFFIC (ACCESS ROAD) _____. Dollars and _____. Cents				
M-250-1	1 LS	RECORD DOCUMENTS _____. Dollars and _____. Cents				
M-400-5.10	1 LS	REMOVE, SALVAGE AND RELOCATE WIRELESS INTERNET POLE _____. Dollars and _____. Cents				
M-600-1	640 TON	NHDOT HOT BITUMINOUS PAVEMENT – ½” WEARING COURSE _____. Dollars and _____. Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE C2 – ACCESS ROAD ALTERNATE 2 – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-600-2	1,120 TON	NHDOT HOT BITUMINOUS PAVEMENT – ¾" BINDER COURSE _____ Dollars and _____ Cents				
M-700-5.1a	50 CY	BASE COURSE MATERIAL _____ Dollars and _____ Cents				
M-700-5.3a	1 EA	TRAFFIC SIGN – NHDOT TYPE C _____ Dollars and _____ Cents				
M-700-5.3c	7 EA	REMOVAL OF TRAFFIC SIGN _____ Dollars and _____ Cents				
M-700-5.6	1 LS	LOT C ENTRANCE CANOPY REMOVAL & ACCESS GATE RELOCATION _____ Dollars and _____ Cents				
M-700-5.7	1 LS	LOT C EGRESS GATE RELOCATION _____ Dollars and _____ Cents				
M-700-5.8	1 LS	CUL-DE-SAC AREA REMOVAL _____ Dollars and _____ Cents				
M-700-5.9c	1 LS	REMOVE, SALVAGE AND RELOCATE HYDRANT _____ Dollars and _____ Cents				
M-800-5.1	7,750 SY	RECLAIMED BASE COURSE _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE C2 – ACCESS ROAD ALTERNATE 2 – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-800-5.2	440 TON	SUPPLEMENTAL AGGREGATE MATERIAL _____ Dollars and _____ Cents				
P-101-5.1	6,840 SY	PAVEMENT REMOVAL _____ Dollars and _____ Cents				
P-101-5.7A	60 LF	REMOVAL OF PIPE _____ Dollars and _____ Cents				
P-101-5.7B	1 EA	REMOVAL OF DRAIN INLET/MANHOLE _____ Dollars and _____ Cents				
P-152-4.1	200 CY	UNCLASSIFIED EXCAVATION _____ Dollars and _____ Cents				
P-152-4.2	20 CY	UNSUITABLE EXCAVATION _____ Dollars and _____ Cents				
P-154-5.1	570 CY	SUBBASE COURSE _____ Dollars and _____ Cents				
P-603-5.1	500 GAL	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				
P-605-5.1	140 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE C2 – ACCESS ROAD ALTERNATE 2 – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-620-5.2b	1,950 SF	MARKING _____ Dollars and _____ Cents				
P-620-5.3c	120 LBS	REFLECTIVE MEDIA _____ Dollars and _____ Cents				
F-162-5.1b	1,260 LF	4-FT. HEIGHT CHAIN-LINK FENCE _____ Dollars and _____ Cents				
F-162-5.3	360 LF	REMOVAL OF FENCE _____ Dollars and _____ Cents				
D-701-5.1B	220 LF	15-INCH CLASS V REINFORCED CONCRETE PIPE _____ Dollars and _____ Cents				
D-751-5.2B	4 EA	CATCH BASIN - H-20 RATED _____ Dollars and _____ Cents				
D-751-5.4	2 EA	ADJUST STRUCTURE RIM/GRATE ELEVATION _____ Dollars and _____ Cents				
T-901-5.1	70 KSF	SEEDING _____ Dollars and _____ Cents				
T-905-5.1	30 CY	TOPSOIL (OBTAINED ON SITE OR REMOVED FROM STOCKPILE) _____ Dollars and _____ Cents				

<p style="text-align: center;">Manchester-Boston Regional Airport GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION SCHEDULE C2 – ACCESS ROAD ALTERNATE 2 – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
T-905-5.2	370 CY	TOPSOIL (FURNISHED FROM OFF THE SITE) _____ Dollars and _____ Cents				
T-908-5.1	7,170 SY	MULCHING _____ Dollars and _____ Cents				

SCHEDULE C2 – ACCESS ROAD ALTERNATE 2 SUBTOTAL (Pages BP-30 to BP-34)

(Transfer the Amount to Page BP-41)

\$ _____

<p style="text-align: center;">Manchester-Boston Regional Airport</p> <p style="text-align: center;">GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION</p> <p style="text-align: center;">SCHEDULE D – ADDITIVE ALTERNATE 3</p> <p style="text-align: center;">TERMINAL DOCK AREA PAVEMENT – PROPOSAL FORM</p>						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-101-5.2	1,100 LF	JOINT AND CRACK REPAIR _____ Dollars and _____ Cents				
P-101-5.6	1,260 SY	COLD MILLING _____ Dollars and _____ Cents				
M-600-1	170 TON	NHDOT HOT BITUMINOUS PAVEMENT – ½” WEARING COURSE _____ Dollars and _____ Cents				

SCHEDULE D – ADDITIVE ALTERNATE 3 SUBTOTAL (Pages BP-35 to BP-35)
(Transfer the Amount to Page BP-41)

\$ _____

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE E – ADDITIVE ALTERNATE 4
TAXILANE TO TAXIWAY D – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
M-250-1	1 LS	RECORD DOCUMENTS _____ Dollars and _____ Cents				
M-250-2	1 LS	FIELD DATA COLLECTION FOR GIS SURVEY CONVERSION _____ Dollars and _____ Cents				
P-101-5.1	960 SY	PAVEMENT REMOVAL _____ Dollars and _____ Cents				
P-101-5.7A	230 LF	REMOVAL OF PIPE _____ Dollars and _____ Cents				
P-101-5.7B	2 EA	REMOVAL OF DRAIN INLET/MANHOLE _____ Dollars and _____ Cents				
P-152-4.1	5,000 CY	UNCLASSIFIED EXCAVATION _____ Dollars and _____ Cents				
P-152-4.2	500 CY	UNSUITABLE EXCAVATION _____ Dollars and _____ Cents				
P-154-5.1	4,000 CY	SUBBASE COURSE _____ Dollars and _____ Cents				
P-209-5.1	1,000 CY	CRUSHED AGGREGATE BASE COURSE _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE E – ADDITIVE ALTERNATE 4
TAXILANE TO TAXIWAY D – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
P-401-8.1	1,000 TON	ASPHALT SURFACE COURSE _____ Dollars and _____ Cents				
P-403-8.1	1,700 TON	ASPHALT BASE COURSE/SHOULDER PAVEMENT _____ Dollars and _____ Cents				
P-603-5.1	900 GAL	EMULSIFIED ASPHALT TACK COAT _____ Dollars and _____ Cents				
P-605-5.1	400 LF	JOINT SEALING FILLER _____ Dollars and _____ Cents				
P-620-5.2b	3,040 SF	MARKING _____ Dollars and _____ Cents				
P-620-5.3c	70 LBS	REFLECTIVE MEDIA _____ Dollars and _____ Cents				
D-751-5.1A	1 EA	DRAINAGE MANHOLE - AIRCRAFT RATED _____ Dollars and _____ Cents				
D-751-5.4	1 EA	ADJUST STRUCTURE RIM/GRATE ELEVATION _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE E – ADDITIVE ALTERNATE 4
TAXILANE TO TAXIWAY D – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
T-901-5.1	4 KSF	SEEDING _____ Dollars and _____ Cents				
T-905-5.1	20 CY	TOPSOIL (OBTAINED ON SITE OR REMOVED FROM STOCKPILE) _____ Dollars and _____ Cents				
T-908-5.1	340 SY	MULCHING _____ Dollars and _____ Cents				
L-108-5.1	1,200 LF	No. 8 AWG, 5 KV, L-824, TYPE C CABLE INSTALLED IN TRENCH, DUCT BANK OR CONDUIT _____ Dollars and _____ Cents				
L-108-5.2	940 LF	#6 AWG, SOLID, BARE COPPER COUNTERPOISE WIRE, INSTALLED ABOVE THE DUCT BANK OR CONDUIT, INCLUDING CONNECTIONS/TERMINATIONS _____ Dollars and _____ Cents				
L-110-5.1	940 LF	CONCRETE ENCASED ELECTRICAL CONDUIT – 1 WAY - 2-INCH SCH 40 PVC _____ Dollars and _____ Cents				
L-110-5.4	430 LF	REMOVAL OF CONCRETE ENCASED OR NON-ENCASED ELECTRICAL CONDUIT/DUCT AND CABLE _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
SCHEDULE E – ADDITIVE ALTERNATE 4
TAXILANE TO TAXIWAY D – PROPOSAL FORM

ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-115-5.1	1 EA	ELECTRICAL MANHOLE (AIRCRAFT RATED) _____ Dollars and _____ Cents				
L-115-5.2	1 EA	REMOVAL OF ELECTRICAL MANHOLE/JUNCTION STRUCTURE _____ Dollars and _____ Cents				
L-125-5.1	17 EA	NEW L-861T ELEVATED TAXIWAY EDGE LIGHT _____ Dollars and _____ Cents				
L-125-5.2A	2 EA	NEW L-858(L) AIRFIELD GUIDANCE SIGN – 2 MODULE _____ Dollars and _____ Cents				
L-125-5.2B	1 EA	NEW L-858(L) AIRFIELD GUIDANCE SIGN – 3 MODULE _____ Dollars and _____ Cents				
L-125-5.3	1 EA	REMOVE, STORE AND REINSTALL EXISTING AIRFIELD GUIDANCE SIGN ON NEW FOUNDATION _____ Dollars and _____ Cents				
L-125-5.4	1 EA	REMOVE, STORE AND REINSTALL ELEVATED TAXIWAY EDGE LIGHT ON EXISTING BASE CAN _____ Dollars and _____ Cents				

Manchester-Boston Regional Airport GREEN DRIVE CARGO FACILTY APRON AND ACCESS ROAD CONSTRUCTION SCHEDULE E – ADDITIVE ALTERNATE 4 TAXILANE TO TAXIWAY D – PROPOSAL FORM						
ITEM NO.	ESTIMATED QUANTITY/ UNIT	DESCRIPTION AND UNIT PRICE (IN WORDS)	FIGURES			
			UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
L-125-5.6	5 EA	REMOVE ELEVATED TAXIWAY EDGE LIGHT AND BASE CAN _____ Dollars and _____ Cents				

SCHEDULE E – ADDITIVE ALTERNATE 4 SUBTOTAL (Pages BP-36 to BP-40)
 (Transfer the Amount to Page BP-41)

\$ _____

SCHEDULE A: BASE BID SUBTOTAL*(FROM PAGE BP-17)*

\$ _____

SCHEDULE B: BASE BID SUBTOTAL*(FROM PAGE BP-26)*

\$ _____

SCHEDULE C1:**ACCESS ROAD ALTERNATE 1 SUBTOTAL***(FROM PAGE BP-29)*

\$ _____

**BID SUMMARY – BASE BID WITH ACCESS ROAD ALTERNATE 1
(SCHEDULE A + SCHEDULE B + SCHEDULE C1)****TOTAL BID:** _____ **dollars**
(amount in words)(\$ _____).
(amount in figures)**SCHEDULE C2:****ACCESS ROAD ALTERNATE 2 SUBTOTAL***(FROM PAGE BP-34)*

\$ _____

**BID SUMMARY – BASE BID WITH ACCESS ROAD ALTERNATE 2
(SCHEDULE A + SCHEDULE B + SCHEDULE C2)****TOTAL BID:** _____ **dollars**
(amount in words)(\$ _____).
(amount in figures)**SCHEDULE D: ADDITIVE ALTERNATE 3 –****TERMINAL DOCK AREA PAVEMENT SUBTOTAL***(FROM PAGE BP-35)*

\$ _____

SCHEDULE E: ADDITIVE ALTERNATE 4 –**TAXILANE TO TW D SUBTOTAL***(FROM PAGE BP-40)*

\$ _____

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 either of the Access Road Alternates and 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)

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

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BID PROPOSAL CERTIFICATES OF COMPLIANCE FOR AIP PROJECTS
CERTIFICATION OF BIDDING REQUIREMENTS SIGNATURE PAGE

This signature page is included in this Contract Document to provide assistance to all Bidders in the form of a checklist and to stipulate that if any of the items mentioned below, but not limited to, are incomplete or otherwise incorrect, the Manchester-Boston Regional Airport may reject the bid.

I. REQUIRED FORMS AND SIGNATURE

- A. Certification of Bidding Requirements Signature Page
- B. Bid Proposal Forms and Summaries
- C. Certificate as to Corporate Principal – Bid Proposal (If applicable)
- D. Bid Bond
- E. Certification of Compliance with Federally Required Contract Requirements
- F. Affirmative Action Certification
- G. Buy American Certification
- H. Proposed Disadvantaged Business (DBE) Utilization Plan – Race-Neutral Projects
- I. Letter of Intent to Perform as a Qualified Disadvantaged Business
- J. Bidder's Project Subcontractor and Suppliers
- K. Non-Collusion Affidavit
- L. Certification Regarding Debarment, Suspension, and Other Responsibility Matters
- M. Certification of Prohibition of Segregated Facilities
- N. Disclosure of Lobbying Activities
- O. Trade Restriction Certification
- P. Certification of Offerer/Bidder Regarding Tax Delinquency and Felony Convictions

II. BID PROPOSAL FORMS

Unit Price Bids will be considered to be incomplete if any of the following conditions exist:

- A. All written words and figures shall be in INK or TYPED
- B. Unit price in words is omitted
- C. Unit price in figures is omitted
- D. A zero, N/A, or blank is used as a bid price

III. CERTIFICATION SUMMARY

I hereby certify that I have read all of the above requirements and understand that it affects the acceptability of my bid(s).

Contractor's Signature

Date

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.

**CERTIFICATION OF COMPLIANCE WITH
FEDERALLY REQUIRED CONTRACT REQUIREMENTS**

The bidder certifies, by submission of this proposal or acceptance of this, that he/she has read the federally mandated contract requirements as listed in within these Bid Documents. Federal Contract Conditions and that compliance with said references will be incorporated into the terms of the Contract Documents.

I hereby certify that I have read and will comply with all of the above requirements.

Signature of Authorized Contractor and/or Consultant Representative

Date

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:
- Only installing steel and manufactured products produced in the United States, or;
 - 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;
 - 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:

- To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
- To faithfully comply with providing US domestic product
- To furnish US domestic product for any waiver request that the FAA rejects
- 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:

- To 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.
- 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.
- To faithfully comply with providing US domestic products at or above the approved US domestic content percentage as approved by the FAA.
- 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% of the cost of all components and subcomponents of the "item". The required documentation for a type 3 waiver is:

- 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. The City of Manchester-Department of Aviation encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

The Contractor must comply with the Federal DBE, Equal Employment Opportunity (EEO), and Affirmative Action Requirements contained within the Contract Documents.

2022 Aviation projects sponsored by the City of Manchester – Department of Aviation, Manchester, New Hampshire **utilize race-neutral DBE procedures. There is no specific DBE goal for this project.** Bidders must comply with the requirements of 49 CFR Part 26, including Appendix A, which discusses making good-faith efforts, to ensure that all DBE's and Small Businesses are afforded the maximum opportunity to work with them on federally funded projects. The City of Manchester – Department of Aviation, Manchester, New Hampshire has an **overall DBE goal of 6.5% for FAA funded projects** in Federal Fiscal Year (FFY) 2022.

The Bidder/Offeror shall make good faith efforts, as defined in Appendix A, 49 CFR Part 26 (Attachment 1), to meet the FFY 2021 overall DBE goal for DBE participation in the performance of this contract.

The successful Bidder or Offeror must provide written confirmation of participation from each of the DBE firms the Bidder or Offeror lists in its commitment within five (5) days after bid opening.

The Bidder or Offeror must submit the following information 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.

**PROPOSED DISADVANTAGED BUSINESS ENTERPRISE (DBE) UTILIZATION
RACE-NEUTRAL PROJECTS**

The undersigned Bidder/Offeror has made a good faith effort to make subcontracting and supplier opportunities available to all firms including, but not limited to, DBE's as defined in 49 CFR 26. As a result of these efforts:

- The Bidder/Offeror is committed to a minimum of _____% **DBE** utilization on this Contract.

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.)

BIDDER'S PROJECT SUBCONTRACTORS & SUPPLIERS

The Bidder advises herein that the following Subcontractors are proposed for the item of work listed. Subcontractors are subject to review and approval per the requirements of the Contract Documents and the technical requirements specified. List firms that will supply labor at the site and major suppliers.

Failure to provide this information may result in the bid being considered non-responsive.

	DBE		
<u>SUBCONTRACTOR NAME</u>	<u>(Y/N)</u>	<u>TRADE</u>	<u>CONTRACT WORK ITEMS</u> <u>VALUE (\$)</u>
1. _____			
2. _____			
3. _____			
4. _____			
5. _____			
6. _____			
7. _____			
8. _____			
9. _____			
10. _____			
11. _____			
12. _____			
13. _____			
14. _____			
15. _____			

RESPECTFULLY SUBMITTED:

(Bidder)

By: _____ Title: _____ Date: _____

**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.

**Green Drive Cargo Facility Apron and Access Road
Manchester-Boston Regional Airport**

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 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.

**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.

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

Page BPC-15 of 18

**DISCLOSURE OF LOBBYING ACTIVITIES
CONTINUATION SHEET**

Reporting Entity:

— Page _ of —

Authorized for Local Reproduction Standard Form – LLL-A

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

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

CONTRACT DOCUMENTS
GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION

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CONTRACT AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 2022, (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:

GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD CONSTRUCTION
City Bid # FY22-805-48

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 **one hundred thirty (130) calendar days** from the effective date of the NOTICE TO PROCEED unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS, but in addition, **the substantial completion date for functional use shall be no later than September 30, 2022**. The only exception to the contact time limit or certain date for substantial completion is the final installation of only the Snow Melter Equipment due to an anticipated long-lead procurement time. The final completion date will be only extended by a modification to 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 and the noted date certain, 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 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 Indemnatee 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 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 Four (4) Originals on the date first above written.

**CITY OF MANCHESTER –
DEPARTMENT OF AVIATION**

Witnessed:

By: _____

Notary Public

Name: _____

My Commission Expires: _____

(type or print)

(SEAL)

Title: _____

CONTRACTOR

Witnessed:

By: _____

Notary Public

Name: _____

My Commission Expires: _____

(type or print)

(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 four (4) 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: _____

SIGNED: _____

DATE: _____

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CONTRACT BONDS

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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 _____

_____, 2022, entered into a Contract Agreement with the Owner for:

Green Drive Cargo Facility Apron and Access Road Construction
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 _____, 2022.

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.

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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 _____, 2022
entered into a Contract Agreement with the Owner for:

Green Drive Cargo Facility Apron and Access Road Construction
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 _____, 2022 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

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 _____, 2022, 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

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FAA GENERAL CONTRACT PROVISIONS

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FAA GENERAL CONTRACT PROVISIONS
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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:

Paragraph Number	Term	Definition
10-01	AASHTO	The American Association of State Highway and Transportation Officials.
10-02	Access Road	The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.
10-03	Advertisement	A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.
10-04	Airport	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.
10-05	Airport Improvement Program (AIP)	A grant-in-aid program, administered by the Federal Aviation Administration (FAA).
10-06	Air Operations Area (AOA)	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.
10-07	Apron	Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.
10-08	ASTM International (ASTM)	Formerly known as the American Society for Testing and Materials (ASTM).
10-09	Award	The Owner's notice to the successful bidder of the acceptance of the submitted bid.
10-10	Bidder	Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.
10-11	Building Area	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.
10-12	Calendar Day	Every day shown on the calendar.
10-13	Certificate of Analysis (COA)	The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.

Paragraph Number	Term	Definition
10-14	Certificate of Compliance (COC)	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.
10-15	Change Order	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.
10-16	Contract	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.
10-17	Contract Item (Pay Item)	A specific unit of work for which a price is provided in the contract.
10-18	Contract Time	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.
10-19	Contractor	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.
10-20	Contractors Quality Control (QC) Facilities	The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).
10-21	Contractor Quality Control Program (CQCP)	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.
10-22	Control Strip	A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.

Paragraph Number	Term	Definition
10-23	Construction Safety and Phasing Plan (CSPP)	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.
10-24	Drainage System	The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.
10-25	Engineer	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.
10-26	Equipment	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.
10-27	Extra Work	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.
10-28	FAA	The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.
10-29	Federal Specifications	The federal specifications and standards, commercial item descriptions, and supplements, amendments, and indices prepared and issued by the General Services Administration.
10-30	Force Account	<p>a. Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis.</p> <p>b. Owner Force Account - Work performed for the project by the Owner's employees.</p>
10-31	Intention of Terms	<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>

Paragraph Number	Term	Definition
		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.
10-32	Lighting	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.
10-33	Major and Minor Contract Items	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.
10-34	Materials	Any substance specified for use in the construction of the contract work.
10-35	Modification of Standards (MOS)	Any deviation from standard specifications applicable to material and construction methods in accordance with FAA Order 5300.1.
10-36	Notice to Proceed (NTP)	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.
10-37	Owner	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: City of Manchester, NH – Department of Aviation d/b/a Manchester-Boston Regional Airport
10-38	Passenger Facility Charge (PFC)	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.
10-39	Pavement Structure	The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.
10-40	Payment bond	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.
10-41	Performance bond	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.
10-42	Plans	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.'

Paragraph Number	Term	Definition
10-43	Project	The agreed scope of work for accomplishing specific airport development with respect to a particular airport.
10-44	Proposal	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.
10-45	Proposal guaranty	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.
10-46	Quality Assurance (QA)	Owner's responsibility to assure that construction work completed complies with specifications for payment.
10-47	Quality Control (QC)	Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.
10-48	Quality Assurance (QA) Inspector	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.
10-49	Quality Assurance (QA) Laboratory	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.
10-50	Resident Project Representative (RPR)	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.
10-51	Runway	The area on the airport prepared for the landing and takeoff of aircraft.
10-52	Runway Safety Area (RSA)	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.
10-53	Safety Plan Compliance Document (SPCD)	Details how the Contractor will comply with the CSPP.
10-54	Specifications	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.
10-55	Sponsor	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.

Paragraph Number	Term	Definition
10-56	Structures	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.
10-57	Subgrade	The soil that forms the pavement foundation.
10-58	Superintendent	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.
10-59	Supplemental Agreement	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.
10-60	Surety	The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.
10-61	Taxilane	A taxiway designed for low speed movement of aircraft between aircraft parking areas and terminal areas.
10-62	Taxiway	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.
10-63	Taxiway/Taxilane Safety Area (TSA)	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.
10-64	Work	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.
10-65	Working day	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.

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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

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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

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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

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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.

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 PROJECT AND CSPP PLANS FOR THE SCHEDULE OF WORK FOR ALL PROJECT PHASING AND ALLOWED TIME.

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
Excavation and Embankment Volume	In computing volumes of excavation, the average end area method will be used unless otherwise specified.
Measurement and Proportion by Weight	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.
Measurement by Volume	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.
Asphalt Material	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

Term	Description
	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.
Cement	Cement will be measured by the ton (kg) or hundredweight (km).
Structure	Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
Timber	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.
Plates and Sheets	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.
Miscellaneous Items	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.
Scales	<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.
Rental Equipment	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> .
Pay Quantities	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

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**FAA
Airports**

Contract Provision Guidelines for Obligated Sponsors and Airport Improvement Program Projects

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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 ([Rockingham County](#)): **4.0%**

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](#).

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 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 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 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. These requirements apply to all bidders/offerors, including those who qualify as a DBE. The City of Manchester-Department of Aviation encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

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.

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.

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DAVIS-BACON WAGE SCHEDULE

**STATE OF NEW HAMPSHIRE
ROCKINGHAM COUNTY – HIGHWAY
NH20220013 02/25/2021**

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General Decision Number: NH20220013 02/25/2022
Superseded General Decision Number: NH20210013

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: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022, Executive Order 14026 generally applies to the contract. The Contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022, Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022

* 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.
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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$15.00) or 13658 (\$11.25). Please see the Note at the top of the wage determination for more information.

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 <https://www.dol.gov/agencies/whd/government-contracts>.

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.

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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
Aggregate Limits are per 12-month policy period unless otherwise indicated.	

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 Contractor's 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, and all subcontractors supervisory personnel being on-site for at least 2 continuous weeks, 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
(DRAFT PRIOR TO FAA DETERMINATION)**

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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.

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CONSTRUCTION SAFETY AND PHASING PLAN

CONSTRUCT NEW GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD

AT



**MANCHESTER-BOSTON REGIONAL AIRPORT
MANCHESTER, NEW HAMPSHIRE**

AIRPORT IMPROVEMENT PROGRAM NO. 3-33-0011-XXX-2022

Prepared by



53 Regional Drive
Concord, NH 03301

MARCH 2022 –DRAFT FOR BIDDING

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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, NH 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 the construction of a new Portland cement concrete and bituminous concrete pavement apron to support three (3) Boeing 767-300ER aircraft (or equivalent), a new taxilane connection from the apron to Taxiway A, and a new access road from Ammon Drive to the new cargo facility. This project will also include the relocation of the Automated Surface Observation System (ASOS), installation of a snow melter system, installation of a underground stormwater infiltration system, installation of taxiway edge lights, airfield pavement markings, reconfiguration of Green Drive with the construction of a new cul-de-sac, an Add Alternate option to mill and overlay the terminal loading dock pavement, and an Add Alternate option to construct a new taxilane connection from the apron to Taxiway D.

The scope of work items will include, but not be limited to, pavement removal, pavement milling, unclassified excavation, installation of base course and subbase course, drainage improvements, taxiway edge lighting removal and installation, airfield guidance signage installation, paving base and surface bituminous asphalt, concrete apron construction, and turf restoration for disturbed areas.

The phasing of the project proposes the partial closure of Taxiways A, A3 & D as described in Section 2 – *Phasing*. The project shall not include any runway closures.

1. COORDINATION

Date	Attendees	Description
November 2021	Design Engineer & MHT Staff	Design Scoping Meeting
December 2021	Design Engineer & NHDES	AoT Pre-Application Meeting
December 2021	Design Engineer & Eversource	Utility Coordination
January 2022	Design Engineer & MHT Staff	60% Design Meeting
February 2022	Design Engineer, MHT Staff, & FAA	ASOS Coordination
March 2022	Design Engineer, MHT Staff, & FAA	100% Design Meeting

Preconstruction Conference:

- Construction Safety and Phasing Plan (CSPP) & Safety Plan Compliance Document (SPCD) to be reviewed and discussed.
- Key Attendees:
 - Airport Management representative
 - MHT Operations & Maintenance representative(s)
 - Design Engineer representative(s)
 - 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 - Access Road Construction

Includes Work Areas 1, 1A, 2, 3A & 3B, none of which occur within the Air Operations Area (AOA).

Work Area 1 Limits: Work Area 1 includes constructing the access road section that runs along the cargo facility lease line and the reconfiguration of the Quick Turnaround (QTA) facility operation area.

Duration: One Hundred Thirty (130) Consecutive Calendar Days from the Notice to Proceed date

Closure: N/A for Airside

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:

- Erosion control BMP installation

- Reclaim existing pavement
- Mill existing pavement
- Pavement removal
- Drainage improvements
- Underground chamber storage system installation
- Pave binder course
- Curb installation
- Pave surface course
- Fence installation
- Topsoil, seed, and mulch

Work Area 1A Limits: Work Area 1A includes milling and overlaying pavement in the terminal loading dock area which will ONLY occur if Add Alternate 3 is awarded.

Duration: Two (2) Consecutive Calendar Days anytime within Work Area 1 duration

Closure: N/A for Airside

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:

- Erosion control BMP installation
- Mill existing pavement
- Paving operations

Work Area 2 Limits: Work Area 2 includes constructing the Alternate 1 access road option that connects the Work Area 1 section to Green Drive. This work area will occur ONLY if Alternate 1 is awarded and will not occur if Alternate 2 is awarded.

Duration: Fourteen (14) Consecutive Calendar Days within Work Area 1 duration

Closure: N/A for Airside

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:

- Erosion control BMP installation
- Reclaim existing pavement
- Pavement removal
- Drainage improvements
- Paving operations
- Fence installation
- Topsoil, seed, and mulch

Work Area 3A Limits: Work Area 3A includes the Alternate 2 access road limits that connects the Work Area 1 section to Ammon Drive through existing Lot C. This work area will occur ONLY if Alternate 2 is awarded and will not occur if Alternate 1 is awarded.

Duration: Sixty (60) Consecutive Calendar Days within Work Area 1 duration

Closure: N/A for Airside

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:

- Erosion control BMP installation
- Relocate Lot C access control gates
- Reclaim existing pavement
- Pavement removal
- Unclassified excavation
- Drainage improvements
- Paving operations
- Fence installation
- Topsoil, seed, and mulch

Work Area 3B Limits: Work Area 3B includes the reconfiguration of existing Green Drive with the construction of a new cul-de-sac. This work area will occur ONLY if Alternate 2 is awarded and will not occur if Alternate 1 is awarded.

Duration: Seven (7) Consecutive Calendar Days within Work Area 1 duration upon completion of Work area 3A

Closure: N/A for Airside

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:

- Erosion control BMP installation
- Reclaim existing pavement
- Drainage improvements
- Paving operations

PHASE 2 - Apron Construction

Includes Work Areas 4, 4A, 4B, 5A, 5B, 6, 7, 8, 8A & 8B. Work Areas 6, 7, 8, 8A & 8B occur within the Air Operations Area (AOA), the other areas in Phase 2 do not.

Work Area 4 Limits: Work Area 4 includes all work needed to install the new snow melter system, precast building, concrete snow melter pad, and utilities as well as the relocation of the security fence and vehicle service road (VSR).

Duration: One Hundred Thirty (130) Consecutive Calendar Days from the Notice to Proceed date

Closure: N/A

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:

- Erosion control BMP installation
- Install temporary fence on concrete barriers
- Temporary Vehicle Service Road installation and removal
- Pavement removal
- Unclassified excavation
- Concrete pad installation
- Utility installation and backfill
- Snow melter building installation
- Snow melter installation

Work Area 4A Limits: Work Area 4A includes the site preparation associated with the relocation of the ASOS.

Duration: Fourteen (14) Consecutive Calendar Days within Work Area 4 duration and occurring simultaneously with Work Area 4B.

Closure: N/A

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:

- Erosion control BMP installation
- Unclassified excavation
- Install underground power and utilities
- Construct concrete pads
- Install new rail support infrastructure
- Construct new driveway access
- Connect relocated ASOS
- Topsoil, seed, and mulch

Work Area 4B Limits: Work Area 4B includes the disconnection and relocation of the existing ASOS at the existing ASOS site.

Duration: Fourteen (14) Consecutive Calendar Days within Work Area 4 duration and occurring simultaneously with Work Area 4A.

Closure: N/A

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:

- Erosion control BMP installation
- Disconnect existing ASOS
- Remove abandoned equipment

Work Area 5A Limits: Work Area 5A includes the concrete portion of the new cargo facility apron.

Duration: Sixty (60) Consecutive Calendar Days within Work Area 4 duration

Closure: N/A

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:

- Erosion control BMP installation
- Pavement removal
- Unclassified excavation
- Drainage improvements
- Subbase and base course installation
- Concrete apron construction

Work Area 5B Limits: Work Area 5B includes the construction of the new asphalt apron section that occurs landside.

Duration: Thirty (30) Consecutive Calendar Days within Work Area 4 duration and the time will be able to overlap with the Work Area 5A limits. However, Work Area 5B shall be completed prior to the completion of Day 75, in order to allow for the completion of Work Area 6 no later than Day 90.

Closure: N/A

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:

- Erosion control BMP installation
- Pavement removal
- Unclassified excavation
- Drainage improvements
- Subbase and base course installation
- Paving operations

Work Area 6 Limits: Work Area 6 includes all work needed to install the new airport security fence and construct the new asphalt apron section that occurs airside.

Duration: Fifteen (15) Consecutive Calendar Days within Work Area 4 duration and upon completion of Work Area 5B, but this work area shall be completed no later than Day 90.

Closure: N/A

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:

- Erosion control BMP installation
- Security fence installation
- Install temporary gate for site access
- Coordinate fence relocation with MHT operations and the RPR
- Update MHT ACM and ASP for approval by the FAA and TSA
- Install temporary security fence

- Pavement removal
- Unclassified excavation
- Drainage improvements
- Subbase and base course installation
- Paving operations
- Topsoil, seed, mulch

Work Area 7 Limits: Work Area 7 includes the taxiway stub which connects the new apron to existing Taxiway A.

Duration: Twenty-five (25) Consecutive Calendar Days within Work Area 4 duration and upon completion of Work Area 6.

Closure: Taxiway A (between TW B & TW D)
Taxiway A3

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:

- Erosion control BMP installation
- Pavement removal
- Unclassified excavation
- Drainage improvements
- Taxiway edge light
- Taxiway centerline light installation
- Guidance sign installation
- Subbase and base course installation
- Paving operations
- Topsoil, seed, mulch

Work Area 8 Limits: Work Area 8 includes all work outside the Taxiway Object Free Area (TOFA) limits needed to construct the taxiway stub which connects the new apron to existing Taxiway D.

Duration: Fifteen (15) Consecutive Calendar Days within Work Area 4 duration and upon completion of Work Area 7.

Closure: N/A

Work Hours: 6 AM – 6 PM, Monday to Friday, unless otherwise approved by Owner & Resident Project Representative (RPR) for extended hours and weekend work which may be required.

Primary work to be performed in this work area:

- Erosion control BMP installation
- Unclassified excavation
- Drainage improvements
- Taxiway edge light and guidance sign installation
- Subbase and base course installation
- Paving operations
- Topsoil, seed, mulch

Work Area 8A Limits: Work Area 8A includes all work within the Taxiway D TOFA limits needed to construct the taxilane stub which connects the new apron to existing Taxiway D.

Duration: Five (5) Consecutive Calendar Days within Work Area 8 duration

Closure: Taxiway D (west of TW A)

Work Hours: 6 AM – 6 PM, Monday to Friday, unless lengthened day hours are otherwise approved by Owner & Resident Project Representative (RPR) for extended hours which may be required.

Primary work to be performed in this work area:

- Erosion control BMP installation
- Pavement removal
- Unclassified excavation
- Drainage improvements
- Taxiway edge light and guidance sign installation
- Subbase and base course installation
- Paving operations
- Topsoil, seed, mulch

Work Area 8B Limits: Work Area 8B includes all work within the Taxiway A TOFA limits needed to construct the taxilane stub which connects the new apron to existing Taxiway D.

Duration: Three (3) Consecutive Calendar Days within Work Area 8 duration

Closure: Taxiway A (between TW A3 & TW E)
Taxiway D

Work Hours: 6 AM – 6 PM, Monday to Friday, unless otherwise approved by Owner & Resident Project Representative (RPR) for extended hours which may be required.

Primary work to be performed in this work area:

- Erosion control BMP installation
- Pavement removal
- Unclassified excavation
- Drainage improvements
- Taxiway edge light installation
- Subbase and base course installation
- Paving operations
- Topsoil, seed, mulch

Sequence of Work

Phase 1 and Phase 2 are intended to occur simultaneously.

Estimated Start Date: Spring 2022

Estimated Completion Date: Summer / Fall 2022 (No later than September 30 for Apron and Access Road work, Snow Melter Facility completion date may occur later)

The Construction Schedule will allot the following amount of time for each work area:

Phase 1

- Work Area 1: 130 Consecutive Calendar Days from the Notice to Proceed (NTP)
- Work Area 1A: 2 Consecutive Calendar Days in Work Area 1 Duration
- Work Area 2: 14 Consecutive Calendar Days in Work Area 1 Duration
- Work Area 3A: 60 Consecutive Calendar Days in Work Area 1 Duration
- Work Area 3B: 7 Consecutive Calendar Days upon completion of Work Area 3A in Work Area 1

Phase 2

- Work Area 4: 130 Consecutive Calendar Days from the NTP
- Work Area 4A: 14 Consecutive Calendar Day in Work Area 4 Duration
- Work Area 4B: 14 Consecutive Calendar Days in Work Area 4 Duration
- Work Area 5A: 60 Consecutive Calendar Days in Work Area 4 Duration
- Work Area 5B: 30 Consecutive Calendar Days Work Area 4 Duration and no later than Day 75
- Work Area 6: 15 Consecutive Calendar Days upon completion of Work Areas 5A & 5B in Work Area 4 Duration and no later than Day 90
- Work Area 7: 25 Consecutive Calendar Days upon completion of Work Area 6 in Work Area 4
- Work Area 8: 15 Consecutive Calendar Days upon completion of Work Area 7 in Work Area 4
- Work Area 8A: 5 Consecutive Calendar Days in Work Area 8 Duration
- Work Area 8B: 3 Consecutive Calendar Days in Work Area 8 Duration

See Construction Sequence Chart on the Construction Safety and Phasing Plans in Appendix B.

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. Phase 2 Work Areas 6, 7, 8, 8A & 8B will be performed “Airside” within the Airport Operations Area (AOA). No part of Phase 1 or the other Phase 2 work areas will occur within the AOA. All work locations within the AOA Movement Area will require coordination and advanced notification in accordance with Section 1 - *Coordination*. There are no runway closures associated with this project. Taxiway closures will occur in Works Areas 7, 8, 8A & 8B as described in this section.

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*. As noted above, Phase 1 and Phase 2 are intended to occur simultaneously.

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.

Phase 1

- Work Area 1: N/A – all work occurs outside the AOA
- Work Area 1B: N/A – all work occurs outside the AOA
- Work Area 2: N/A – all work occurs outside the AOA
- Work Area 3A: N/A – all work occurs outside the AOA
- Work Area 3B: N/A – all work occurs outside the AOA

Phase 2

- Work Area 4: N/A – all work occurs outside the AOA
- Work Area 4A: N/A – all work occurs outside the AOA
- Work Area 4B: N/A – all work occurs outside the AOA
- Work Area 5A: N/A – all work occurs outside the AOA

- Work Area 5B: N/A – all work occurs outside the AOA

PROJECT	Construct New Green Drive Cargo Facility Apron and Access Road	
WORK AREA	Work Area 6: Relocate Security Fence and Airside Apron Construction	
SCOPE OF WORK	<u>Work Associated with the work area:</u> 1. Install new permanent and temporary security fence sections. 2. Construct the Airside portion of the new asphalt apron. Fifteen (15) consecutive calendar days	
OPERATIONAL REQUIREMENTS	Normal (Existing)	Work Area 6 (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	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
RW 17 Approach Procedures	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
RW 17 NAVAIDs	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
RW 35 Declared Distances	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
RW 35 Approach Procedures	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
RW 35 NAVAIDs	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIIE
RW 6-24 ARC	D-IV	D-IV
RW 6 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
RW 6 Approach Procedures	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
RW 6 NAVAIDs	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
RW 24 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
RW 24 Approach Procedures	RNAV(GPS)	RNAV(GPS)
RW 24 NAVAIDs	REIL, PAPI(P4L)	REIL, PAPI(P4L)
Taxiway A ADG	IV	IV
Taxiway A3 ADG	IV	IV
Taxiway D ADG	IV	IV
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 OPEN No Restrictions

PROJECT	Construct New Green Drive Cargo Facility Apron and Access Road	
WORK AREA	Work Area 7: Construct taxiway stub connecting apron to TW A	
SCOPE OF WORK	<u>Work Associated with the work area:</u> 1. Construct new pavement section for new taxiway. 2. Install edge and centerline lights and airfield guidance signs. Twenty-five (25) consecutive calendar days	
OPERATIONAL REQUIREMENTS	Normal (Existing)	Work Area 7 (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	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
RW 17 Approach Procedures	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
RW 17 NAVAIDS	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
RW 35 Declared Distances	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
RW 35 Approach Procedures	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
RW 35 NAVAIDS	ALSf2 / TDZL / PAPI(4PL) / ILS/DME – Class III E	ALSf2 / TDZL / PAPI(4PL) / ILS/DME – Class III E
RW 6-24 ARC	D-IV	D-IV
RW 6 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
RW 6 Approach Procedures	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
RW 6 NAVAIDS	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
RW 24 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
RW 24 Approach Procedures	RNAV(GPS)	RNAV(GPS)
RW 24 NAVAIDS	REIL, PAPI(P4L)	REIL, PAPI(P4L)
Taxiway A ADG	IV	CLOSED (Between TW B & TW D)
Taxiway A3 ADG	IV	CLOSED
Taxiway D ADG	IV	IV
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 OPEN No Restrictions

PROJECT	Construct New Green Drive Cargo Facility Apron and Access Road	
WORK AREA	Work Area 8: Construct taxiway stub connecting apron to TW D	
SCOPE OF WORK	<p><u>Work Associated with the work area:</u></p> <p>1. Construct new pavement section for the portion of the new taxiway that occurs outside the Taxiway D Object Free Area (TOFA).</p> <p>2. Install edge lights and airfield guidance signs.</p> <p>Fifteen (15) consecutive calendar days</p>	
OPERATIONAL REQUIREMENTS	Normal (Existing)	Work Area 8 (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	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
RW 17 Approach Procedures	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
RW 17 NAVAIDs	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
RW 35 Declared Distances	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
RW 35 Approach Procedures	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
RW 35 NAVAIDs	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE
RW 6-24 ARC	D-IV	D-IV
RW 6 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
RW 6 Approach Procedures	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
RW 6 NAVAIDs	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
RW 24 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
RW 24 Approach Procedures	RNAV(GPS)	RNAV(GPS)
RW 24 NAVAIDs	REIL, PAPI(P4L)	REIL, PAPI(P4L)
Taxiway A ADG	IV	IV
Taxiway A3 ADG	IV	IV
Taxiway D ADG	IV	IV
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 OPEN No Restrictions (Refer to Work Areas 8A & 8B)

PROJECT	Construct New Green Drive Cargo Facility Apron and Access Road	
WORK AREA	Work Area 8A: Construct taxiway stub connecting apron to TW D	
SCOPE OF WORK	<p><u>Work Associated with the work area:</u></p> <p>1. Construct new pavement section for the portion of the new taxiway that occurs within the Taxiway D Object Free Area (TOFA).</p> <p>2. Install edge lights and airfield guidance signs.</p> <p>Five (5) consecutive calendar days in Work Area 8 duration</p>	
OPERATIONAL REQUIREMENTS	Normal (Existing)	Work Area 8A (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	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
RW 17 Approach Procedures	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
RW 17 NAVAIDs	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
RW 35 Declared Distances	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
RW 35 Approach Procedures	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
RW 35 NAVAIDs	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class IIIE
RW 6-24 ARC	D-IV	D-IV
RW 6 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
RW 6 Approach Procedures	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
RW 6 NAVAIDs	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
RW 24 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
RW 24 Approach Procedures	RNAV(GPS)	RNAV(GPS)
RW 24 NAVAIDs	REIL, PAPI(P4L)	REIL, PAPI(P4L)
Taxiway A ADG	IV	IV
Taxiway A3 ADG	IV	IV
Taxiway D ADG	IV	CLOSED (TW A to TW G)
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 OPEN No Restrictions

PROJECT	Construct New Green Drive Cargo Facility Apron and Access Road	
WORK AREA	Work Area 8B: Construct taxiway stub connecting apron to TW D	
SCOPE OF WORK	<p><u>Work Associated with the work area:</u></p> <p>1. Construct new pavement section for the portion of the new taxiway that occurs within the Taxiway A Object Free Area (TOFA).</p> <p>2. Install edge lights.</p> <p>Three (3) consecutive calendar days in Work Area 8 duration</p>	
OPERATIONAL REQUIREMENTS	Normal (Existing)	Work Area 8B (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	TORA: 9,250 & TODA: 9,250 ASDA: 9,250 & LDA: 8,914
RW 17 Approach Procedures	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)	ILS or LOC/DME, RNAV(GPS), RNAV(RNP)
RW 17 NAVAIDs	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE	MALSR / TDZL / PAPI(4PR) / ILS/DME – Class IE
RW 35 Declared Distances	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650	TORA: 9,250 & TODA: 9,250 ASDA: 8,500 & LDA: 7,650
RW 35 Approach Procedures	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
RW 35 NAVAIDs	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class III E	ALSF2 / TDZL / PAPI(4PL) / ILS/DME – Class III E
RW 6-24 ARC	D-IV	D-IV
RW 6 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208	TORA: 7,650 & TODA: 7,650 ASDA: 7,650 & LDA: 7,208
RW 6 Approach Procedures	ILS or LOC, RNAV(GPS)	ILS or LOC, RNAV(GPS)
RW 6 NAVAIDs	REIL, PAPI(P4L), ILS – Class IT	REIL, PAPI(P4L), ILS – Class IT
RW 24 Declared Distances	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850	TORA: 7,650 & TODA: 7,650 ASDA: 6,850 & LDA: 6,850
RW 24 Approach Procedures	RNAV(GPS)	RNAV(GPS)
RW 24 NAVAIDs	REIL, PAPI(P4L)	REIL, PAPI(P4L)
Taxiway A ADG	IV	CLOSED (Between TW A3 & TW E)
Taxiway A3 ADG	IV	IV
Taxiway D ADG	IV	CLOSED (RW 17-35 to TW G)
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 OPEN No Restrictions

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 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.
- 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:** N/A

Anticipated potential SEC notifications required are as outlined below:

1. **Runway 17-35 Impacts:** N/A
2. **Runway 6-24 Impacts:** N/A

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 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 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:

- a. Major work items to be accomplished.
- b. Subcontractors to be on site.
- c. Number of personnel to be on site.
- d. Type and quantity of equipment to be on site.
- e. Areas of the site where construction is scheduled.
- f. Any anticipated closing of facilities that will be required.
- g. Any anticipated power outages and/or system to be inoperable including anticipated length of downtime in hours.
- h. Other information requested by MHT Operations and Maintenance, Airport Management or the RPR.

The primary contact for construction activities will be 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 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: N/A

Temporary Taxiway Closures:

- a. A portion of Taxiway A (between Taxiway B and Taxiway D) and Taxiway A3 will be closed temporarily during Work Area 7 on a phase duration as outlined in the Airside phasing plans in Appendix B.
- b. A portion of Taxiway D (West of Taxiway A) will be closed temporarily during Work area 8A on a phase duration as outlined in the Airside phasing plans in Appendix B.
- c. A portion of Taxiway A (between Taxiway A3 and Taxiway E) and Taxiway D will be closed temporarily during Work Area 8B on a phase duration as outlined in the Airside phasing plans in Appendix B.
- d. 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 or Contractor may cover the lights within work areas.
- 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: N/A

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 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 Airport or RPR 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 6:00 AM to 6:00 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.

CSPP Appendix A
KEY PERSONNEL CONTACT LIST

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CSPP Appendix A – UPDATED Key Personnel Contact List – As of 03/06/22

KEY PERSONNEL & CONTACT LIST		
Communications Office (24-hour line)	Emergency:	(603) 628-6222
	Non-Emergency:	(603) 624-6439
Luis Elguezabal	Airport Operations & Facilities, Asst. Dir.	Manchester Boston Regional Airport
Office:	(603) 624-6539, Ext 306	1 Airport Road, Suite 300
Cell:	(603) 815-1106	Manchester, NH 03103
E-Mail:	lelguezabal@flymanchester.com	
Andre Garcia	Manager, Airport Operations & Maintenance	Manchester Boston Regional Airport
Office:	(603) 624-6592	Operations and Maintenance
Cell:	(603) 506-9605	402 Kelly Avenue
E-Mail:	agarcia@flymanchester.com	Manchester, NH 03103
Andrew Fournier	Airport Operations, Superintendent	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
Dennis Duhaime	Airport Maintenance, Superintendent	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
Mark Blad	MHT ATC Air Traffic Manager	8 Ammon Drive
ATCT Gen. Phone:	(603) 621-1700	Manchester, NH 03103
Office:	(603) 621-1701	
Cell:	(603) 779-4301	
Email:	Mark.Blad@faa.gov	
	MHT FAA Technical Operations	FAA Granite State SSC
Office:	<u>CALL Kevin Belanger</u>	25 Robert Milligan Pkwy
Cell:		Merrimack, NH 03054
Craig Pankey	BCT MHT SSC A Manager, Acting	FAA Granite State SSC
Office:	(603) 594-5405	25 Robert Milligan Pkwy
Cell:		Merrimack, NH 03054
Kevin Belanger	Manchester SSC B Manager	FAA Granite State SSC
Office:	(603) 594-5404	25 Robert Milligan Pkwy
Cell:	(603) 493-8242	Merrimack, NH 03054
Email:	kevin.belanger@faa.gov	
John Kirkendall	FAA Airports Div., Project Manager	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	
Radio: Manchester Ground (ATCT):	121.9 MHz	
UNICOM Frequency:	122.95 MHz	
Airport Communications Center	Emergencies: (603) 628-6222	
	Non-Emergencies: (603) 628-6019	
Police (Manchester Airport):	Non Emergency: (603) 628-6349	
	<u>Emergencies: CALL 911 or Comm Center (603) 628-6222</u>	
Fire (Manchester Airport):	Non Emergency: (603) 624-1614	
	<u>Emergencies: CALL 911 or Comm Center (603) 628-6222</u>	

KEY PERSONNEL & CONTACT LIST – CONT.		
David Brouillet Office: Cell: Fax: E-Mail:	ENGINEER Deputy Project Manager (603) 225-2978 (in Concord) (603) 731-7237 (603) 225-0095 (in Concord) dbrouillet@mjinc.com	McFarland Johnson 53 Regional Drive Concord, NH 03301
Brian Bennett Office: Cell: Fax: E-Mail:	ENGINEER Project Manager (603) 225-2978 (in Concord) (603) 340-0437 (603) 225-0095 (in Concord) bbennett@mjinc.com	McFarland Johnson 53 Regional Drive Concord, NH 03301
Robert Law Office: Cell: Fax: E-Mail:	ENGINEER Resident Project Representative (603) 225-2978 (in Concord) (603) (603) 225-0095 (in Concord) rlaw@mjinc.com	McFarland Johnson 53 Regional Drive Concord, NH 03301
TBD Office: Cell: E-Mail:	CONTRACTOR Site Superintendent	
TBD Office: Cell: Fax: E-Mail:	CONTRACTOR Project Manager	
TBD Office: Cell: Fax: E-Mail:	CONTRACTOR Director of Safety	
TBD Office: Cell: Fax: E-Mail:	CONTRACTOR Principal-In-Charge	

CSPP Appendix B
PHASING PLANS

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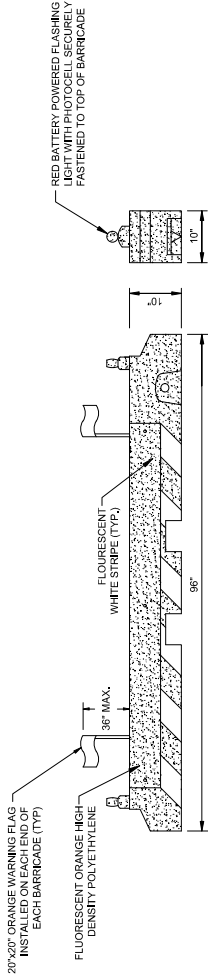
CONSTRUCTION SAFETY AND PHASING NOTES:

1. CONTRACTOR SHALL SUBMIT A WRITTEN SAFETY PLAN COMPLIANCE DOCUMENT (SPCD) TO THE RESIDENT PROJECT REPRESENTATIVE (RPR), 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 NOTICE TO PROCEED DUE TO THE FAILURE BY THE CONTRACTOR TO OBTAIN AN APPROVED SPCD SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE SPCD SHALL BE REVIEWED AND APPROVED BY THE RPR AND THE REQUIREMENTS AND PROCEDURES OF THE FAA ADVISORY CIRCULAR NO. 1505374-30 (CURRENT EDITION) "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION" AND THE APPROVED "CONSTRUCTION SAFETY AND PHASING PLAN" (GSPPP), AND INCORPORATE RELEVANT ITEMS INTO THE SPCD WHICH MUST MEET OR EXCEED THE PROJECT'S CRITERIA. THE SPCD SHALL BE MODIFIED AND UPDATED AS REQUIRED THROUGHOUT THE PROJECT'S CONSTRUCTION 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.
 - 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, NAVIAD, CRITICAL AREAS, AND APPROACH SURFACES, (I.E. GRADING, HULLING MATERIALS, ETC.).
 - METHODS AND REQUIREMENTS FOR SEPARATING CONSTRUCTION AREAS FROM AIRPORT OPERATIONS AREAS (AOA).
 - PREVENTING INTERFERENCE WITH FAA NAVIAD (ILS OR OTHER) CRITICAL AREAS.
 - CONTROL OF FOREIGN OBJECT DEBRIS (FOD) AND DUST.
 - CONSTRUCTION OPERATIONS ADJACENT TO OR WITHIN SAFETY AREAS, OBJECT FREE.
 - CONSTRUCTION VEHICLE REQUIREMENTS, PROCEDURES AND DRIVER TRAINING FOR ESCORT DRIVERS.
 - OPERATIONS WITHIN MOVEMENT AND NON-MOVEMENT AREAS TO PREVENT RUNWAY INCURSIONS.
 - CONTRACTOR ACCESS POINTS, VEHICLE CROSSING LOCATIONS, SECURITY FENCING AND GATES, AND
 - EMPLOYEE SECURITY TRAINING.
 - PROCEDURES, REQUIREMENTS, AND COORDINATION OF RUNWAY AND/OR AIRPORT CLOSURES, INCLUDING NOTICE TO AIRMEN (NOTAM) COORDINATION.
 - RSA DELINEATION MARKER PLACEMENT LOCATIONS, AND TEMPORARY CONSTRUCTION SIGN LOCATIONS.
 - PROCEDURES FOR MANAGING HAZARDOUS MATERIALS.

2. THE CONSTRUCTION SAFETY AND PHASING PLANS HAVE BEEN REVIEWED AND ACCEPTED BY THE FAA AND MHT OPERATIONS, COMBINING, MODIFYING, OR ALTERING WORK AREAS WILL NOT BE ALLOWED WITHOUT APPROVAL FROM THE FAA AND MHT OPERATIONS. THE CONTRACTOR SHALL PREPARE THEIR BID BASED ON THE CONSTRUCTION SAFETY AND PHASING PLANS. ANY CHANGES TO THE CONSTRUCTION SAFETY AND PHASING PLANS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. ANY PROPOSED CHANGES FROM THE CONTRACTOR SHALL BE SUBMITTED THROUGH THE RPR WHO SHALL SUBMIT IT TO THE AIRPORT AND FAA. HOWEVER, CHANGES MAY NOT BE ACCEPTED.
3. 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. THIS INDIVIDUAL WILL BE RESPONSIBLE FOR MONITORING CONSTRUCTION ACTIVITIES AND PERSONNEL FOR COMPLIANCE WITH THE REQUIREMENTS OF THE AIRPORT, FAA, AND OTHER APPLICABLE AGENCIES. THE SPCD, THE REGULATIONS AND REQUIREMENTS OF THE AIRPORT, FAA, AND OTHER APPLICABLE AGENCIES.
4. CONTRACTOR SHALL PROVIDE A POINT OF CONTACT TO THE OWNER AND RPR WHO CAN BE CONTACTED AT ANY TIME THROUGHOUT THE COURSE OF THE CONTRACT. THIS INDIVIDUAL WILL BE CAPABLE OF COORDINATING AN IMMEDIATE RESPONSE TO CORRECT ANY CONSTRUCTION RELATED ACTIVITY THAT MAY ADVERSELY AFFECT THE OPERATIONAL SAFETY AND PHASING PLANS.
5. THE PRIMARY ACCESS POINT FOR AIRSIDE WORK AREAS 6, 7, AND 8 SHALL BE THROUGH A CONTRACTOR-INSTALLED, TEMPORARY ACCESS GATE INSTALLED PRIOR TO COMMENCING WORK AREA 5A WORK. ALL VEHICLES ENTERING THE AIRFIELD SHALL BE ESCORTED TO AND FROM THE WORK AREA BY MHT OPERATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING ALL PROJECT SUPPLIERS AND SUBCONTRACTORS OF THE HAUL ROUTE AND ACCESS TO THE WORK AREA.
6. THE CONTRACTOR SHALL PROVIDE A GATE GUARD AT ALL TIMES WHEN THE GATE IS UNLOCKED. GATE GUARD RESPONSIBILITIES WILL BE TO IDENTIFY, REGULATE, AND DIRECT ALL CONSTRUCTION VEHICLES ENTERING THE AIR OPERATIONS AREA AOA. ALL VEHICLES SHALL BE INSPECTED PRIOR TO ENTERING AOA. TEMPORARY CONSTRUCTION BADGES WILL BE ISSUED TO INDIVIDUALS THAT DO NOT HAVE A MHT BADGE. INDIVIDUALS ENTERING THE AOA MUST BE EQUIPPED WITH A MHT BADGE. INDIVIDUALS ENTERING THE AOA MUST BE EQUIPPED WITH A MHT BADGE. INDIVIDUALS ENTERING THE AOA MUST BE EQUIPPED WITH A MHT BADGE.
7. ALL CONTRACTORS MOTOR VEHICLES OPERATING IN AIRSIDE MOVEMENT AREAS SHALL BE EQUIPPED WITH AN AMBER FLASHING LIGHT AND/OR A 3 SQUARE-FOOT FLAG CONSISTING OF INTERNATIONAL ORANGE AND WHITE SQUARES NOT LESS THAN ONE SQUARE-FOOT DISPLAYING IN FULL VIEW ABOVE THE VEHICLE. ALL CONTRACTOR VEHICLES SHALL HAVE THE COMPANY IDENTIFICATION AND TELEPHONE NUMBER PLAINLY VISIBLE ON BOTH SIDES OF THE VEHICLE.
8. THE CONTRACTOR SHALL PROVIDE A CLOSURE AND BEFORE EQUIPMENT ENTERS THE AIRFIELD AND CONSTRUCTION COMMENCES. THE WORK AREA SHALL BE SECURED, LIGHTING EQUIPMENT, RSA DELINEATION MARKERS AND SAFETY BARRICADES SHALL BE PLACED AND OPERATIONAL AS APPLICABLE. THE WORK AREA SHALL BE CLEARLY DELINEATED AND ALL SAFETY REQUIREMENTS SHALL BE APPROVED BY THE RPR PRIOR TO BEGINNING ANY WORK.
9. CONSTRUCTION SIGNS (I.E. "CONSTRUCTION TRAFFIC" WITH ARROWS, "NO UNAUTHORIZED VEHICLES BEYOND THIS LINE" WITH ARROWS, "NO UNAUTHORIZED VEHICLES BEYOND THIS LINE" WITH ARROWS, "NO UNAUTHORIZED VEHICLES BEYOND THIS LINE" WITH ARROWS) SHALL BE PLACED AND OPERATIONAL AS APPLICABLE. THE WORK AREA SHALL BE CLEARLY DELINEATED AND ALL SAFETY REQUIREMENTS SHALL BE APPROVED BY THE RPR PRIOR TO BEGINNING ANY WORK.
10. OTHER APPURTENANCES EXCEED 3 INCHES WITHIN ACTIVE AIRCRAFT OPERATIONAL AREAS.
11. DAILY COORDINATION OF CONSTRUCTION ACTIVITIES SHALL BE HELD ON-SITE WITH THE RPR AND MHT OPERATIONS TO CLEARLY IDENTIFY THE LIMITS OF WORK FOR THE DAY. THE CONTRACTOR SHALL NOT EXCEED THE LIMITS OF WORK FOR THE DAY.
12. TEMPORARY TAXIWAY CLOSURES OR CAUTIONS AND/OR RUNWAY CLOSURES IN ACCORDANCE WITH THE GSPPP ARE SUBJECT TO WIND WEATHER AVAILABILITY AND ARE SUBJECT TO A RECALL TIME TO BE DETERMINED BY MHT OPERATIONS.
13. IF ALLOWED, WHEN WORKING UNDER A TAXIWAY CAUTION, ALL ADJACENT PAVEMENTS WILL BE AVAILABLE FOR CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING AND NOTIFYING MHT OPERATIONS THAT NO INTERFERENCE WITH AIRCRAFT OPERATIONS WILL OCCUR. THE CONTRACTOR SHALL BE ESCORTED BY MHT OPERATIONS AND THE CONTRACTOR SHALL RELOCATE PERSONNEL AND EQUIPMENT A MINIMUM OF 1255 FEET FROM THE TAXIWAY CENTERLINE, OR A MINIMUM OF 250 FEET FROM RUNWAY CENTERLINE, TO ALLOW FOR SAFE PASSAGE OF AIRCRAFT AS REQUIRED.
14. DURING NIGHT WORK (IF ALLOWED), ALL LIGHTING EQUIPMENT UTILIZED SHALL BE CONTROLLED TO PREVENT STRAY LIGHT FROM ILLUMINATING THE TAXIWAY CENTERLINE, OR A MINIMUM OF 250 FEET FROM RUNWAY CENTERLINE, TO ALLOW FOR SAFE PASSAGE OF AIRCRAFT AS REQUIRED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING AND NOTIFYING MHT OPERATIONS THAT NO INTERFERENCE WITH AIRCRAFT OPERATIONS WILL OCCUR. THE CONTRACTOR SHALL BE ESCORTED BY MHT OPERATIONS AND THE CONTRACTOR SHALL RELOCATE PERSONNEL AND EQUIPMENT A MINIMUM OF 1255 FEET FROM THE TAXIWAY CENTERLINE, OR A MINIMUM OF 250 FEET FROM RUNWAY CENTERLINE, TO ALLOW FOR SAFE PASSAGE OF AIRCRAFT AS REQUIRED.

GENERAL AVIATION BARRICADE NOTES:

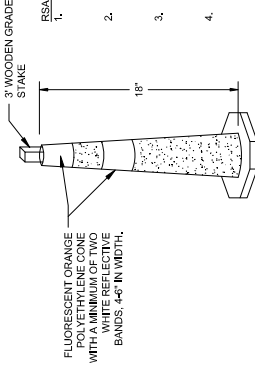
1. THE RPR AND MHT OPERATIONS WILL HAVE FINAL DETERMINATION WHERE EACH TYPE OF BARRICADE (LOW PROFILE, CHANNELIZER CONES, TRAFFIC CONES, ETC.) SHALL BE PLACED.
2. BARRICADES SHALL BE WATER BALLASTED LIGHTED SAFETY BARRICADES AND RSA DELINEATION MARKERS AS DETAILED IN THE SPCD.
3. ALL BARRICADES SHALL MEET REQUIREMENTS OF FAA ADVISORY CIRCULAR 1505374-30 (CURRENT EDITION).
4. "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION".
5. MHT OPERATIONS MAINTAINS A SMALL SUPPLY OF LIGHTED CONSTRUCTION BARRICADES FOR CONTRACTOR USE. BARRICADES SHALL BE MHT OPERATIONS SUPPLIED TO THE GREATEST EXTENT POSSIBLE. IT IS ANTICIPATED THE CONTRACTOR WILL BE REQUIRED TO PURCHASE ADDITIONAL BARRICADES FOR THE PROJECT.
6. CONTRACTOR SHALL MAKE DAILY INSPECTIONS OF THE BARRICADES/CONES TO VERIFY LIGHTS ARE OPERATING EVERY NIGHT.
7. CONTRACTOR SHALL INSTALL OWNER PROVIDED "DO NOT ENTER" SIGNS ON TAXIWAYS TO BE CLOSED AT 260' FROM RUNWAY CENTERLINE AT THE REQUEST OF THE OWNER.



- SAFETY BARRICADE NOTES:**
1. BARRICADES SHALL BE PLACED END TO END TO CREATE A CONTINUOUS BARRICADE.
 2. BARRICADES SHALL BE ADEQUATELY WEIGHTED WITH WATER OR OTHER APPROVED METHOD TO WITHSTAND HIGH WINDS AND/OR JET BLAST.
 3. CONTRACTOR SHALL MAINTAIN THE FLASHING LIGHT IN WORKING ORDER THROUGHOUT THE PROJECT.

WATER BALLASTED LIGHTED SAFETY BARRICADE

NOT TO SCALE
(INCIDENTAL TO ITEM M-200-1)



- RSA DELINEATION MARKER NOTES:**
1. MARKERS SHALL BE PLACED AT 20' ON CENTER TO PROTECT THE RUNWAY SAFETY AREA AND SHALL BE PLACED 260' FROM THE RUNWAY CENTERLINE.
 2. CONTRACTOR SHALL MAKE FREQUENT INSPECTIONS OF THE MARKERS AND SHALL RELOCATE ANY CONES THAT ARE MISALIGNED.
 3. TRAFFIC CONES SHALL BE ADEQUATELY WEIGHTED TO WITHSTAND HIGH WINDS AND/OR JET BLAST USING GRADE STAKES AS SHOWN.
 4. INSTALLATION, REMOVAL AND RELOCATION OF WORK AREA DELINEATION MARKERS AS SHOWN IN THE RPR IS INCIDENTAL TO ITEM M-200-1.

RSA DELINEATION MARKER

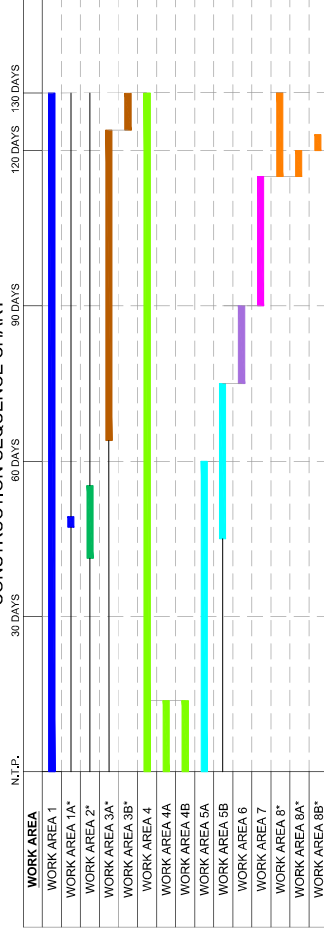
NOT TO SCALE
(INCIDENTAL TO ITEM M-200-1)

ENGINEER'S SEAL	PROJECT DESIGNER	CITY OF MANCHESTER DEPARTMENT OF AVIATION MANCHESTER, NEW HAMPSHIRE	MANCHESTER-BOSTON REGIONAL AIRPORT CARGO APRON AND ACCESS	SCALE: MTS	DATE: MARCH 2022
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WORK AREA	CONTRACT DURATION	REQUIREMENT TO BEGIN
WORK AREA 4	130 CALENDAR DAYS	NOTICE TO PROCEED
WORK AREA 4A	14 CALENDAR DAYS IN WORK AREA 4 DURATION	NOTICE TO PROCEED
WORK AREA 4B	14 CALENDAR DAYS IN WORK AREA 4 DURATION	NOTICE TO PROCEED
WORK AREA 5A	60 CALENDAR DAYS IN WORK AREA 4 DURATION	NOTICE TO PROCEED
WORK AREA 5B	10 CALENDAR DAYS IN WORK AREA 4 DURATION	NOTICE TO PROCEED
WORK AREA 6	15 CALENDAR DAYS IN WORK AREA 4 DURATION	COMPLETION OF WORK AREA 5B
WORK AREA 7	25 CALENDAR DAYS IN WORK AREA 4 DURATION	COMPLETION OF WORK AREA 6
WORK AREA 8	15 CALENDAR DAYS IN WORK AREA 4 DURATION	COMPLETION OF WORK AREA 7
WORK AREA 8A	5 CALENDAR DAYS IN WORK AREA 7 DURATION	COMPLETION OF WORK AREA 7
WORK AREA 8B	3 CALENDAR DAYS IN WORK AREA 7 DURATION	COMPLETION OF WORK AREA 7
TOTAL DURATION: 130 CALENDAR DAYS		

NOTE: PHASES 1 & 2 ARE INTENDED TO OCCUR SIMULTANEOUSLY. SEE CONSTRUCTION SEQUENCE CHART THIS SHEET.

CONSTRUCTION SEQUENCE CHART

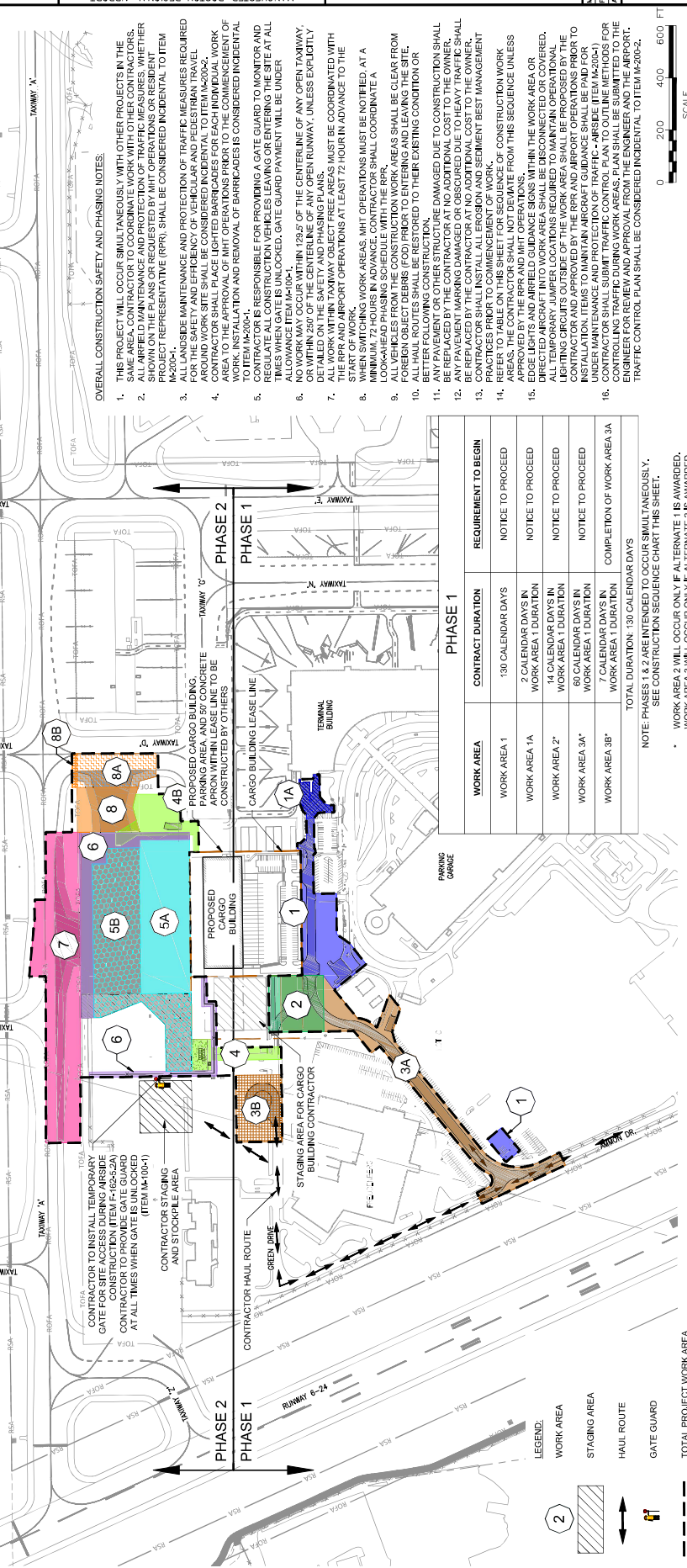


WORK AREA 1A WILL OCCUR ONLY IF ALTERNATE 1 IS AWARDED.
WORK AREA 1B WILL OCCUR ONLY IF ALTERNATE 2 IS AWARDED.
WORK AREA 3A WILL OCCUR ONLY IF ALTERNATE 1 IS AWARDED.
WORK AREA 3B WILL OCCUR ONLY IF ALTERNATE 2 IS AWARDED.

LEGEND:

- WORK AREA
- STAGING AREA
- HAUL ROUTE
- GATE GUARD

TOTAL PROJECT WORK AREA



LEGEND:

- WORK AREA
- STAGING AREA
- HAUL ROUTE
- GATE GUARD

TOTAL PROJECT WORK AREA

ENGINEER'S SEAL

PROJECT DESIGNER

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DESIGNED BY: DRAKE BT

DRAWN BY: CHUCK BT

CHECKED BY: BT

CITY OF MANCHESTER

DEPARTMENT OF AVIATION

MANCHESTER, NEW HAMPSHIRE

DATE: MARCH 2022

SCALE: 1" = 200'

MANCHESTER-BOSTON REGIONAL AIRPORT

CARGO APRON AND ACCESS

CONSTRUCTION SAFETY AND PHASING PLAN - OVERALL PLAN

REVISIONS

NO.	DATE	DESCRIPTION
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FILE NAME: AT PROJ: 18702.05

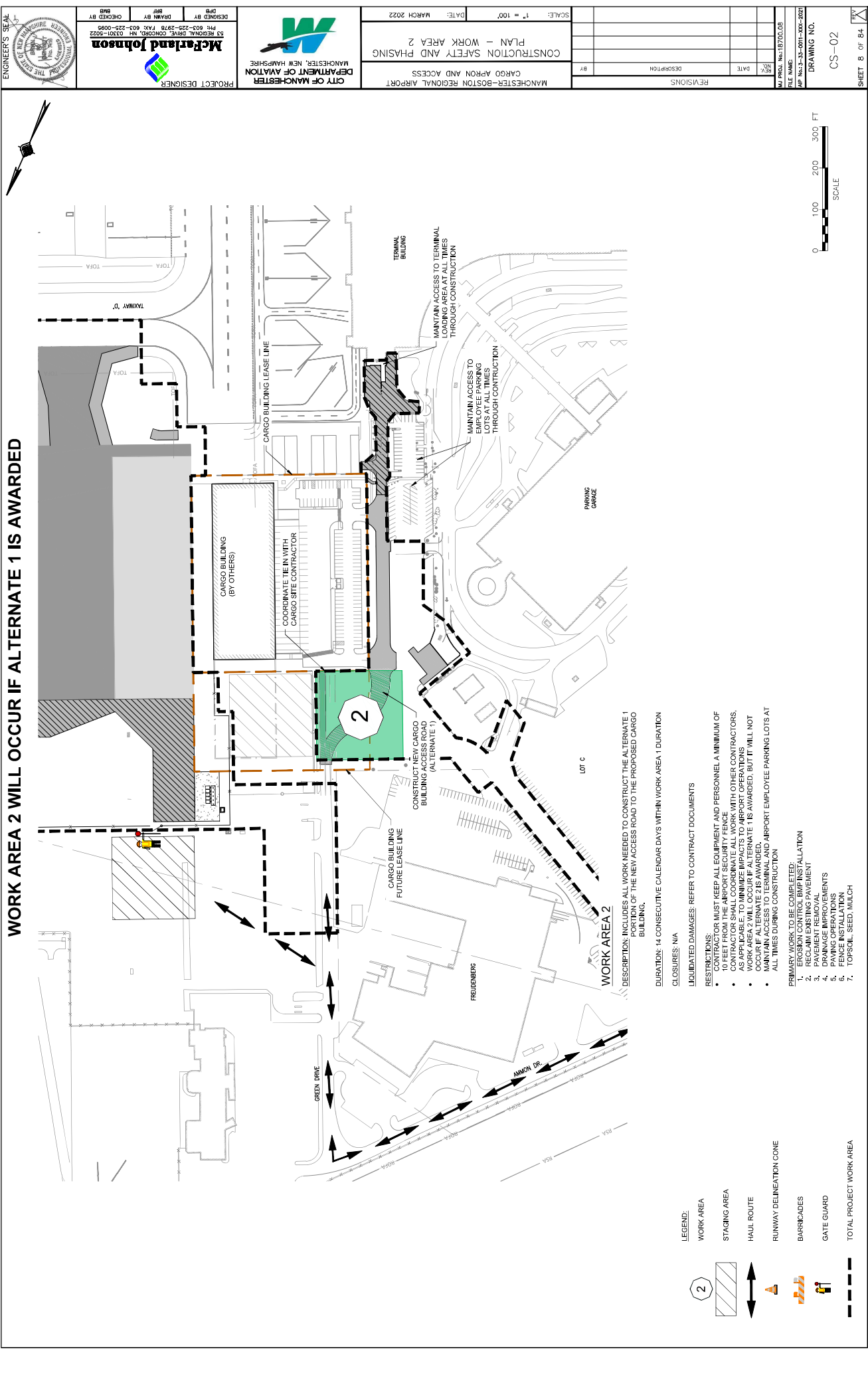
APP: 18702.05

DRAWING NO. CS-00

SHEET 6 OF 84

- OVERALL CONSTRUCTION SAFETY AND PHASING NOTES:
- THIS PROJECT WILL OCCUR SIMULTANEOUSLY WITH OTHER PROJECTS IN THE SAME AREA. CONTRACTOR TO COORDINATE WITH OTHER CONTRACTORS.
 - ALL APPLIED MAINTENANCE AND PROTECTION OF TRAFFIC MEASURES, WHETHER TEMPORARY OR PERMANENT, SHALL BE MAINTAINED THROUGHOUT THE PROJECT REPRESENTATIVE (PRP), SHALL BE CONSIDERED INCIDENTAL TO ITEM M-2020-1.
 - ALL LANDSIDE MAINTENANCE AND PROTECTION OF TRAFFIC MEASURES REQUIRED FOR THE PROJECT SHALL BE MAINTAINED THROUGHOUT THE PROJECT.
 - CONTRACTOR SHALL PLACE LIGHTED BARRIERS FOR EACH INDIVIDUAL WORK AREA TO THE APPROVAL OF MHT OPERATIONS PRIOR TO THE COMMENCEMENT OF WORK. INSTALLATION AND REMOVAL OF BARRIERS IS CONSIDERED INCIDENTAL TO ITEM M-2020-1.
 - CONTRACTOR IS RESPONSIBLE FOR PROVIDING A GATE GUARD TO MONITOR AND REGULATE ALL CONSTRUCTION VEHICLES LEAVING OR ENTERING THE SITE AT ALL TIMES WHEN GATE IS UNLOCKED. GATE GUARD PAYMENT WILL BE UNDER ALLOWANCE ITEM M-100-1.
 - ALL WORK WITHIN TAXIWAY OBJECT FREE AREA MUST BE COORDINATED WITH MHT OPERATIONS AT LEAST 72 HOURS IN ADVANCE TO THE START OF WORK. AIRPORT OPERATIONS AT LEAST 72 HOURS IN ADVANCE TO THE START OF WORK.
 - WHEN SWITCHING WORK AREAS, MHT OPERATIONS MUST BE NOTIFIED AT A MINIMUM 72 HOURS IN ADVANCE. CONTRACTOR SHALL COORDINATE A LOOK-AHEAD PHASING SCHEDULE WITH THE PRP.
 - CONTRACTOR SHALL RESTORE ALL EXISTING AND REMOVED DEBRIS FROM FOREIGN OBJECT DEBRIS (FOD) PRIOR TO ENTERING AND LEAVING THE SITE.
 - ALL HALL ROUTES SHALL BE RESTORED TO THEIR EXISTING CONDITION OR BETTER FOLLOWING CONSTRUCTION.
 - ANY PAVEMENT OR OTHER STRUCTURE DAMAGED DUE TO CONSTRUCTION SHALL BE REPAIRED TO ORIGINAL CONDITION OR BETTER PRIOR TO LEAVING THE SITE.
 - ANY PAVEMENT MARKING DAMAGED OR OBLISCURED DUE TO HEAVY TRAFFIC SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
 - CONTRACTOR SHALL INSTALL ALL EROSION AND SEDIMENT BEST MANAGEMENT PRACTICES (BMP) PRIOR TO THE START OF CONSTRUCTION.
 - CONTRACTOR SHALL SUBMIT TRAFFIC CONTROL PLAN TO OUTLINE METHODS FOR CONTROLLING TRAFFIC DURING WORK AREAS. PLAN SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL FROM THE ENGINEER AND THE AIRPORT. TRAFFIC CONTROL PLAN SHALL BE CONSIDERED INCIDENTAL TO ITEM M-2020-2.

WORK AREA 2 WILL OCCUR IF ALTERNATE 1 IS AWARDED



ENGINEER'S SEAL

PROJECT DESIGNER

DESIGNED BY

DRAWN BY

CHECKED BY

DATE

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CITY OF MANCHESTER

DEPARTMENT OF AVIATION

MANCHESTER, NEW HAMPSHIRE

MANCHESTER-BOSTON REGIONAL AIRPORT

CARGO APRON AND ACCESS

CONSTRUCTION SAFETY AND PHASING

PLAN - WORK AREA 2

SCALE: 1" = 100'

DATE: MARCH 2022

REVISIONS

BY

DATE

DESCRIPTION

FILE NAME

MT PROJ. No:18702.05

DRAWING NO.

CS-02

APR No:3-3-001-x00-x001

APR No:3-3-001-x00-x001

SHEET 8 OF 84

- WORK AREA 2**
- DESCRIPTION: INCLUDES ALL WORK NEEDED TO CONSTRUCT THE ALTERNATE 1 PORTION OF THE NEW ACCESS ROAD TO THE PROPOSED CARGO BUILDING.
- DURATION: 14 CONSECUTIVE CALENDAR DAYS WITHIN WORK AREA 1 DURATION
- CLOSURES: N/A
- LIQUIDATED DAMAGES: REFER TO CONTRACT DOCUMENTS
- RESTRICTIONS:
- CONTRACTOR MUST KEEP ALL EQUIPMENT AND PERSONNEL A MINIMUM OF 10 FEET FROM THE AIRPORT SECURITY FENCE
 - CONTRACTOR MUST MAINTAIN ACCESS TO ALL EXISTING AND PROPOSED ROADS AND DRIVEWAYS
 - AS APPLICABLE, CONTRACTOR MUST MAINTAIN ACCESS TO AIRPORT OPERATIONS
 - WORK AREA 2 WILL OCCUR IF ALTERNATE 1 IS AWARDED, BUT IT WILL NOT OCCUR IF ALTERNATE 2 IS AWARDED.
 - MAINTAIN ACCESS TO TERMINAL AND AIRPORT EMPLOYEE PARKING LOTS AT ALL TIMES DURING CONSTRUCTION
- PRIMARY WORK TO BE COMPLETED:
- EROSION CONTROL BMP INSTALLATION
 - RECLAIM EXISTING PAVEMENT
 - RECLAIM EXISTING PAVEMENT
 - DRAINAGE IMPROVEMENTS
 - PAVING OPERATIONS
 - FENCE INSTALLATION
 - TOPSOIL, SEED, MULCH

- LEGEND:
- WORK AREA
 - STAGING AREA
 - HAUL ROUTE
 - RUNWAY DELINEATION CONE
 - BARRICADES
 - GATE GUARD
 - TOTAL PROJECT WORK AREA

WORK AREA 3B

DESCRIPTION: INCLUDES ALL WORK NEEDED TO RECONFIGURE GREEN DRIVE AND INSTALL NEW CUL-DE-SAC.
DURATION: 7 CONSECUTIVE CALENDAR DAYS WITHIN WORK AREA 1
HAS BEEN COMPLETED

CLOSURES: N/A

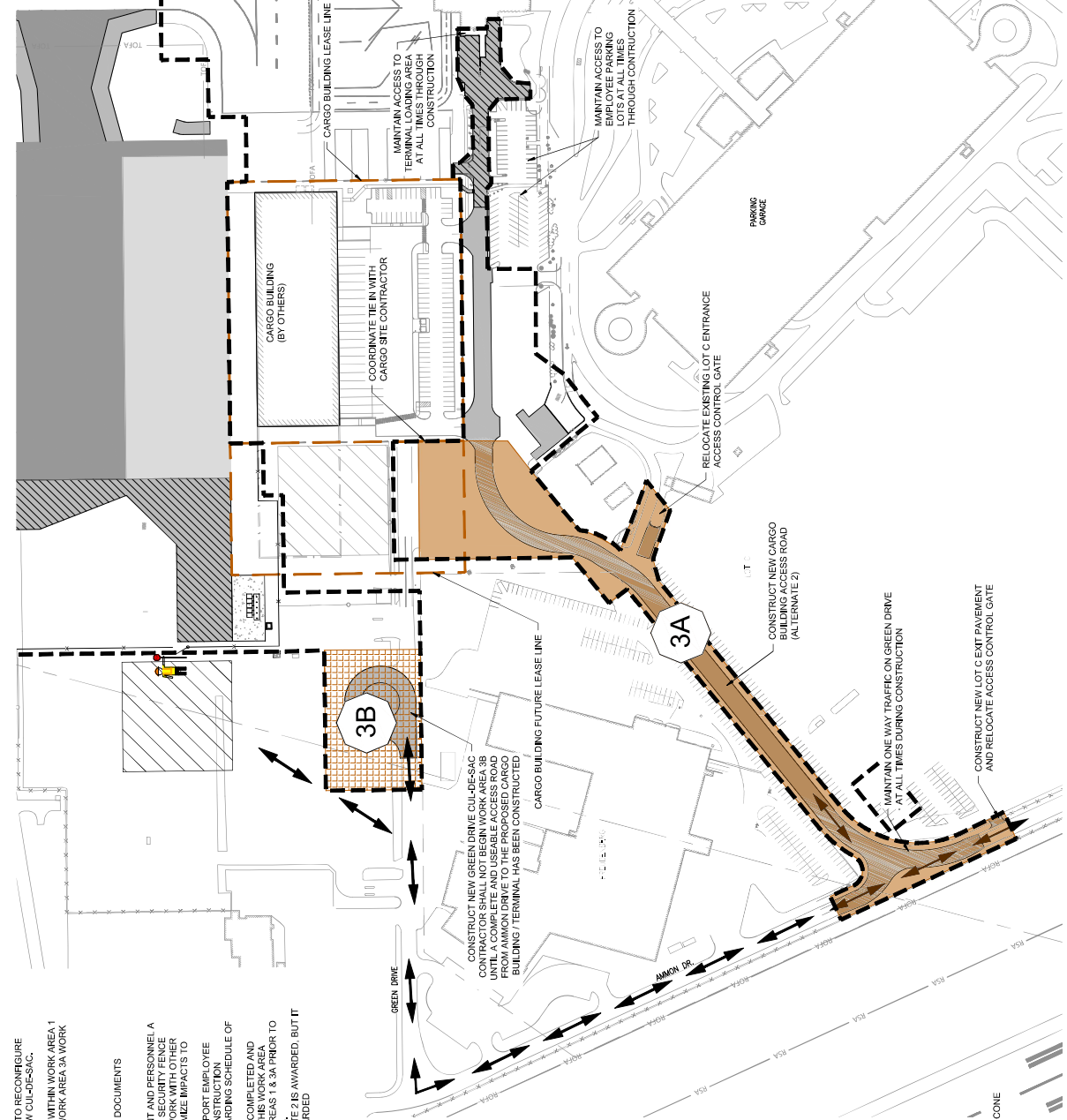
LIQUIDATED DAMAGES: REFER TO CONTRACT DOCUMENTS

- RESTRICTIONS:
- CONTRACTOR MUST KEEP ALL EQUIPMENT AND PERSONNEL A MINIMUM OF 10 FEET FROM THE AIRPORT SECURITY FENCE
 - CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER AIRPORT CONTRACTORS, AS APPLICABLE, TO MINIMIZE IMPACTS TO AIRPORT OPERATIONS
 - MAINTAIN ACCESS TO TERMINAL AND AIRPORT EMPLOYEE PARKING LOTS AT ALL TIMES DURING CONSTRUCTION
 - PROVIDE ADVANCED NOTIFICATION REGARDING SCHEDULE OF CONSTRUCTION
 - THE PROPOSED ACCESS ROAD MUST BE COMPLETED AND USABLE PRIOR TO COMMENCEMENT OF THIS WORK AREA
 - CONTRACTOR MUST COMPLETE WORK AREAS 1 & 3A PRIOR TO THE COMMENCEMENT OF WORK AREA 3B
 - IF ALTERNATE 2 IS AWARDED, BUT IT WILL NOT OCCUR IF ALTERNATE 1 IS AWARDED

PRIMARY WORK TO BE COMPLETED:

- RECLAIM EXISTING PAVEMENT
- RECLAIM EXISTING PAVEMENT
- PAVING OPERATIONS

WORK AREA 3A & 3B WILL OCCUR IF ALTERNATE 2 IS AWARDED



LEGEND:

- WORK AREA
- STAGING AREA
- HAUL ROUTE
- RUNWAY DELINEATION CONE
- BARRICADES
- GATE GUARD
- TOTAL PROJECT WORK AREA

WORK AREA 3A

DESCRIPTION: INCLUDES ALL WORK NEEDED TO CONSTRUCT THE ALTERNATE 2 PORTION OF THE NEW ACCESS ROAD TO THE PROPOSED CARGO BUILDING.

DURATION: 60 CONSECUTIVE CALENDAR DAYS WITHIN WORK AREA 1 DURATION

CLOSURES: N/A

LIQUIDATED DAMAGES: REFER TO CONTRACT DOCUMENTS

- RESTRICTIONS:
- CONTRACTOR MUST KEEP ALL EQUIPMENT AND PERSONNEL A MINIMUM OF 10 FEET FROM THE AIRPORT SECURITY FENCE
 - CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER CONTRACTORS, AS APPLICABLE, TO MINIMIZE IMPACTS TO AIRPORT OPERATIONS
 - MAINTAIN ACCESS TO TERMINAL AND AIRPORT EMPLOYEE PARKING LOTS AT ALL TIMES DURING CONSTRUCTION
 - MAINTAIN, AT A MINIMUM, ONE LANE OF TRAFFIC ON GREEN DRIVE AT ALL TIMES
 - CHANGE PEAK TRAFFIC HOURS
 - WORK AREA 3A WILL OCCUR IF ALTERNATE 2 IS AWARDED, BUT IT WILL NOT OCCUR IF ALTERNATE 1 IS AWARDED.

PRIMARY WORK TO BE COMPLETED:

- EROSION CONTROL BMP INSTALLATION
- RELOCATE LOT C ACCESS CONTROL GATES
- RECLAIM EXISTING PAVEMENT
- PAVING OPERATIONS
- UNCLASSIFIED EXCAVATION
- DRAINAGE IMPROVEMENTS
- PAVING OPERATIONS
- FENCE INSTALLATION
- TOPSOIL SEED MULCH



ENGINEER'S SEAL

PROJECT DESIGNER

McFarland Johnson

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CITY OF MANCHESTER
DEPARTMENT OF AVIATION
MANCHESTER, NEW HAMPSHIRE

MANCHESTER-BOSTON REGIONAL AIRPORT
CARGO APRON AND ACCESS
CONSTRUCTION SAFETY AND PHASING
PLAN - WORK AREAS 3A & 3B

SCALE: 1" = 100'

DATE: MARCH 2022

REVISIONS

NO.	DATE	DESCRIPTION	BY
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FILE NAME: M:\PROJ\16187002.08

DRAWING NO. CS-03

SHEET 9 OF 84



ENGINEER'S SEAL

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CITY OF MANCHESTER
DEPARTMENT OF AVIATION
MANCHESTER, NEW HAMPSHIRE

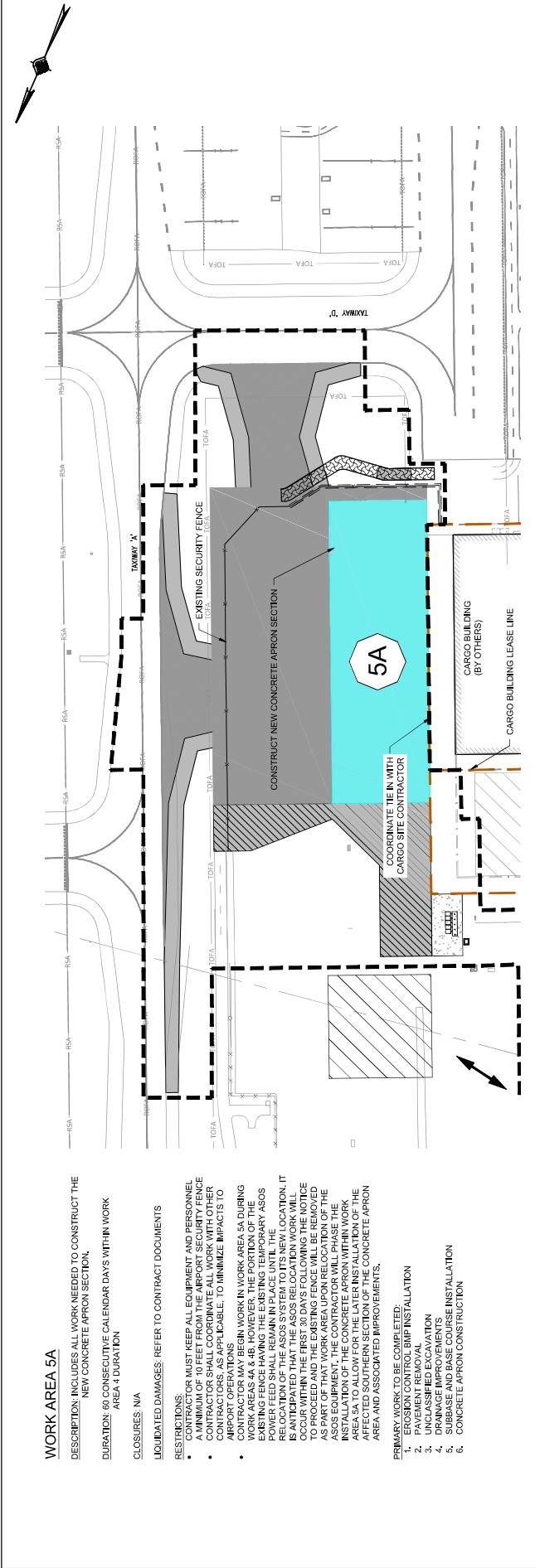
MANCHESTER-BOSTON REGIONAL AIRPORT
CARGO APRON AND ACCESS
CONSTRUCTION SAFETY AND PHASING
PLAN - WORK AREAS 5A & 5B
DATE: MARCH 2022
SCALE: 1" = 100'

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FILE NAME
M PROJ No:18702.05
APP No:3-33-001-XXX-0021

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CS-05

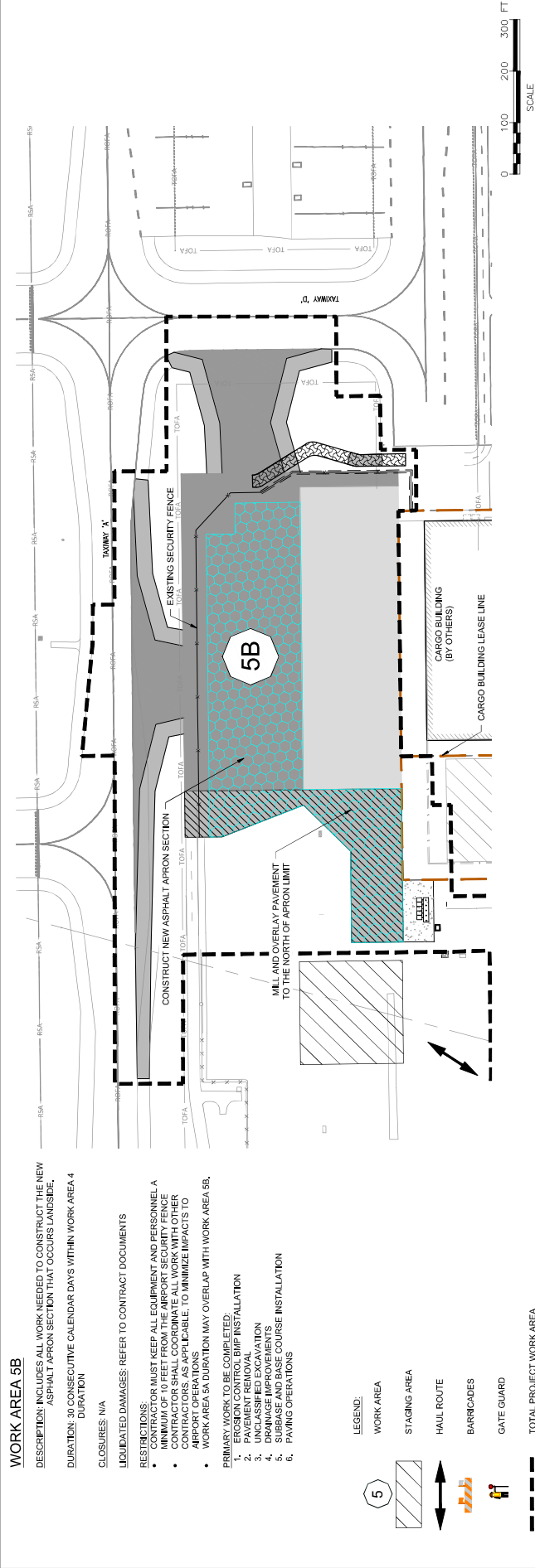
SHEET 11 OF 84



WORK AREA 5A

DESCRIPTION: INCLUDES ALL WORK NEEDED TO CONSTRUCT THE NEW CONCRETE APRON SECTION.
DURATION: 40 CONSECUTIVE CALENDAR DAYS WITHIN WORK AREA 1 DURATION
CLOSURES: N/A

- LIQUIDATED DAMAGES: REFER TO CONTRACT DOCUMENTS
- RESTRICTIONS:
- CONTRACTOR MUST KEEP ALL EQUIPMENT AND PERSONNEL MINIMUM OF 10 FEET FROM THE AIRPORT SECURITY FENCE
 - CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER CONTRACTORS, AS APPLICABLE, TO MINIMIZE IMPACTS TO AIRPORT OPERATIONS
 - CONTRACTOR MAY BEGIN WORK IN WORK AREA 5A DURING PHASE 1 OF THE PROJECT. THE CONTRACTOR SHALL MAINTAIN EXISTING FENCE HAVING THE EXISTING TEMPORARY ASOS POWER FEED SHALL REMAIN IN PLACE UNTIL THE RELOCATION OF THE ASOS SYSTEM TO ITS NEW LOCATION. IT IS ANTICIPATED THAT THE ASOS RELOCATION WORK WILL BE COMPLETED BY THE END OF PHASE 1. THE CONTRACTOR SHALL PROCEED AND THE EXISTING FENCE WILL BE REMOVED AS PART OF THAT WORK AREA UPON RELOCATION OF THE ASOS EQUIPMENT. THE CONTRACTOR WILL PHASE THE RELOCATION OF THE ASOS EQUIPMENT TO THE NEW LOCATION IN PHASE 2 OF THE PROJECT. THE CONTRACTOR SHALL MAINTAIN THE AREA 5A TO ALLOW FOR THE RELOCATION OF THE ASOS EQUIPMENT AND ASSOCIATED IMPROVEMENTS.
- PRIMARY WORK TO BE COMPLETED:
- EROSION CONTROL BMP INSTALLATION
 - PAVEMENT REMOVAL
 - UNCLASSIFIED EXCAVATION
 - DRAINAGE IMPROVEMENTS
 - CONCRETE APRON CONSTRUCTION
 - CONCRETE APRON CONSTRUCTION



WORK AREA 5B

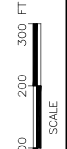
DESCRIPTION: INCLUDES ALL WORK NEEDED TO CONSTRUCT THE NEW ASPHALT APRON SECTION THAT OCCURS LANDSIDE.
DURATION: 30 CONSECUTIVE CALENDAR DAYS WITHIN WORK AREA 4 DURATION
CLOSURES: N/A

- LIQUIDATED DAMAGES: REFER TO CONTRACT DOCUMENTS
- RESTRICTIONS:
- CONTRACTOR MUST KEEP ALL EQUIPMENT AND PERSONNEL A MINIMUM OF 10 FEET FROM THE AIRPORT SECURITY FENCE
 - CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER CONTRACTORS, AS APPLICABLE, TO MINIMIZE IMPACTS TO AIRPORT OPERATIONS
 - WORK AREA 5A DURATION MAY OVERLAP WITH WORK AREA 5B.
- PRIMARY WORK TO BE COMPLETED:
- EROSION CONTROL BMP INSTALLATION
 - PAVEMENT REMOVAL
 - UNCLASSIFIED EXCAVATION
 - DRAINAGE IMPROVEMENTS
 - CONCRETE APRON CONSTRUCTION
 - PAVING OPERATIONS

LEGEND:

- WORK AREA
- STAGING AREA
- HAUL ROUTE
- BARRICADES
- GATE GUARD

TOTAL PROJECT WORK AREA





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CITY OF MANCHESTER
DEPARTMENT OF AVIATION
MANCHESTER, NEW HAMPSHIRE

MANCHESTER-BOSTON REGIONAL AIRPORT
CARGO APRON AND ACCESS
CONSTRUCTION SAFETY AND PHASING
PLAN - WORK AREA 6
DATE: MARCH 2022

REV	DATE	DESCRIPTION	BY

FILE NAME
M PROJ: 1618700.05
APP No: 3-33-001-200-2021
DRAWING NO.
CS-06
SHEET---of 84

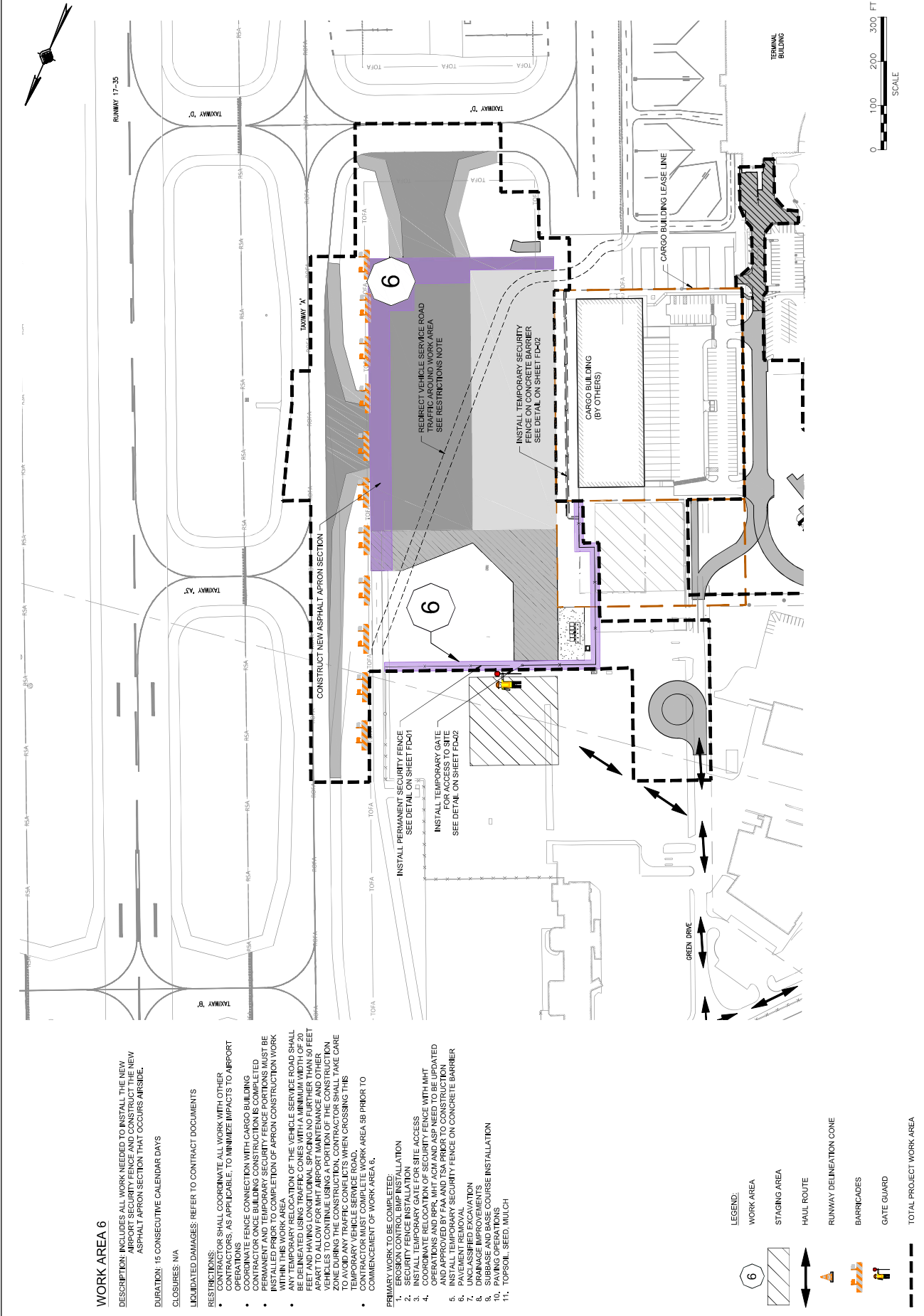
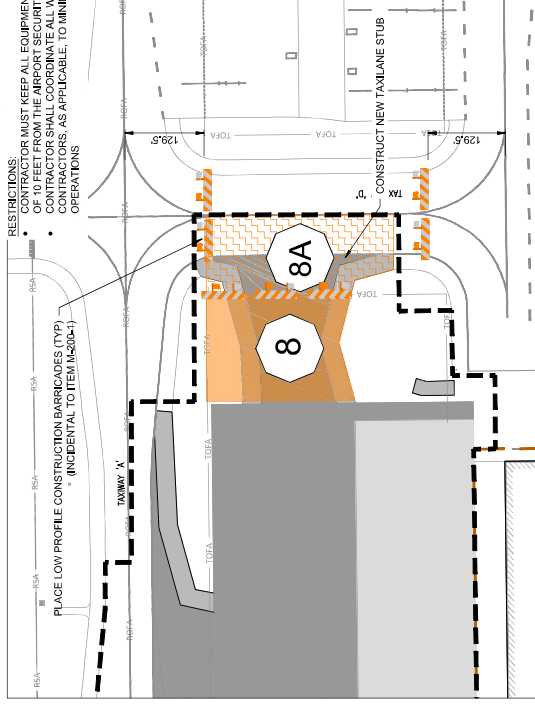
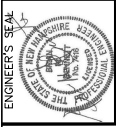


Diagram illustrating the placement of a low profile construction barricade (TYP) (INCIDENTAL TO ITEM M-203-1) on a road. The diagram shows a road with lane markings, including a dashed line for the centerline and solid lines for the edges. The barricade is positioned on the right side of the road, adjacent to a construction area. The diagram includes dimensions for the barricade's placement, such as 250' and 100'. A label 'TAXILANE "N"' is present, indicating the direction of travel. A note 'CONSTRUCT NEW TAXILANE STUB' is also visible. The diagram is labeled 'PLACE LOW PROFILE CONSTRUCTION BARRICADES (TYP) (INCIDENTAL TO ITEM M-203-1)'.



REVIEWS						DRAWING NO.		CS-08	SHEET --- of B4	
REV NO.	DATE	DESCRIPTION	BY			FILE NAME				
						AI PROJ No: 18700-08				
						AP No: 3-33-0011-KDC-2021				



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CITY OF MANCHESTER
DEPARTMENT OF AVIATION
MANCHESTER, NEW HAMPSHIRE

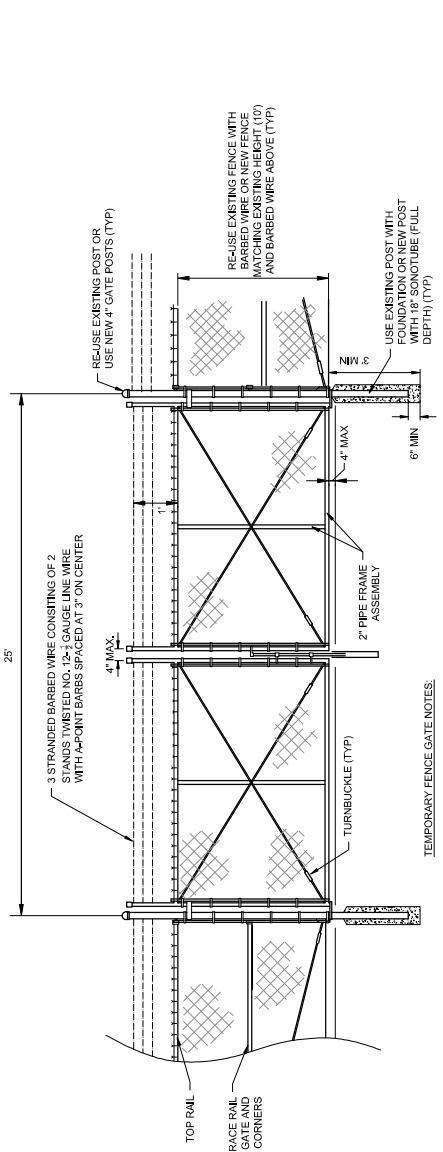
MANCHESTER-BOSTON REGIONAL AIRPORT
CARGO APRON AND ACCESS
DATE: MARCH 2022
SCALE: NTS
FENCE DETAILS (2 OF 2)

REV	DATE	DESCRIPTION

FILE NAME
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APP No: 3-33-001-000-0001
DRAWING NO.
FD-02
SHEET 15 OF 84

POST AND RAIL SCHEDULE			
USE	MATERIAL	FED SPEC	STEEL O.D.
		RRF-191-3 SIZE (INCHES)	
END CORNER AND INTERMEDIATE POSTS FOR FENCES LESS THAN 8' FENCES 6' AND OVER	CLASS 1 (STEEL) GRADE B, GROUP 1C	SP4	2.875
	CLASS 1 (STEEL) GRADE B, GROUP 1C	SP1	1.56
	CLASS 1 (STEEL) GRADE B, GROUP 1C	SP1	1.56
TOP RAIL			
LINE POSTS FOR FENCES GREATER THAN 6' AND EQUAL TO OR LESS THAN 8'	CLASS 1 (STEEL) GRADE B, GROUP 1C	SP3	2.375
	CLASS 1 (STEEL) GRADE B, GROUP 1C	SP5	4.00
GATE POSTS			
NOTE: ALL POSTS AND RAILS TO BE GALVANIZED TUBULAR STEEL PIPE			

NOTE: ALL POSTS AND RAILS TO BE GALVANIZED TUBULAR STEEL PIPE

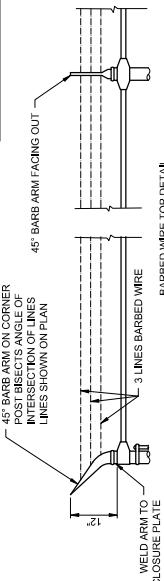


TEMPORARY FENCE GATE NOTES:

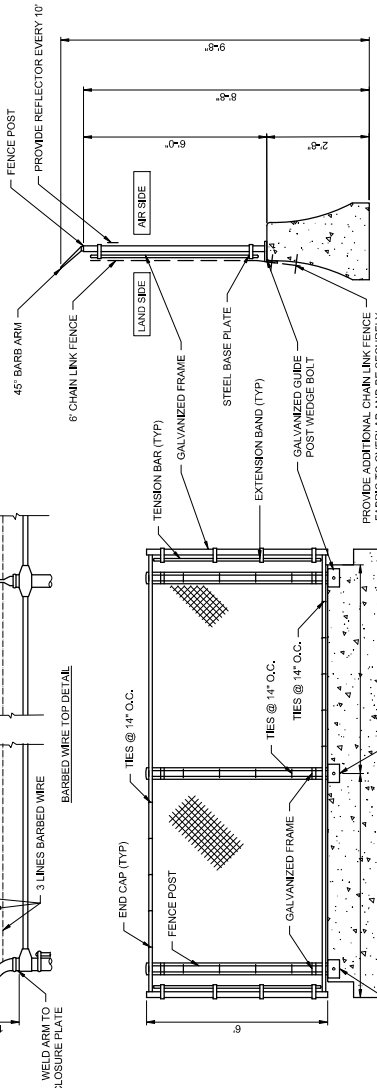
1. GATE FABRIC SHALL MATCH FENCE FABRIC. BARBED WIRE ON GATES SHALL MATCH THAT USED ON THE FENCE.
2. LOCK MECHANISM SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL HAVE THE SAME MINT STANDARD. LOCK TYPE MUST BE APPROVED BY THE AIRPORT. THE LOCK SHALL BE CONSIDERED INCIDENTAL TO THE FENCE GATE ITEM F-1624-2A.
3. 1624-2A SWING GATES SHALL HAVE THE CAPABILITY OF SWINGING IN BOTH DIRECTIONS WITH STOPS ON BOTH SIDES.

TEMPORARY CHAIN LINK FENCE GATE DETAIL

NOT TO SCALE
(ITEM F-1624-2A)



BARBED WIRE TOP DETAIL

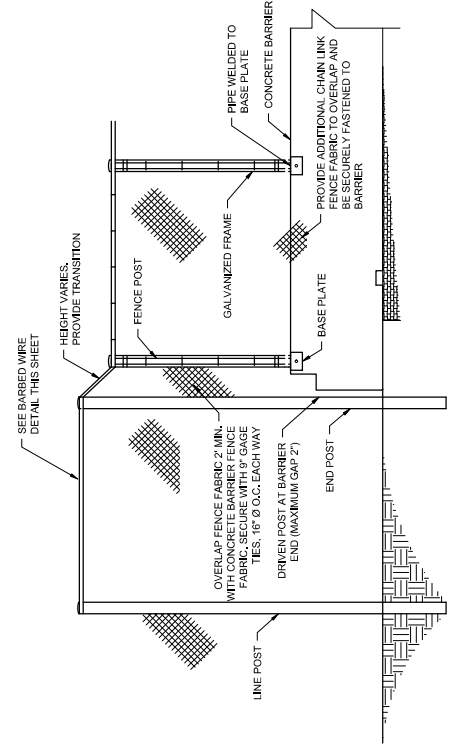


PROVIDE ADDITIONAL CHAIN LINK FENCE FABRIC TO OVERLAP AND BE SECURELY FASTENED TO THE FRAME IF VERTICAL PLANE OF THE FENCE FRAME IS NOT IN LINE WITH THE BARRIER EDGE

OMIT CENTER POST FOR 8' & 10' BARRIER LENGTHS

TEMPORARY SECURE AIRFIELD 6FT CHAIN LINK FENCE WITH BARB WIRE ON CONCRETE BARRIER DETAIL

NOT TO SCALE
(ITEM F-1624-1C)



TEMPORARY FENCE ON CONCRETE BARRIER TO PERMANENT FENCE TRANSITION DETAIL

NOT TO SCALE

CSPP Appendix C
SAFETY AND PHASING PLAN CHECKLIST

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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			
NAVAIDs					
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			
Contractor Access					
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			
Wildlife Management					
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			
Inspection Requirements					
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			
Underground Utilities					
Procedures for protecting existing underground facilities in excavation areas are described.	<u>2.15</u>	X			
Penalties					
Penalty provisions for noncompliance with airport rules and regulations and the safety plans are detailed.	<u>2.16</u>	X			
Special Conditions					
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			
Runway and Taxiway Visual Aids - Marking, Lighting, Signs, and Visual NAVAIDs					
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			
Marking and Signs For Access Routes					
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			
Hazard Marking and Lighting					
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			
Other Limitations on Construction					
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			

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CSPP Appendix D
DAILY SAFETY INSPECTION CHECKLIST

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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

Item	Action Required (Describe)	No Action Required (Check)
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		

Item	Action Required (Describe)	No Action Required (Check)
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).		

Item	Action Required (Describe)	No Action Required (Check)
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

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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: **Construct New Green Drive Cargo Facility Apron and Access Road
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 single sheet of white paper with horizontal blue 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

GEOTECHNICAL REPORT

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GEOTECHNICAL INVESTIGATION REPORT REV 1

GREEN DRIVE CARGO FACILITY APRON AND ACCESS ROAD

Manchester-Boston Regional Airport
Manchester, New Hampshire 03103

Prepared for:

McFarland Johnson, Inc.
53 Regional Drive
Concord, New Hampshire 03301

Prepared by:

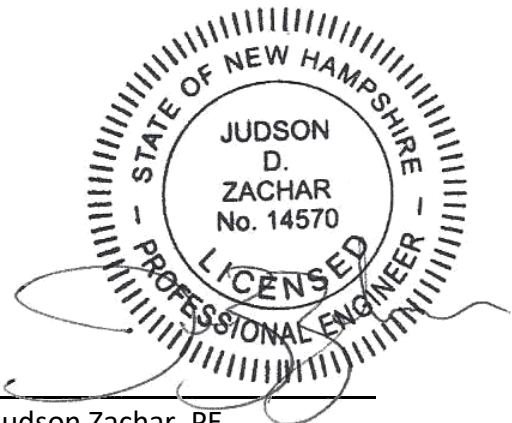
John Turner Consulting, Inc.
19 Dover Street
Dover, New Hampshire 03820

JTC Project No. 21-04-098

January 13, 2022



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January 13, 2022

David Brouillet, P.E. – Project Manager



McFarland Johnson, Inc.
53 Regional Drive
Concord, New Hampshire 03301

**RE: Geotechnical Investigation Report Rev 1
Green Drive Cargo Facility Apron and Access Drive
Manchester-Boston Regional Airport
Manchester, New Hampshire 03103**

Dear Mr. Brouillet:

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 apron and access drive.

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.

A handwritten signature in dark ink, reading 'Thomas A. McIntosh III'.

Thomas A McIntosh III, P.E.
Senior Geotechnical Engineer
19 Dover Street
Dover, NH 03820
tmcintosh@consultjtc.com
Ph: (508) 446-6180

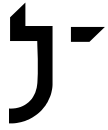
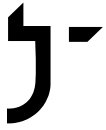


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1.0 INTRODUCTION

John Turner Consulting, Inc. (JTC) is pleased to present this *Geotechnical Investigation Report* for the proposed Green Drive Cargo Facility Apron and Access Road at Manchester-Boston Regional Airport in Manchester, New Hampshire. JTC conducted geotechnical explorations, laboratory testing, and engineering evaluations in general accordance with the *Subconsultant Agreement* between McFarland Johnson, Inc. and John Turner Consulting, Inc. dated 27 October 2021.

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 2021.

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*.

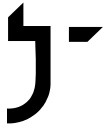
2.0 PROJECT INFORMATION

The following subsections provide general descriptions of the site, the regional geologic setting, and the proposed development.

2.1 Site & Project Description

The first area of interest consists of a 400,000± s.f. parcel of land located approximately 1,500 feet southeast of the intersection of Ammon Drive and Green Drive at Manchester-Boston Municipal Airport in Manchester, New Hampshire. This site to be developed lies to the northeast of Green Drive and comprises an existing parking lot located behind two existing corrugated steel utility buildings and a landscaped area adjacent to the existing taxiway within the confines of the Airport Operations Area (AOA). Elevations within this locale range from EL. 220.0± ft. to EL. 225.0± ft. The second area of exploration for future development is a 70,000± s.f. area within an existing paved access roadway and portions of paved parking areas adjacent to the existing *Parking Area B* that lies to the southwest of Green Drive. Elevations within this locale ranged from EL. 218.0± ft. to EL. 220.0± ft. JTC anticipates finished grades for the project will generally be coincident with the existing grades.

JTC understands that the new development consists of the construction of a new cargo plane unloading apron adjacent to a proposed cargo facility. The heavy-duty asphalt section will have a total depth (including pavement base) of approximately 40 inches. The project will also include a reconfiguration of existing parking areas and roadways adjacent to Green Drive for construction of a new access road for the proposed cargo facility. Refer to the attached *Cargo Facility and Access Road Design Survey* and the *Test Boring 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 the Lake Bottom Deposits are overlain by surficial soils consisting of udipsamments group soils which consist of outwash sand.

3.0 GEOTECHNICAL EXPLORATIONS

JTC subcontracted Soil Exploration Corp. (Soil-X) to drill thirty-two (32) geotechnical test borings on October 18 - 21, 2021. JTC performed Dynamic Cone Penetrometer (DCP) testing at three (3) hand excavated test pit locations in close proximity to machine augered test boring locations. Soil samples were recovered within the DCP test strata and transported to our laboratory for California Bearing Ratio (CBR) testing. JTC performed infiltration testing in the vicinity of two (2) boring locations. The approximate locations of the subsurface explorations and testing are shown on the attached *Exploration Location Plan*. DCP testing and CBR sampling was performed at locations designated CBR1 through CBR3 in close proximity to borings B-2, B-3, and B-13, respectively. IT-1 was tested in the immediate vicinity of B-5.

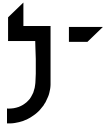
3.1 Soil Borings

Soil Exploration Corp. (Soil-X) drilled thirty-two (32) geotechnical test borings designated as B-1 through B-5 and C/B-2 through C/B-28, via a Mobile B-57 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 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 depths of 11 to 22 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*.



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 as CBR1, CBR2 and CBR3 via a Kessler K-100 Dynamic Cone Penetrometer. DCP testing was performed from a depth of 24 inches to 60 inches bgs. The results of the DCP testing are summarized in Table 3 and Appendix E. Samples for California Bearing Ratio (CBR) laboratory testing were collected from within the test strata at each test pit location.

4.2 Infiltration Testing

Soil-X drilled two (2) borings, designated IT-1 and IT-2, at 3.0 feet bgs for the purpose of infiltration testing. Soils immediately below the infiltration test depth were collected at location IT-1 and IT-2 and transported to JTC's laboratory for sieve analysis. Soils at the test depths consisted of poorly graded Sand (SP) and poorly graded Sand (SP-SM) with silt at test locations IT-1 and IT-2, respectively.

4.2.1 Infiltration Test Procedure

Infiltration testing was performed in general accordance with the *New Hampshire Stormwater Manual* and proceeded as follows:

- A 4-inch diameter Schedule 40 polyvinyl chloride (PVC) casing was placed approximately 3.0 feet bgs at each of the two (2) test locations. The pipes were 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 2.0 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:

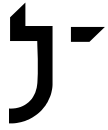


Table 1 – Summary of Infiltration Testing Results

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	Refer to Exploration Location Plan	36	Sand (SP)	70.1*	69.6*	74.4*	72.0*	71.5
IT-2	Refer to Exploration Location Plan	36	Sand (SP-SM)	38.4**	35.8**	26.9***	24.3***	31.4

*Infiltration rate based on measurement after one (1) 15-minute increment.

**Infiltration rate based on measurement after two (2) 15-minute increments.

***Infiltration rate based on measurement after three (3) 15-minute increments.

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:

- 70 Moisture Contents
- 70 Washed Sieve Analyses
- 2 Hydrometer 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 seventy (70) samples. The following table summarizes the particle size data obtained from the analyses.

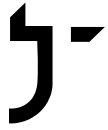


Table 2 – Summary of Sieve Analysis Results

Exploration Location	Depth Range (bgs)	USCS Desc.	Percent by Weight Passing Sieve			
			No. 4	No. 10	No. 40	No. 200
B-1	0' - 2'	SP-SM	99.6	99.2	75.4	6.1
B-1	2' - 4'	SP-SM	99.6	98.9	76.8	6.6
B-2	0' - 2'	SP-SM	98.5	97.8	71.1	5.7
B-2	2' - 4'	SP-SM	100.0	99.6	69.7	7.4
B-2	5' - 7'	SP	100.0	100.0	96.5	3.1
B-2	7' - 9'	SP	100.0	99.9	67.9	3.7
B-3	0' - 2'	SP-SM	98.5	96.5	68.2	10.4
B-3	2' - 4'	SP	100.0	100.0	67.9	4.8
B-3	5' - 7'	SP-SM	100.0	99.5	67.6	5.5
B-3	10' - 12'	SP	99.8	99.8	86.1	3.5
B-4	2' - 4'	SP-SM	99.7	99.2	70.7	6.3
B-5	2' - 4'	SP-SM	94.8	94.1	69.5	8.2
C/B-2	5' - 7'	SP	100.0	98.1	58.1	3.2
C/B-2	20' - 22'	SP	99.8	99.6	96.3	1.3
C/B-3	10' - 12'	SP	93.4	91.9	70.4	2.4
C/B-3	15' - 17'	SP	100.0	99.7	89.2	2.3
C/B-4	0' - 2'	SP-SM	100.0	100.0	71.6	6.8
C/B-4	20' - 22'	SP-SM	100.0	99.9	88.0	3.5
C/B-5	2' - 4'	SP-SM	100.0	98.5	45.9	7.2
C/B-6	0' - 2'	SP-SM	100.0	96.4	42.5	6.3
C/B-6	10' - 12'	SP	99.5	98.9	78.3	3.0
C/B-7	0' - 2'	SP	100.0	100.0	66.8	4.6
C/B-7	10' - 12'	SP	100.0	99.3	77.4	2.2
C/B-8	0' - 2'	SP-SM	100.0	99.9	62.8	6.1
C/B-8	5' - 7'	SP	99.7	98.4	74.8	3.8
C/B-9	0' - 2'	SP-SM	100.0	99.6	73.1	8.5
C/B-9	7' - 9'	SP-SM	100.0	100.0	85.5	5.9

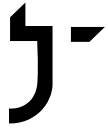


Table 2 (Cont.) – Summary of Sieve Analysis Results

Exploration Location	Depth Range (bgs)	USCS Desc.	Percent by Weight Passing Sieve			
			No. 4	No. 10	No. 40	No. 200
C/B-10	2' - 4'	SP-SM	100.0	98.6	57.8	5.3
C/B-11	0' - 2'	SP-SM	98.9	97.7	63.1	8.2
C/B-11	9' - 11'	SP	99.7	98.9	79.9	4.6
C/B-12	0' - 2'	SP-SM	92.6	89.0	59.4	11.2
C/B-12	10' - 12'	SP	100.0	100.0	83.4	2.5
C/B-13	0' - 2'	SP-SM	100.0	99.1	66.2	9.8
C/B-13	2' - 4'	SP-SM	100.0	99.2	66.7	7.9
C/B-13	5' - 7'	SP-SM	100.0	98.6	57.8	7.3
C/B-13	10' - 12'	SP	100.0	99.7	54.8	1.5
C/B-14	0' - 2'	SP	100.0	100.0	79.2	4.6
C/B-14	5' - 7'	SP-SM	100.0	99.8	74.8	5.1
C/B-15	0' - 2'	SP-SM	100.0	99.7	53.6	5.9
C/B-15	10' - 12'	SP	100.0	99.5	69.0	3.2
C/B-16	2' - 4'	SP-SM	100.0	99.2	66.0	6.4
C/B-16	7' - 9'	SP-SM	100.0	99.1	70.4	6.5
C/B-17	0' - 2'	SM	100.0	99.6	77.0	15.5
C/B-17	5' - 7'	SP-SM	100.0	100.0	72.7	5.7
C/B-18	0' - 2'	SP-SM	99.0	97.2	59.7	9.0
C/B-18	2' - 4'	SP-SM	100.0	99.9	72.9	5.7
C/B-19	0' - 2'	SP-SM	100.0	100.0	66.2	8.8
C/B-19	5' - 7'	SP	100.0	98.7	69.9	4.7
C/B-20	0' - 2'	SP-SM	100.0	100.0	76.5	6.8
C/B-20	7' - 9'	SP	100.0	99.7	83.9	2.7
C/B-21	0' - 2'	SM	100.0	97.8	72.4	21.9
C/B-21	2' - 4'	SP-SM	100.0	100.0	69.5	7.0
C/B-21	5' - 7'	SP-SM	100.0	98.6	68.4	6.5
C/B-22	0' - 2'	SP-SM	71.6	60.7	27.4	5.9
C/B-22	7' - 9'	SW-SM	89.9	82.2	41.6	7.6
C/B-23	9' - 11'	SP	97.0	90.0	45.1	4.0
C/B-24	0' - 2'	SM	88.2	80.4	49.0	12.8
C/B-24	9' - 11'	SP	99.7	96.2	60.8	1.2
C/B-25	0' - 2'	SP-SM	99.5	96.1	44.9	8.2
C/B-25	9' - 11'	SP	99.4	97.5	32.8	2.2
C/B-26	0' - 2'	SW-SM	100.0	96.2	39.3	7.9
C/B-26	7' - 9'	SP	100.0	99.1	61.5	3.1
C/B-27	0' - 2'	SW-SM	97.8	94.1	45.0	9.6
C/B-27	2' - 4'	SP-SM	100.0	98.5	55.5	9.4
C/B-28	0' - 2'	SP-SM	88.5	80.2	48.0	11.6
C/B-28	7' - 9'	SP	100.0	99.4	85.7	1.6

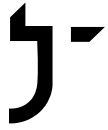


Table 2 (Cont.) – Summary of Sieve Analysis Results

Exploration Location	Depth Range (bgs)	USCS Desc.	Percent by Weight Passing Sieve			
			No. 4	No. 10	No. 40	No. 200
IT-1	3' - 3.5'	SP	98.5	98.3	68.1	2.6
IT-2	3' - 3.5'	SP-SM	98.5	98.1	70.9	5.3
Pave Base Composite 1	0' - 2'	SP-SM	64.2	50.6	26.8	5.9
Pave Base Composite 2	0' - 2'	SP-SM	63.7	55.1	32.4	7.2

5.2 California Bearing Ratio (CBR) and Modified Proctors

The results of the CBR lab testing and field CBR values are provided in Table 3. CBR values are based on the CBR at 0.1-inch penetration.

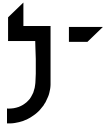
Modified proctor tests (ASTM D1557) were performed on all CBR samples (results in Table 4). CBR testing was performed in accordance with ASTM D1883. CBR samples were soaked and compacted to 97.0 to 98.4 percent of maximum modified proctor density prior to testing.

Table 3 – CBR Testing Results

Sample/ Location #	USCS Soil Type	Laboratory CBR Values & Test Conditions				Field CBR Values From DCP Testing	
		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
CBR1 (B-2)	SP-SM	2.0' - 5.0'	10	18.0	7.6	2.0' - 5.0'	22
CBR2 (B-3)	SP	2.0' - 5.0'	8	17.4	6.8	2.0' - 5.0'	30
CBR3 (C/B-13)	SP-SM	2.0' - 5.0'	34	13.3	8.1	2.0' - 5.0'	15

Table 4 – Modified Proctor Analysis Summary

Exploration and Sample Depth	Maximum Dry Density (pcf)	Optimum Moisture (%)	USCS Soil Type
CBR1 (B-2) (2.0' - 5.0' bgs)	111.1	6.3	SP-SM
CBR2 (B-3) (2.0' - 5.0' bgs)	110.8	7.2	SP
CBR3 (C/B-13) (2.0' - 5.0' bgs)	117.4	8.1	SP-SM



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

Asphalt thicknesses were recorded during the exploration program. The thickness of the asphalt pavement ranged from 2.5 inches to 5.0 inches at boring locations C/B-2 to C/B-28. For the thickness of the asphalt pavement at specific locations refer to the attached boring logs.

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 9.0, 8.0, 9.0, 9.0, and 3.0 inches bgs in borings B-1 through B-5, respectively.

6.2.2 Pavement Base

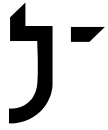
Soils interpreted to be the base course for the existing pavement were typically encountered underlying the asphalt in borings CB-2 through CB-28. The base course soils were composited and generally consisted of dark gray to brown, poorly graded Sand (SP-SM) with silt and gravel. The base courses were composited for sieve analyses. The composited base course underlying the pavement within the parking area to the northeast of Green Drive is shown as *Composite #1* in the laboratory sieve analysis. The composited base courses underlying the pavement within the roadway and parking area to the southwest of Green Drive is shown as *Composite #2* in the laboratory sieve analysis.

6.2.3 Existing Fill

Soils interpreted to be Fill materials were encountered underlying the pavement/pavement base at all boring locations with the exception of B-5 and B-11. The Fill material typically consisted of tan, medium dense, silty Sand (SM) that extended from 1.0 feet to 4.0 feet bgs where encountered. The gradation of the Fill materials was typically consistent with reworked native Outwash Sands. The depth of Fill has been summarized in Table 5 below.

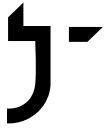
6.2.4 Outwash

The native soils underlying the topsoil, pavement base, or existing fill in all boring explorations



consisted of Outwash Sand. Small amounts of Peat, organics and relic topsoil were observed within the soil matrix, the extent of which has been summarized in Table 5 below. The soil typically consisted of tan to grey-tan, poorly graded Sand (SP-SM) with silt to approximately 4.0 feet bgs and poorly graded Sand (SP-SM) with silt from 4.0 feet bgs to the full depth of exploration. It is possible that some of the native materials encountered may have been reworked.

Table 5 – Fill & Organics Subsurface Data		
Location	Depth of Possible Fill (Feet bgs)	Organic Materials Observations (Feet bgs)
B-1	-	-
B-2	-	-
B-3	2.0	Relic topsoil 2.0 - 2.5
B-4	2.0	Peat 5 – 5.5
B-5	1.67	Relic topsoil 1.67 - 2.0, Peat 3.5 - 4.0
C/B-2	2.0	-
C/B-3	4.0	-
C/B-4	2.5	Peat 2.0 - 3.5
C/B-5	4.0	-
C/B-6	-	-
C/B-7	4.0	-
C/B-8	-	8.5 – 9.0
C/B-9	1.0	-
C/B-10	1.25	1.25 – 1.5
C/B-11	-	Soil mixed with organics 2.0 – 4.0
C/B-12	2.0	Soil mixed with organics 2.0 – 4.0
C/B-13	1.0	Relic topsoil 1.0 - 1.25
C/B-14	-	-
C/B-15	-	-
C/B-16	2.0	-
C/B-17	3.0	-
C/B-18	2.0	Peat 5.0 – 5.33
C/B-19	1.0	-
C/B-20	-	Organic silt seams 0.5 – 2.0, Peat 2.0 – 2.5
C/B-21	2.0	Trace organics 2.0 – 4.0, Peat 5.5 – 6.0
C/B-22	1.5	-
C/B-23	2.0	Peat 5.0 – 5.33, Trace Peat fibers 7.0 – 9.0
C/B-24	2.0	Organics 1.75 – 2.0
C/B-25	1.5	-
C/B-26	1.5	-
C/B-27	1.0	-
C/B-28	6.0	-



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 all test borings at approximate depths between 5.0 and 9.0 feet bgs. JTC estimates that this investigation occurred during a period of seasonally normal to high 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.

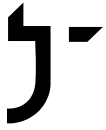
7.1 California Bearing Ratio and Subgrade Preparation

Based on the results of California Bearing Ratio (CBR) laboratory and field testing, JTC recommends using a CBR design value of 9 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 consist primarily of poorly graded Sand (SP-SM) with silt, with an average amount passing the No. 200 sieve of 7.9 percent by weight. Below a depth of 4 feet bgs, native soils generally consist primarily of poorly graded Sand (SP) with an average amount passing the No. 200 sieve of 3.8 percent by weight. 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-3, and the native soils below a depth of 4 feet bgs be classified as frost group FG-4. *Note that the percent of material passing the No. 200 sieve within the table does not correspond to the percent of material passing the No. 200 sieve used to determine the USCS classification.*



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 E: Soft 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, some of the soils are 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:

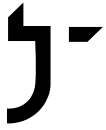
- During site grading, 3 field density tests should be performed for every 1,000 square feet (per lift) of *Gravel Borrow* or *Crushed Stone* placement, at a minimum. At least 3 tests should be performed on each lift of material even if the lift is less than 1,000 square feet;
- During backfilling of 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: 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

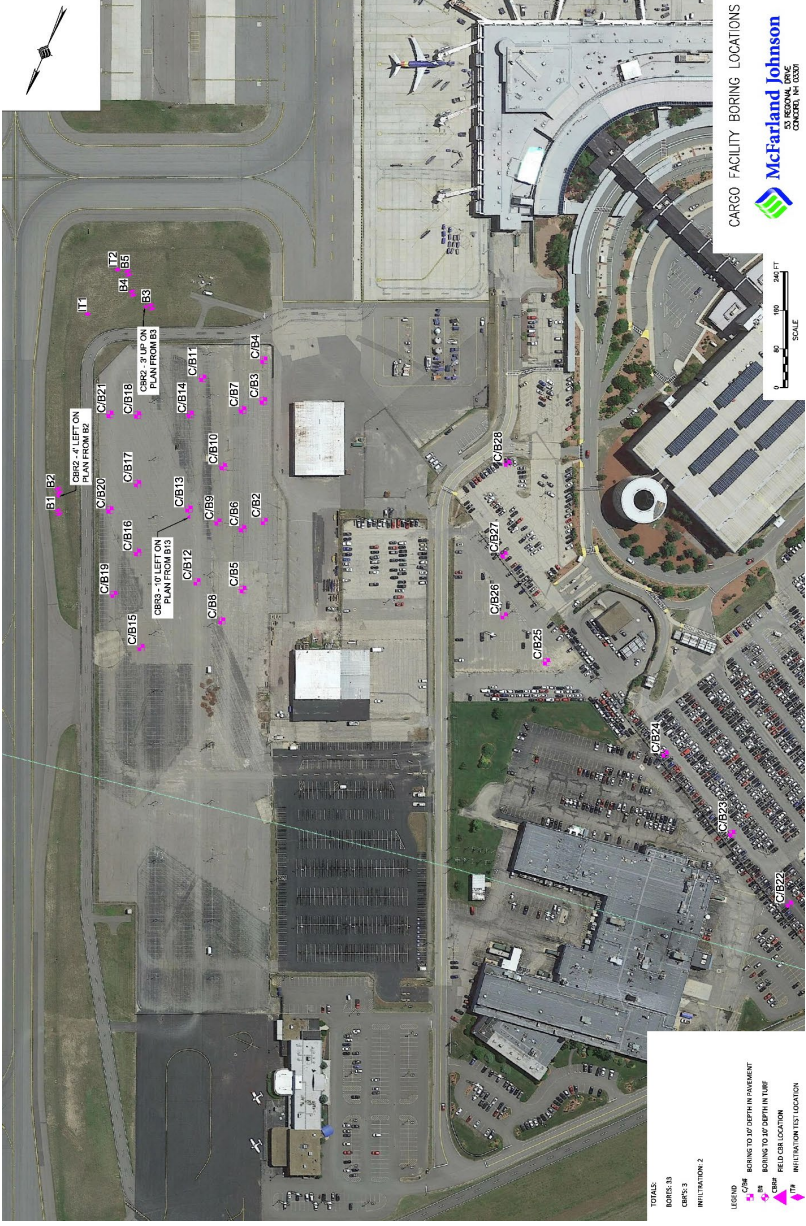
7. This report has been prepared for the exclusive use of McFarland Johnson for the Green Drive Cargo Facility Apron and Access Road project at Manchester – Boston Regional Airport (MHT) located in Manchester, NH. All considerations are based on the available information and is in accordance with generally 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.

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**APPENDIX A: CARGO FACILITY AND ACCESS ROAD DESIGN SURVEY &
EXPLORATION LOCATION PLAN**

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Notes:

1. Test borings were performed on October 18 – 21, 2021 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 2021 “Cargo Facility Boring Locations” prepared by McFarland Johnson
4. Not to Scale.

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APPENDIX B: TEST BORING LOGS & KEY TO SYMBOLS AND DESCRIPTIONS




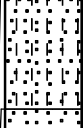






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LOG OF BORING No. C/B-2

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 3.5" Asphalt Pavement			SS01	7 7 7 9						
0.3	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	8 14 12 10						
4	[FILL] Tan-brown, poorly silty Sand (SM); medium dense -shattered rock in spoon										
2	[GLACIAL OUTWASH] Grey-tan, poorly graded Sand (SP-SM) with silt; medium dense			SS03	5 9 9 9						
5	Grey-tan, poorly graded Sand (SP); medium dense										
8	-becomes loose -becomes grey			SS04	4 4 4 7						
12											
16				SS05	1 4 3 2						
20	-becomes very loose										
22	Boring terminated at 22 ft.			SS06	2 1 2 1						
24											
28											


Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-3

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 3.0" Asphalt Pavement			SS01	8 12 9 7						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.25	SS02	4 4 5 7						
4	[FILL] Light brown poorly graded Sand (SP-SM) with silt, medium dense -possible reworked native soil -shattered rock in spoon -becomes loose		0.5	SS03	4 5 7 7						
8	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP); medium dense; moist -becomes loose			SS04	2 3 3 7						
12											
16	-becomes very loose -no recovery			SS05	2 2 2 2						
20	-no recovery			SS06	4 3 2 3						
	Boring terminated at 22 ft.										
24											
28											








Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-4

PROJECT: MHT Development PROJECT NO.: 21-04-098
 CLIENT: McFarland-Johnson
 PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
 LOCATION: See Exploration location plan ELEVATION: G.S.
 DRILLER: Soil Exploration Corp. LOGGED BY: AP
 DRILLING METHOD: 4.25" I.D. HSA DATE: 10/19/2021
 DEPTH TO - WATER> INITIAL: 8.0 AFTER 24 HOURS:

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] 5" Asphalt Pavement			SS01	8 11 10 6						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.42	SS02	4 3 4 10						
	[FILL] Light brown poorly graded Sand (SP-SM) with silt; medium dense		0.67								
4	-possible reworked native soil			SS03	4 6 6 6						
	Dark brown peat; loose		2								
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; loose, moist		3.5								
8	-becomes medium dense										
	-orange color mottling										
	Light grey, poorly graded Sand (SP); loose			SS04	2 3 4 4						
12											
16				SS05	1 0 1 2						
20	-becomes finer			SS06	1 1 1 3						
	Boring terminated at 22 ft.										
24											
28											



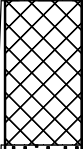
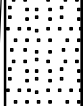
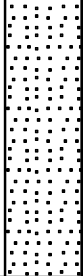
Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-5

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 3.0" Asphalt Pavement			SS01	3 8 8 9						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.25	SS02	6 10 15 18						
4	[FILL] Dark tan, poorly graded Sand (SP-SM) with silt; medium dense -possible reworked native soil -becomes dark, orange brown		1	SS03	5 7 7 9						
	Grey-tan, poorly graded Sand (SP); medium dense; moist		4	SS04	7 7 7 9 3 4 3 3						
8											
12	Boring terminated at 12 ft.										
16											
20											
24											
28											




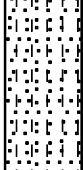


Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-6

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 4.0" Asphalt Pavement			SS01	5 6 6						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.33	SS02	6 5 5						
4	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; medium dense, Light grey-tan, poorly graded Sand (SP); medium dense -moist at spoon tip			SS03	5 8 9 10						
8	-becomes wet			SS04	10 9 9 9						
	-becomes loose			SS05	3 3 3 3						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											



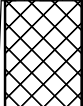
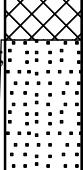
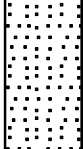
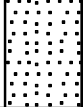
Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-7

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 4.0" Asphalt Pavement			SS01	6 15 12 10						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.33	SS02	6 3 6 8						
4	[FILL] Light brown, poorly graded Sand (SP-SM) with silt, trace gravel medium dense -becomes loose -possible reworked native soil			SS03	4 6 6 8						
8	[GLACIAL OUTWASH] Grey tan, poorly graded Sand (SP); medium dense -becomes wet			SS04	9 7 7 9						
	-becomes loose			SS05	3 4 3 2						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											




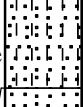



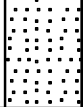
Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-8

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 2.0" Asphalt Pavement			SS01	7 12 10 11						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.17	SS02	6 4 6 5						
4	[GLACIAL OUTWASH] Tan-grey, poorly graded Sand (SP-SM) with silt; medium dense -organics at top of sample										
	Tan-grey, poorly graded Sand (SP); loose		5	SS03	3 4 4 4						
	-becomes medium dense			SS04	5 6 10 10						
8	Red-brown Peat		8.5								
	-poorly graded Sand (SP) becomes loose		9	SS05	3 4 3 4						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											







Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-9

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 9.0 **AFTER 24 HOURS:**

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] 3.5" Asphalt Pavement			SS01	6 7 7						
0.3	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	6 7 10						
0.5	[FILL] Tan, poorly graded Sand (SP-SM) with silt; medium dense				10						
4	[GLACIAL OUTWASH] Tan, poorly graded, Sand (SP-SM) with silt; medium dense			SS03	6 8 4						
	-becomes loose -becomes moist			SS04	5 4 5						
8	Tan-grey, poorly graded Sand (SP); loose; wet				4						
12	Boring terminated at 12 ft.				3 3 3 4						
16											
20											
24											
28											







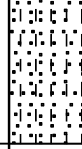
Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-10

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/19/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 3.5" Asphalt Pavement			SS01	8 7 6 6						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.3	SS02	5 6 7 9						
4	[FILL] Light tan and black, poorly graded Sand (SP-SM) with silt; medium dense		0.75								
	Dark brown Peat		1.25	SS03	5 6 7 10						
	[GLACIAL OUTWASH] Grey tan, poorly graded Sand (SP-SM) with silt; medium dense		1.5								
8	Grey tan, poorly graded Sand (SP); medium dense; wet			SS04	8 8 8 9						
				SS05	4 7 7 7						
12	Boring terminated at 11 ft.										
16											
20											
24											
28											








Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-11

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 2.5" Asphalt Pavement			SS01	7 10 9 11						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.21	SS02	5 10 7 7						
4	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt, organics; medium dense		1								
	Grey-tan, poorly graded Sand (SP); loose		5	SS03	4 4 4 6						
8	-becomes medium dense -becomes wet			SS04	6 8 8 6						
				SS05	6 8 8 8						
12	Boring terminated at 11 ft.										
16											
20											
24											
28											

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-12

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.5 **AFTER 24 HOURS:**

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] 3.0" Asphalt Pavement			SS01	4 11 13 13						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel [FILL]		0.3	SS02	8 13 13 15						
4	Tan, poorly graded Sand (SP-SM) with silt; medium dense		2								
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt and organics; medium dense		5	SS03	2 3 3 2						
8	Grey-tan, poorly graded Sand (SP); loose -becomes medium dense -becomes wet			SS04	4 5 9 12						
12	Boring terminated at 12 ft.			SS05	7 8 8 7						
16											
20											
24											
28											

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-13

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.25 **AFTER 24 HOURS:**

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] 2.5" Asphalt Pavement			SS01	5 7 7						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.21	SS02	5 8 10						
4	[FILL] Light brown, silty Sand (SM) with gravel; very dense		0.5								
	[RELIC TOPSOIL] Dark brown, sandy Silt (ML), trace organics		1.0	SS03	5 6 8						
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt ; medium dense -2" organics observed in spoon tip -becomes loose -orange color mottling		1.25	SS04	9 9 9						
8				SS05	4 4 3						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											











Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-14

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 3.5" Asphalt Pavement			SS01	8 8 8						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.3		10						
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP); medium dense		0.75	SS02	6 6 4						
4	Grey-tan poorly graded Sand (SP-SM) with silt; medium dense		5		7						
	-wet at mid depth of spoon			SS03	5 6 7						
8					12 11 10						
	Tan, poorly graded Sand (SP); loose; wet		10	SS04	10						
					4 4 4						
				SS05	4						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-15

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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] 2.5" Asphalt Pavement			SS01	5 6 6						
0.21	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	5 5 6						
0.5	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; medium dense										
4	Grey-tan, poorly graded Sand (SP); medium dense			SS03	5 8 10						
7	-becomes wet			SS04	5 8 12 10						
8				SS05	5 5 6 5						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											







Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-16

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.25 **AFTER 24 HOURS:**

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] 2.5" Asphalt Pavement			SS01	5 6 28 10						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.21	SS02	3 2 3 2						
4	[FILL] Light brown-tan, poorly graded Sand (SP-SM) with silt; dense -pulverized concrete at spoon tip		0.5								
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; loose -becomes medium dense -becomes wet		2.0	SS03	3 3 9 9						
8				SS04	9 14 14 15						
	-becomes loose			SS05	3 4 5 6						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											




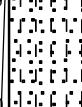
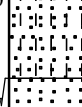
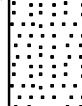
Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-17

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:** 7.0

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] 3.5" Asphalt Pavement			SS01	4 10 10 7						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.21	SS02	10 20 13 13						
4	[FILL] Dark tan, silty Sand (SM) with gravel; very dense -shattered rock in sample at 3.0 feet bgs		0.5 3.0								
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; dense -becomes medium dense		7	SS03	4 7 8 10						
8	Grey-tan poorly graded Sand (SP); medium dense; wet			SS04	5 7 7 9						
				SS05	10 8 9 10						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											








Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-18

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 9.0 **AFTER 24 HOURS:**

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] 2.5" Asphalt Pavement			SS01	3 5 9 8						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.21	SS02	8 9 10 14						
4	[FILL] Light brown-tan, poorly graded Sand (SP-SM) with silt; medium dense		0.5								
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; medium dense, moist		2	SS03	2 8 8 7						
8	-seams of organic silt observed in sample			SS04	9 12 13 13						
	4" Dark brown Peat -bright orange discoloration of sample observed		5	SS05	10 10 10 10						
	Grey-tan, poorly graded Sand (SP); medium dense; wet at spoon tip		5.33								
12	Boring terminated at 12 ft.										
16											
20											
24											
28											

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-19

PROJECT: MHT Development PROJECT NO.: 21-04-098
 CLIENT: McFarland-Johnson
 PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
 LOCATION: See Exploration location plan ELEVATION: G.S.
 DRILLER: Soil Exploration Corp. LOGGED BY: AP
 DRILLING METHOD: 4.25" I.D. HSA DATE: 10/20/2021
 DEPTH TO - WATER> INITIAL: 7.5 AFTER 24 HOURS:

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	TEST RESULTS				
						Plastic Limit	Liquid Limit		Water Content -	
									Penetration -	
									10 20 30 40 50	
0	[PAVEMENT] 2.5" Asphalt Pavement			SS01	7 12 10 10					
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	8 12 9 8					
4	[FILL] Brown-tan, poorly graded Sand (SP-SM) with silt; medium dense									
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; medium dense,			SS03	6 5 8 9					
8	Grey-tan, poorly graded Sand (SP-SM) with silt; medium dense -becomes wet			SS04	10 9 8 9					
				SS05	7 8 10 9					
12	Boring terminated at 11 ft.									
16										
20										
24										
28										

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-20

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.5 **AFTER 24 HOURS:**

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	TEST RESULTS				
						Plastic Limit	Liquid Limit		Water Content -	Penetration -
0	[PAVEMENT] 2.5" Asphalt Pavement			SS01	4 9 8					
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.21	SS02	7 6 5 3					
4	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; medium dense -organic silt seams observed in sample		0.6							
	6" Dark brown Peat		2	SS03	4 6 7 8					
	Grey-tan, poorly graded Sand (SP); medium dense		2.5							
8			5	SS04	10 5 9 10					
				SS05	9 9 10 10					
12	Boring terminated at 11 ft.									
16										
20										
24										
28										

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-21

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 8.5 **AFTER 24 HOURS:**

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] 3.0" Asphalt Pavement			SS01	10 12 12 13						
0.25	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	11 16 14 16						
0.75	[FILL] Tan, silty Sand (SM) with silt and gravel; lens of grey silt near bottom of sample; medium dense -possible reworked native soil -shattered rock in spoon			SS03	6 7 7 7						
2	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt, trace organics; medium dense			SS04	11 7 10 8						
5.5	6" Dark orange-brown, Peat -bright orange staining below organics			SS05	11 11 10 9						
6.0	Tan-grey, poorly graded Sand (SP); medium dense; wet										
7	Boring terminated at 11 ft.										
12											
16											
20											
24											
28											







Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-22

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 6.5 **AFTER 24 HOURS:**

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] 4.5" Asphalt Pavement			SS01	6 11 2 1						
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.38	SS02	2 3 4 3						
4	[FILL] Orange-tan, poorly graded Sand (SP-SM) with silt and gravel; medium dense		0.75								
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; loose -no recovery		1.5	SS03	3 4 3 5						
8	Grey-tan, well graded Sand (SW-SM) with silt; medium dense; wet -shattered rock in spoon			SS04	9 10 10 8						
				SS05	10 7 4 4						
12	Boring terminated at 11 ft.										
16											
20											
24											
28											








Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-23

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 6.0 **AFTER 24 HOURS:**

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] 4.0" Asphalt Pavement			SS01	8						
0.3	[PAVEMENT BASE] Dark brown, poorly graded Sand (SP-SM) with silt and gravel			SS02	8						
1	[FILL] Light brown, poorly graded Sand (SP-SM) with silt and gravel; medium dense				11						
2	[GLACIAL OUTWASH] Grey-tan, poorly graded Sand (SP-SM) with silt; medium dense			SS03	2						
5	4" Dark Brown Peat; loose			SS04	3						
5.33	Grey-tan, poorly graded Sand (SP); loose; wet -becomes medium dense -trace peat fibers in sample -becomes loose			SS05	5						
8					10						
12	Boring terminated at 11 ft.				9						
16					8						
20					4						
24					3						
28					5						








Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-24

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 6.5 **AFTER 24 HOURS:**

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] 4.0" Asphalt Pavement			SS01	4 5 5 9						
0.33	[PAVEMENT BASE] Grey, silty Sand (SM) with gravel			SS02	8 10 9 10						
0.83	[FILL] Grey-black, silty Sand (SM) with gravel; medium dense -organics at spoon tip										
1.75	3" Black-brown organics/muck			SS03	5 7 8 9						
2	[GLACIAL OUTWASH] Tan-grey, poorly graded Sand (SP); medium dense -wet at spoon tip			SS04	6 6 5 4						
	-becomes loose			SS05	3 3 2 6						
12	Boring terminated at 11 ft.										
16											
20											
24											
28											




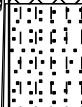
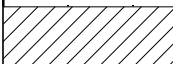
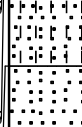



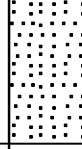

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-25

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 5.0 **AFTER 24 HOURS:**

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] 3.5" Asphalt Pavement			SS01	5 12 13 14						
0.3	[PAVEMENT BASE] Light brown-grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	9 12 15 14						
0.75	[FILL] Dark brown, poorly grade Sand (SP-SM) with silt and gravel; medium dense			SS03	3 5 5 6						
1.5	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; medium dense			SS04	8 5 4 6						
5	Grey-tan, poorly graded Sand (SP); wet; loose			SS05	3 3 5 4						
12	Boring terminated at 11 ft.										
16											
20											
24											
28											





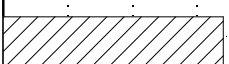






Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-26

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 5.0 **AFTER 24 HOURS:**

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] 3.5" Asphalt Pavement			SS01	8 18 17 18						
0.3	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	13 14 20 19						
0.6	[FILL] Light brown, poorly graded Sand (SP-SM) with silt and gravel; dense										
1.5	[GLACIAL OUTWASH] Tan, well graded Sand (SW-SM) with silt; dense -lenses of black sand at mid depth of sample			SS03	2 4 5 6						
5	Grey-tan, poorly graded Sand (SP); loose; wet -becomes very loose			SS04	5 6 2 2						
				SS05	4 1 1 1						
12	Boring terminated at 11 ft.										
16											
20											
24											
28											







Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-27

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 5.0 **AFTER 24 HOURS:**

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] 3.5" Asphalt Pavement			SS01	14 18 20 20						
0.3	[PAVEMENT BASE] Light brown-grey, poorly graded Sand (SP-SM) with silt and gravel			SS02	15 26 25 27						
0.6	[FILL] Dark brown, poorly grade Sand (SP-SM) with silt and gravel; dense			SS03	4 9 12 10						
1.0	[GLACIAL OUTWASH] Tan, well graded Sand (SW-SM) with silt; dense, moist			SS04	8 6 4 4						
2	Grey-tan, poorly graded Sand (SP-SM) with silt; very dense, -becomes medium dense -becomes loose			SS05	4 4 3 2						
12	Boring terminated at 11 ft.										
16											
20											
24											
28											

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. C/B-28

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/20/2021
DEPTH TO - WATER> INITIAL: 6.5 **AFTER 24 HOURS:**

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
0	[PAVEMENT] 4.5" Asphalt Pavement			SS01	11 20 13 13			
	[PAVEMENT BASE] Grey, poorly graded Sand (SP-SM) with silt and gravel		0.38	SS02	12 26 50/1"			76
4	[FILL] Light brown, silty Sand (SM) with gravel; medium dense -shattered rock in spoon Brown grey, poorly sorted Sand (SP-SM) with silt and gravel; very dense -shattered rock in spoon		0.75	SS03	15 16 4 4			
8	-spoon refusal at 3.1 feet bgs -becomes medium dense -crushed concrete in top half of sample		6	SS04	4 3 3 4			
	[GLACIAL OUTWASH] Grey-tan, poorly graded Sand (SP); loose, wet -becomes medium dense			SS05	6 5 3 2			
12	Boring terminated at 11 ft.							
16								
20								
24								
28								







Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. B-1

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/18/2021
DEPTH TO - WATER> INITIAL: 5.5 **AFTER 24 HOURS:**

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 sandy Silt (ML), roots, organics			SS01	1 5 6 8						
	[GLACIAL OUTWASH] Tan, poorly graded Sand (SP-SM) with silt; medium dense		0.75	SS02	7 8 7 8						
4	Tan, poorly graded Sand (SP); medium dense; wet		5	SS03	4 7 7 10						
8	-becomes loose			SS04	6 7 7 7						
12	Boring terminated at 12 ft.			SS05	2 3 3 4						
16											
20											
24											
28											





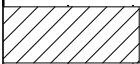

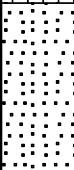


Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. B-2

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/18/2021
DEPTH TO - WATER> INITIAL: ∇ 5.5 **AFTER 24 HOURS:** ∇

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 - 				
							10	20	30	40	50
0	[TOPSOIL] Dark brown sandy Silt (ML), roots, organics			SS01	2 4 7 9						
	[GLACIAL OUTWASH] Grey-tan, laminated, poorly graded Sand (SP-SM) with silt; medium dense -orange color mottling		0.67	SS02	6 11 10 11						
4											
			5	SS03	4 6 6 7						
	Grey-tan, poorly graded Sand (SP); medium dense; wet -orange color mottling			SS04	5 6 6 7						
8											
				SS05	1 2 2 2						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											



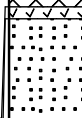


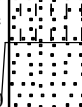
Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. B-3

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/18/2021
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

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 sandy Silt (ML), roots, organics		0.75	SS01	2 5 5 6						
	[FILL] Light brown, poorly graded Sand (SP-SM) with silt; medium dense			SS02	5 12 12 12						
4	-native sand reworked with topsoil		2								
	[RELIC TOPSOIL] Dark brown, sandy Silt (ML), trace organics		2.25	SS03	5 8 8 8						
	[GLACIAL OUTWASH] Grey to tan, laminated, poorly graded Sand (SP); medium dense, moist			SS04	6 7 7 10						
8	-lenses of black sand in sample		5								
	Grey-tan, poorly graded Sand (SP-SM) with silt; medium dense -heavy orange staining at top of sample -becomes wet		10	SS05	5 6 6 5						
12	Grey-tan, poorly graded Sand (SP); medium dense										
	Boring terminated at 12 ft.										
16											
20											
24											
28											








Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. B-4

PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/18/2021
DEPTH TO - WATER> INITIAL: 9.0 **AFTER 24 HOURS:**

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 sandy Silt (ML), roots, organics			SS01	2 3 4 6						
	[FILL] Light brown, poorly graded Sand (SP-SM) with silt; loose			SS02	6 12 14 14						
4	[RELIC TOPSOIL] Dark brown, sandy Silt (ML), trace organics, roots										
	[GLACIAL OUTWASH] Grey to tan, laminated, poorly graded Sand (SP-SM) with silt; medium dense			SS03	6 10 10 10						
	Brown-black, organic material			SS04	9 9 9 9						
8	Dark tan, poorly graded Sand (SP-SM) with silt; medium dense -heavy orange staining at top of spoon -becomes wet			SS05	3 5 5 5						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											








Test boring backfilled with soil cuttings and/or asphalt patch upon completion.



LOG OF BORING No. B-5













PROJECT: MHT Development **PROJECT NO.:** 21-04-098
CLIENT: McFarland-Johnson
PROJECT LOCATION: Manchester-Boston Regional Airport, Manchester, NH
LOCATION: See Exploration location plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** AP
DRILLING METHOD: 4.25" I.D. HSA **DATE:** 10/18/2021
DEPTH TO - WATER> INITIAL: 9.0 **AFTER 24 HOURS:**
















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 sandy Silt (ML), roots, organics			SS01	2 4 7 7						
	[FILL] Light brown, silty Sand (SM) with gravel; medium dense -shattered rock in spoon			SS02	6 5 5 5						
4	[RELIC TOPSOIL] Dark brown, sandy Silt (ML), trace organics, roots										
	[GLACIAL OUTWASH] Grey to tan, laminated, poorly graded Sand (SP-SM) with silt; medium dense			SS03	5 5 6 7						
8	Dark brown Peat -becomes dark tan			SS04	8 8 8 9						
	-becomes wet -becomes loose			SS05	3 4 5 5						
12	Boring terminated at 12 ft.										
16											
20											
24											
28											

Test boring backfilled with soil cuttings and/or asphalt patch upon completion.

















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	
	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

MAJOR DIVISIONS		SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS OVER 50% > No. 200 SIEVE SIZE	GRAVELS		Well-graded gravels or gravel-sand mixtures, little or no fines
			Poorly graded gravels or gravel-sand mixtures, little or no fines
	MORE THAN 1/2 OF COARSE FRACTION > No. 4 SIEVE SIZE		Silty gravels, gravel-sand mixtures
			Clayey gravels, gravel-sand-clay mixtures
	SANDS		Well-graded sand or gravelly sands, little or no fines
			Poorly graded sands or gravelly sands, little or no fines
FINE-GRAINED SOILS OVER 50% < No. 200 SIEVE SIZE	MORE THAN 1/2 OF COARSE FRACTION < No. 4 SIEVE SIZE		Silty sand, sand-silt mixtures
			Clayey sands, sand-clay mixtures
	SILTS & CLAYS		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	LIQUID LIMIT 50% OR LESS		Organic silts and organic silty clays of low plasticity
			Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	SILTS & CLAYS		Inorganic clays of high plasticity, fat clays
			Organic clays of medium to high plasticity, organic silty clays, organic silts
	LIQUID LIMIT GREATER THAN 50%		Peat and other highly organic soils
			Peat and other highly organic soils

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 0 - 4 5 - 10 11-30 31 - 50 51 +	Relative Density	N-Value Su	Parting:	> 1/16 in.
COBBLES	12" to 3"	305 to 76.2		Very Loose	0 - 2	Seam:	0.5 in. to 1/16 in.
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		Loose	3 - 4	Layer:	12 in. to 0.5 in.
				Medium Dense	5 - 8	Stratum:	> 12 in.
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		Dense	9 - 15	Pocket:	Small erratic deposit
				Very Dense	16 - 30	Lens:	Lenticular deposit
SILT & CLAY	Below No. 200	Below 0.075	Standard Penetration Testing (SPT) N ₆₀ based on blows per 12 inches. WR = Weight of Rods; WH = Weight of Hammer		31 +	Occasional:	One or less per foot of thickness
					4001 +	Frequent	More than one per foot of thickness
						Varved	Alternating seams or layers of silt and/or clay and sometimes f. sand

REFERENCE: UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488-93

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APPENDIX C: LABORATORY SIEVE ANALYSIS RESULTS

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The graph displays 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 down to 0.001 mm. The curve shows that approximately 100% of the soil is finer than 0.75 mm, and about 5% of the soil is finer than 0.075 mm.

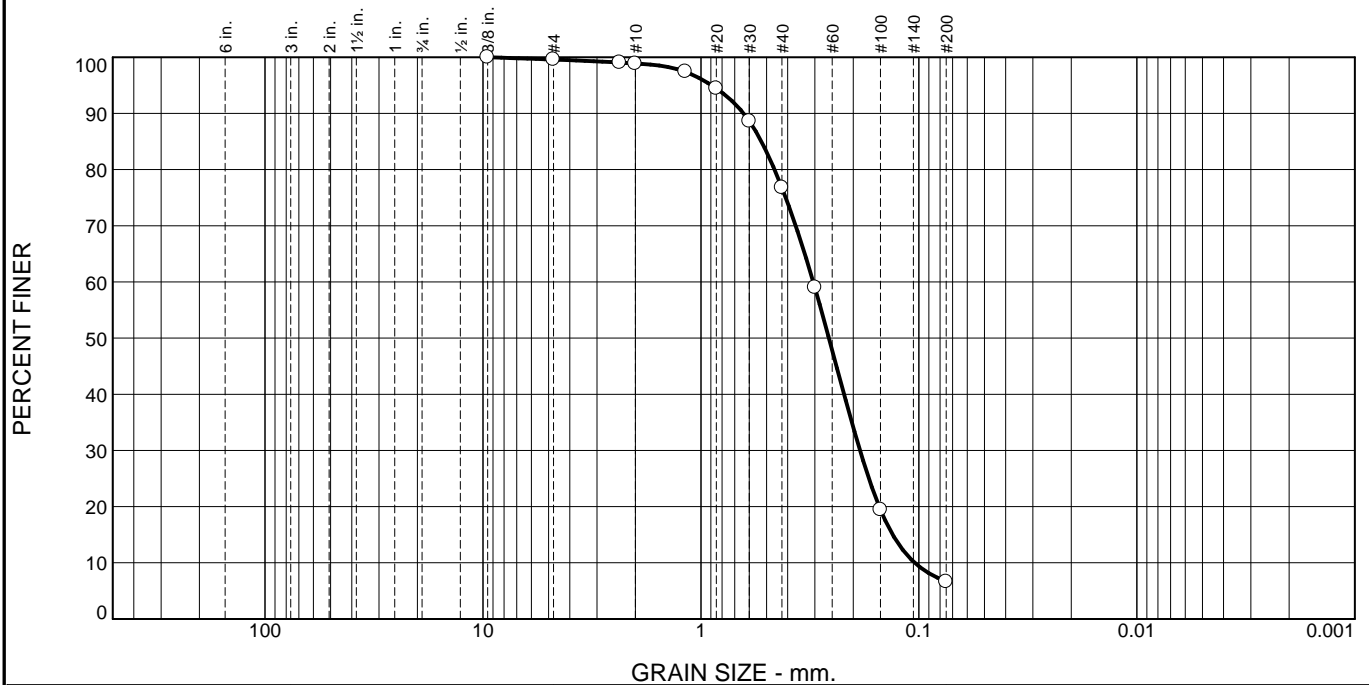
Grain Size (mm)	Percent Finer (%)
6.0	100
3.0	100
2.0	100
1.5	100
1.0	100
0.75	100
0.6	100
0.425	100
0.3	100
0.25	100
0.2	100
0.15	100
0.106	100
0.075	98
0.06	95
0.0425	88
0.03	75
0.025	58
0.02	19
0.015	8
0.0106	5

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.6		
#8	99.6		
#10	99.2		
#16	97.5		
#20	94.2		
#30	88.3		
#40	75.4		
#50	57.8		
#100	18.8		
#200	6.1		

Title: Lab Manager

Figure 813A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.7	22.1	70.2	6.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.6		
#8	99.0		
#10	98.9		
#16	97.4		
#20	94.4		
#30	88.6		
#40	76.8		
#50	59.0		
#100	19.4		
#200	6.6		

* (no specification provided)

Material Description

Light brown sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.6374 D₈₅= 0.5282 D₆₀= 0.3052
D₅₀= 0.2587 D₃₀= 0.1863 D₁₅= 0.1319
D₁₀= 0.1046 C_u= 2.92 C_c= 1.09

Remarks

Moisture content 14.2%

Date Received: 10/26/2021 **Date Tested:** 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-1 SS01

Sample Number: 3521-808

Depth: 2'-4'

Date Sampled: 10/18/2021



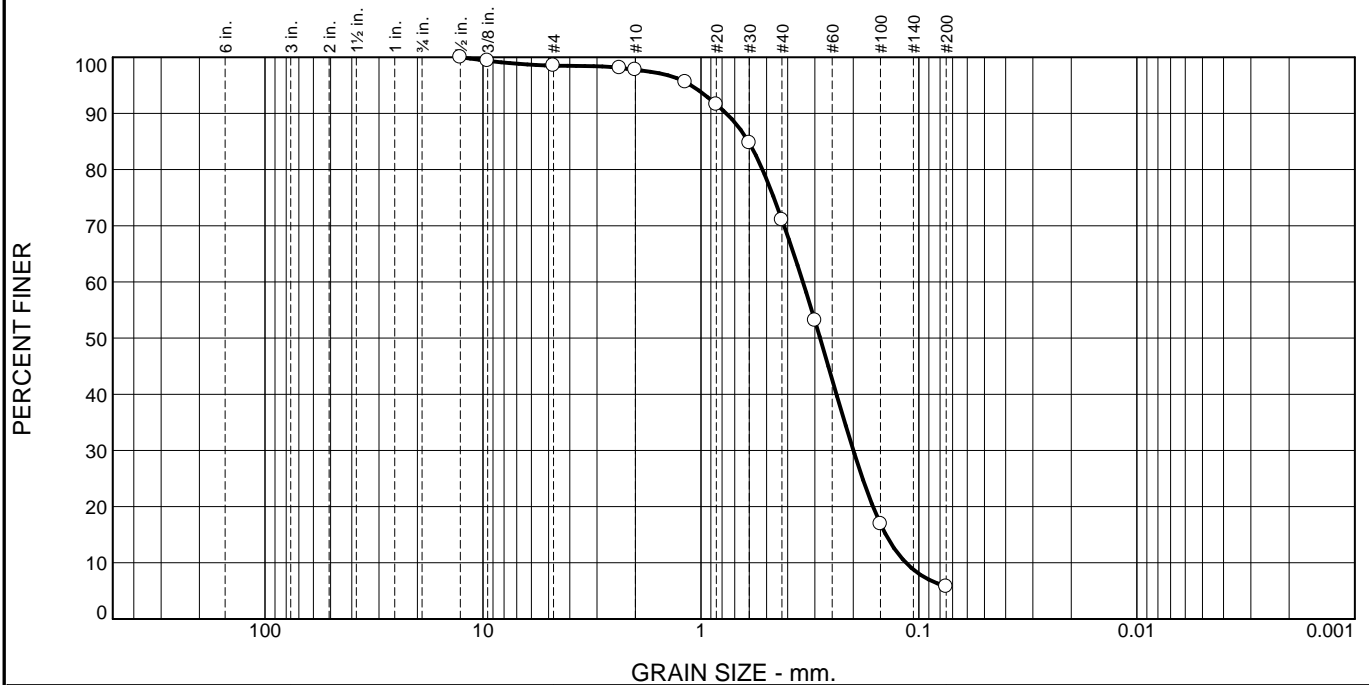
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 808A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.5	0.7	26.7	65.4	5.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	99.4		
#4	98.5		
#8	98.1		
#10	97.8		
#16	95.6		
#20	91.6		
#30	84.7		
#40	71.1		
#50	53.1		
#100	16.9		
#200	5.7		

* (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
D₉₀= 0.7652 D₈₅= 0.6054 D₆₀= 0.3405
D₅₀= 0.2839 D₃₀= 0.1998 D₁₅= 0.1417
D₁₀= 0.1148 C_u= 2.97 C_c= 1.02

Remarks
Moisture content 4.9%

Date Received: 10/26/2021 **Date Tested:** 11/8/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: B-2 SS01

Sample Number: 3521-817

Depth: 0'-2'

Date Sampled: 10/18/2021



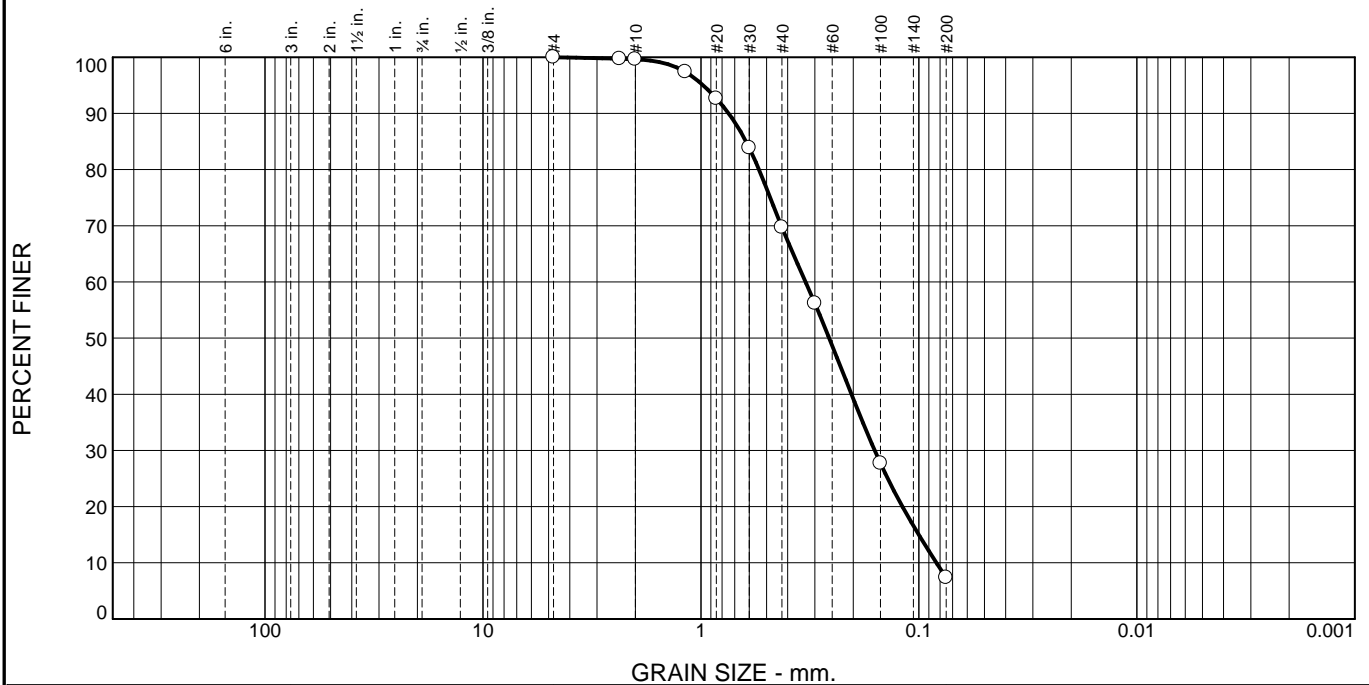
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 817A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	29.9	62.3	7.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.7		
#10	99.6		
#16	97.4		
#20	92.6		
#30	83.9		
#40	69.7		
#50	56.2		
#100	27.7		
#200	7.4		

* (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

D₉₀= 0.7465 D₈₅= 0.6208 D₆₀= 0.3311
D₅₀= 0.2579 D₃₀= 0.1595 D₁₅= 0.1002
D₁₀= 0.0831 C_u= 3.99 C_c= 0.92

Remarks

Moisture content 11.0%

Date Received: 10/26/2021 Date Tested: 10/28/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-2 SS02

Sample Number: 3521-752

Depth: 2'-4'

Date Sampled: 10/18/2021



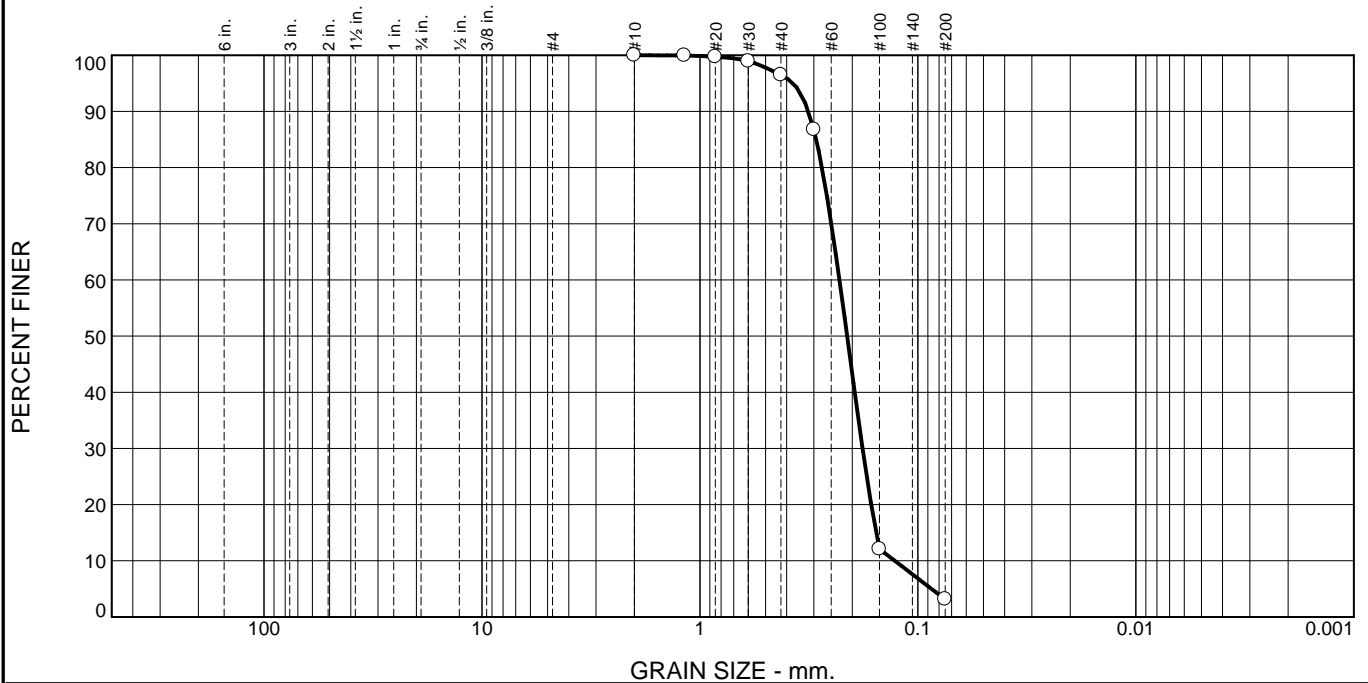
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 752A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	3.5	93.4	3.1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	100.0		
#20	99.7		
#30	98.9		
#40	96.5		
#50	86.7		
#100	12.1		
#200	3.1		

* (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

D₉₀= 0.3177 D₈₅= 0.2926 D₆₀= 0.2290
D₅₀= 0.2112 D₃₀= 0.1794 D₁₅= 0.1553
D₁₀= 0.1276 C_u= 1.79 C_c= 1.10

Remarks

Moisture content 17.2%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

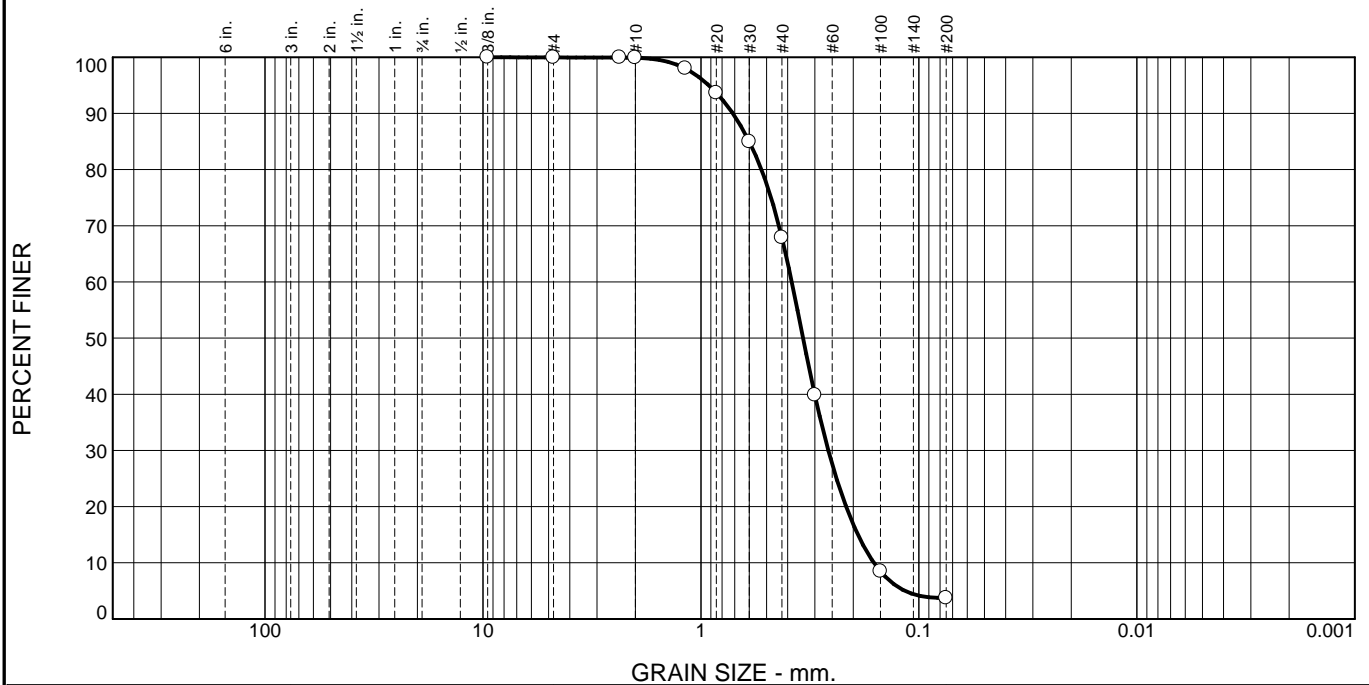
Location: B-2 SS03
Sample Number: 3521-754 **Depth:** 5'-7'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 754A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	32.0	64.2	3.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	98.0		
#20	93.7		
#30	85.0		
#40	67.9		
#50	39.8		
#100	8.5		
#200	3.7		

* (no specification provided)

Material Description
Medium brown sand

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients
D₉₀= 0.7141 D₈₅= 0.6008 D₆₀= 0.3832
D₅₀= 0.3400 D₃₀= 0.2603 D₁₅= 0.1905
D₁₀= 0.1608 C_u= 2.38 C_c= 1.10

Remarks
Moisture content 24.8%

Date Received: 10/26/2021 **Date Tested:** 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-2 SS04

Sample Number: 3521-804

Depth: 7'-9'

Date Sampled: 10/18/2021



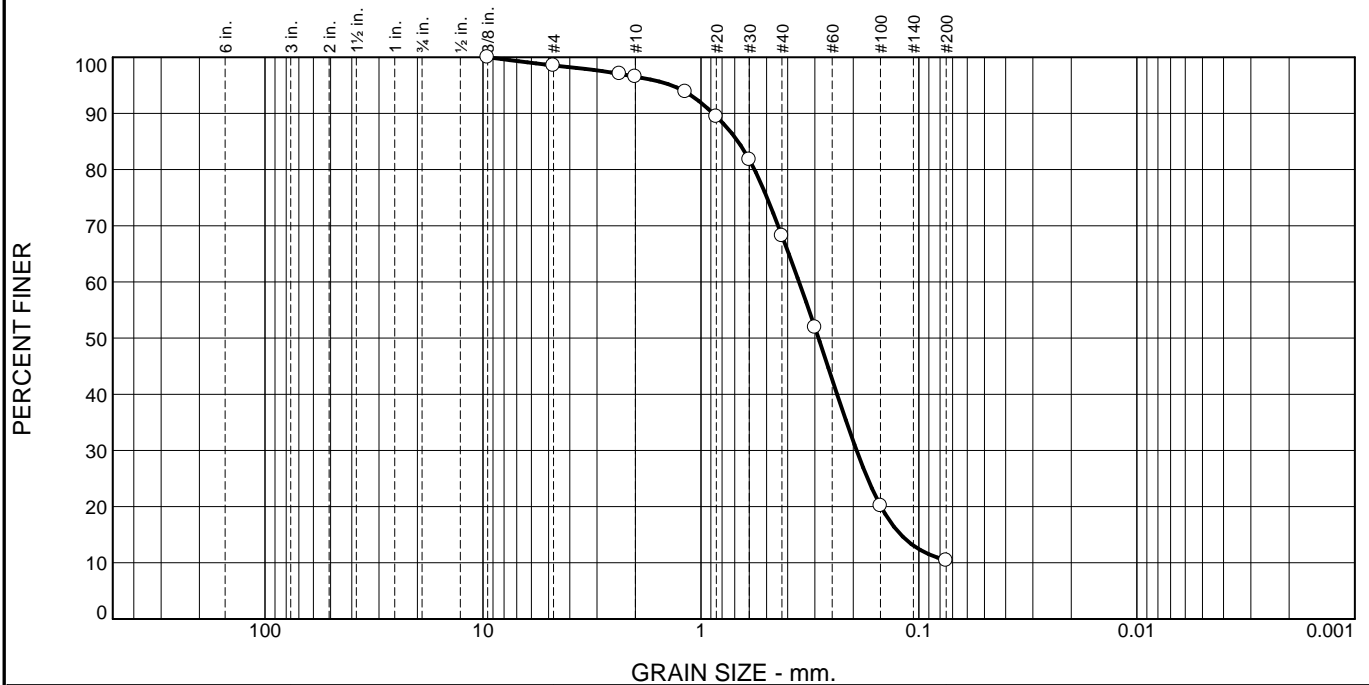
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 804A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.5	2.0	28.3	57.8	10.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	98.5		
#8	97.0		
#10	96.5		
#16	93.8		
#20	89.4		
#30	81.8		
#40	68.2		
#50	51.9		
#100	20.1		
#200	10.4		

* (no specification provided)

Material Description

Dark brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.8801 D₈₅= 0.6757 D₆₀= 0.3548
D₅₀= 0.2887 D₃₀= 0.1931 D₁₅= 0.1211
D₁₀= C_u= C_c=

Remarks

Moisture content 6.4%

Date Received: 10/26/2021 Date Tested: 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-3 SS01

Sample Number: 3521-814

Depth: 0'-2'

Date Sampled: 10/18/2021



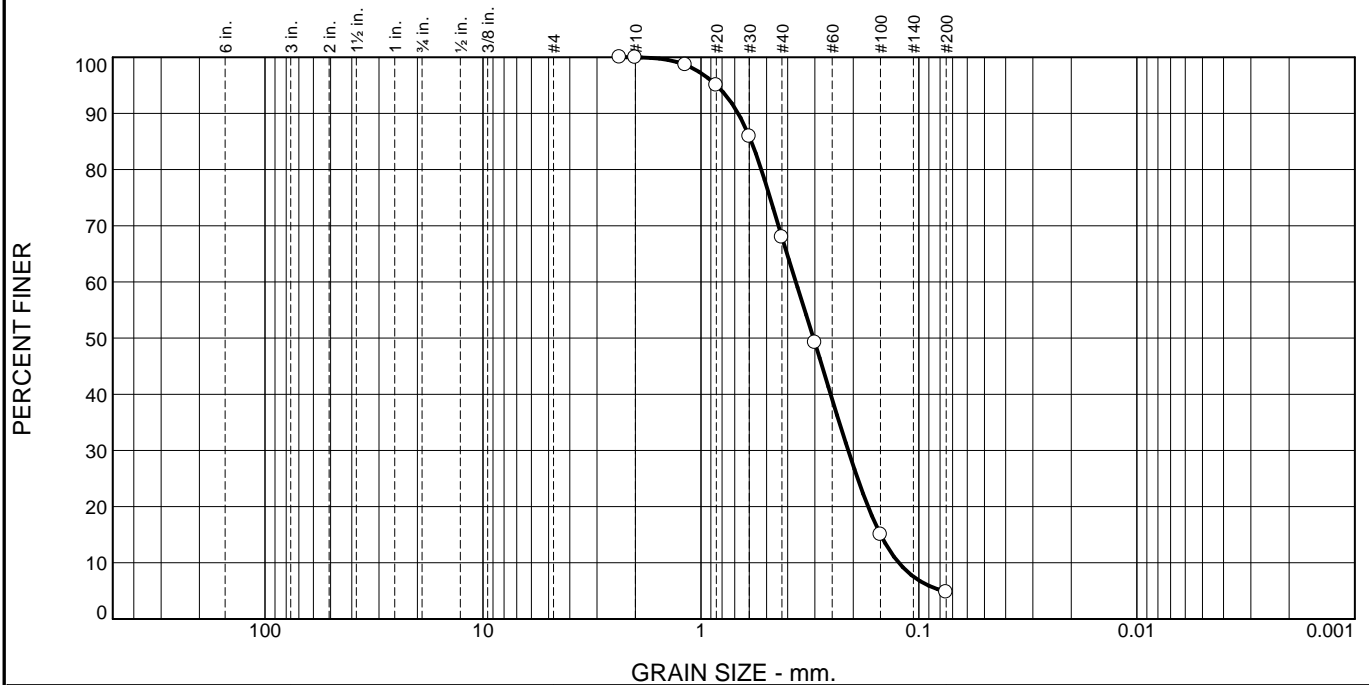
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 814A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	32.1	63.1	4.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	100.0		
#16	98.6		
#20	95.0		
#30	85.9		
#40	67.9		
#50	49.2		
#100	15.0		
#200	4.8		

* (no specification provided)

Material Description

Dark brown sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients

D₉₀= 0.6746 D₈₅= 0.5871 D₆₀= 0.3671
D₅₀= 0.3045 D₃₀= 0.2111 D₁₅= 0.1498
D₁₀= 0.1237 C_u= 2.97 C_c= 0.98

Remarks

Moisture content 5.6%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-3 SS02

Sample Number: 3521-753

Depth: 2'-4'

Date Sampled: 10/18/2021



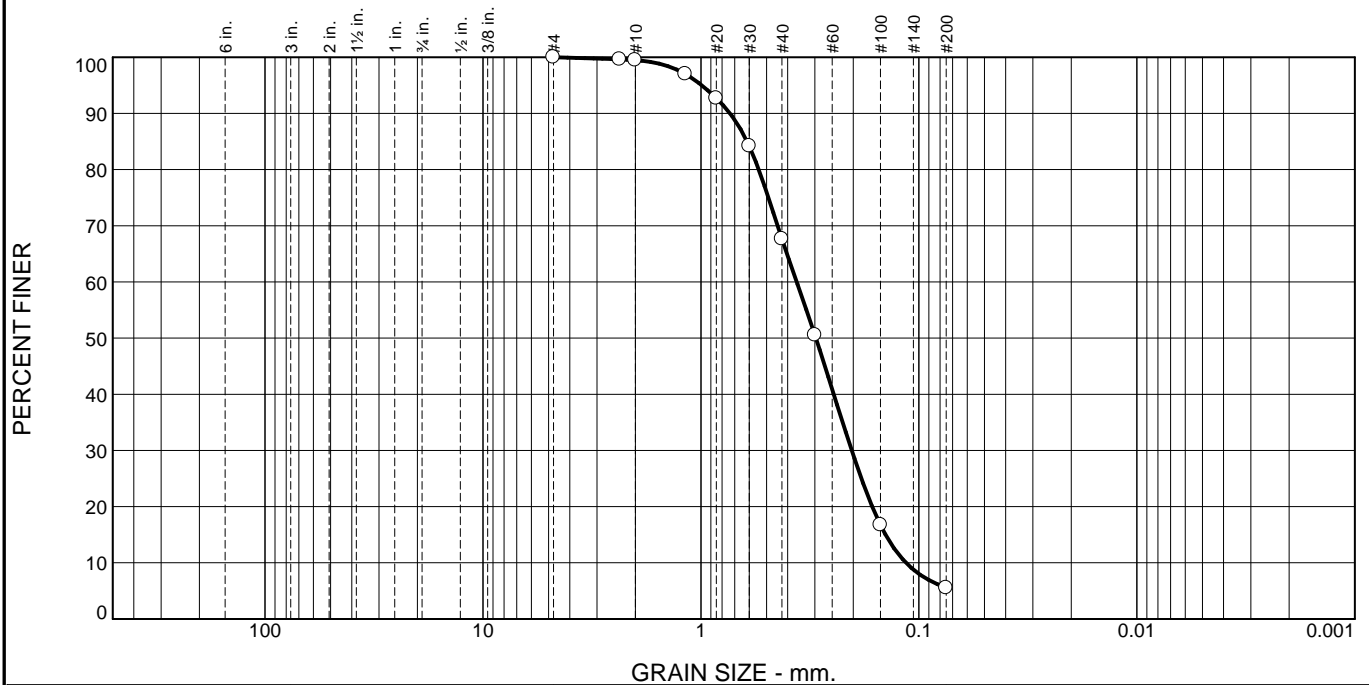
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 753A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	31.9	62.1	5.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.6		
#10	99.5		
#16	97.0		
#20	92.7		
#30	84.2		
#40	67.6		
#50	50.5		
#100	16.7		
#200	5.5		

* (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
D₉₀= 0.7354 D₈₅= 0.6138 D₆₀= 0.3638
D₅₀= 0.2968 D₃₀= 0.2033 D₁₅= 0.1422
D₁₀= 0.1147 C_u= 3.17 C_c= 0.99

Remarks
Moisture content 8.0%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-3 SS03

Sample Number: 3521-755

Depth: 5'-7'

Date Sampled: 10/18/2021



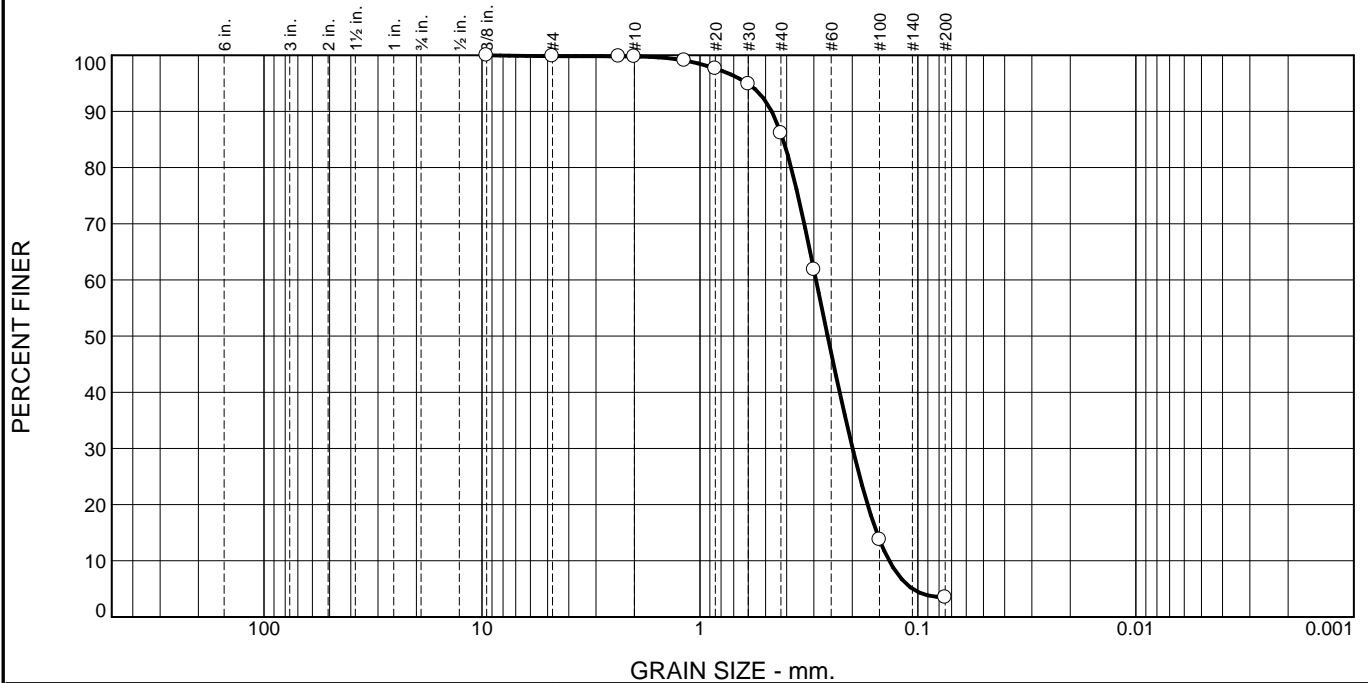
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 755A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.0	13.7	82.6	3.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.8		
#8	99.8		
#10	99.8		
#16	99.1		
#20	97.6		
#30	94.9		
#40	86.1		
#50	61.8		
#100	13.8		
#200	3.5		

* (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

D₉₀= 0.4681 D₈₅= 0.4154 D₆₀= 0.2934
D₅₀= 0.2594 D₃₀= 0.1993 D₁₅= 0.1543
D₁₀= 0.1354 C_u= 2.17 C_c= 1.00

Remarks

Moisture content 25.8%

Date Received: 10/26/2021 **Date Tested:** 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-3 SS04

Sample Number: 3521-805

Depth: 10'-12'

Date Sampled: 10/18/2021



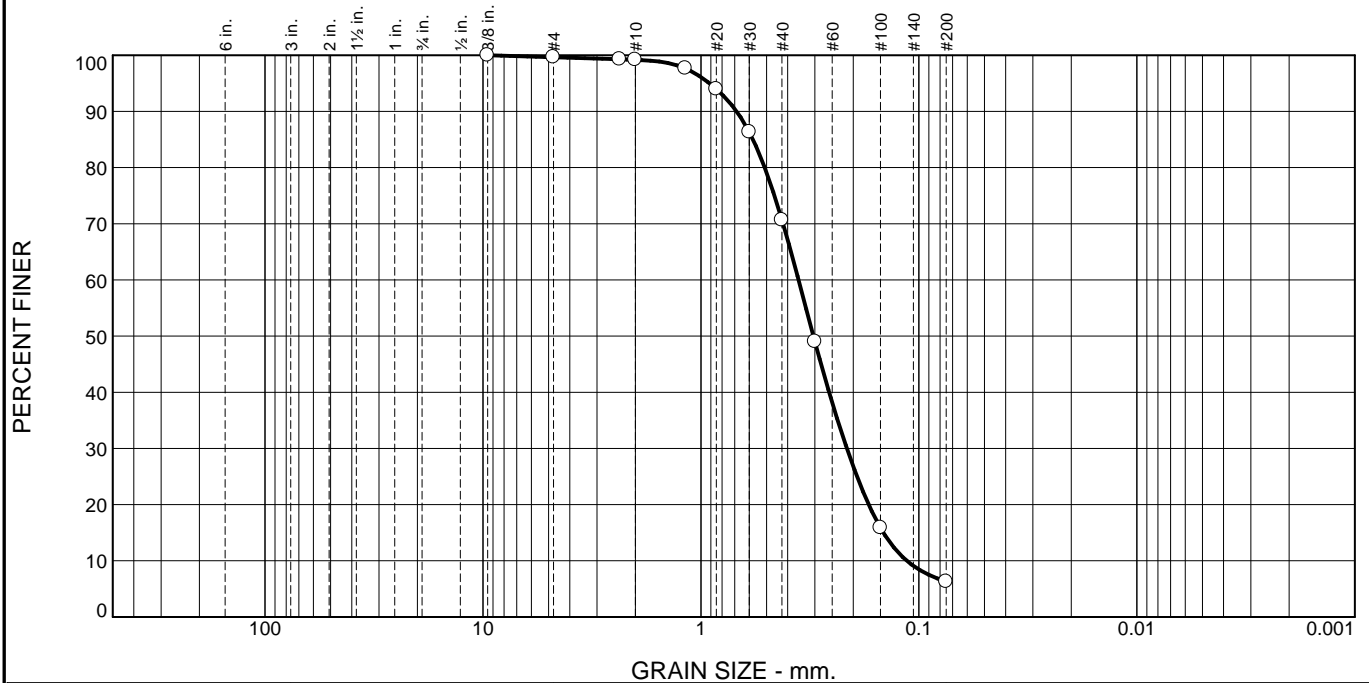
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 805A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.5	28.5	64.4	6.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.7		
#8	99.3		
#10	99.2		
#16	97.7		
#20	94.0		
#30	86.3		
#40	70.7		
#50	49.0		
#100	15.9		
#200	6.3		

* (no specification provided)

Material Description

Medium brown and dark brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.6857 D₈₅= 0.5775 D₆₀= 0.3566
D₅₀= 0.3048 D₃₀= 0.2140 D₁₅= 0.1454
D₁₀= 0.1137 C_u= 3.14 C_c= 1.13

Remarks

Moisture content 7.5%

Date Received: 10/26/2021 Date Tested: 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: B-4 SS02

Sample Number: 3521-812

Depth: 2'-4'

Date Sampled: 10/18/2021



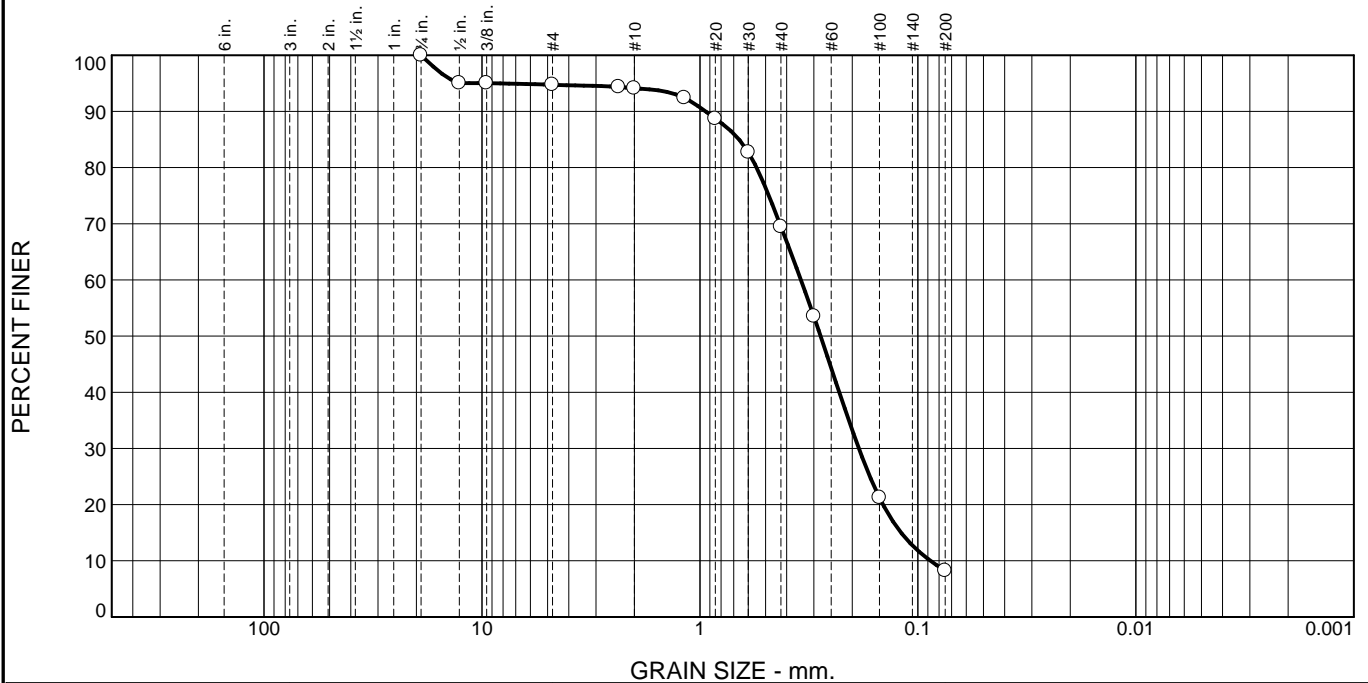
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 812A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.2	0.7	24.6	61.3	8.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	95.0		
3/8"	95.0		
#4	94.8		
#8	94.4		
#10	94.1		
#16	92.4		
#20	88.7		
#30	82.7		
#40	69.5		
#50	53.5		
#100	21.2		
#200	8.2		

* (no specification provided)

Material Description		
Dark brown sand with silt		
Atterberg Limits (ASTM D 4318)		
PL= -	LL= -	PI= -
Classification		
USCS (D 2487)= SP-SM	AASHTO (M 145)= -	
Coefficients		
D ₉₀ = 0.9428	D ₈₅ = 0.6611	D ₆₀ = 0.3441
D ₅₀ = 0.2795	D ₃₀ = 0.1866	D ₁₅ = 0.1195
D ₁₀ = 0.0876	C _u = 3.93	C _c = 1.16
Remarks		
Moisture content 7.9%		
Organics in sample		
Date Received: 10/26/2021		Date Tested: 11/5/2021
Tested By: Matt Watson		
Checked By: Robert Faria		
Title: Lab Manager		

Location: B-5 SS02

Sample Number: 3521-815

Depth: 2'-4'

Date Sampled: 10/18/2021



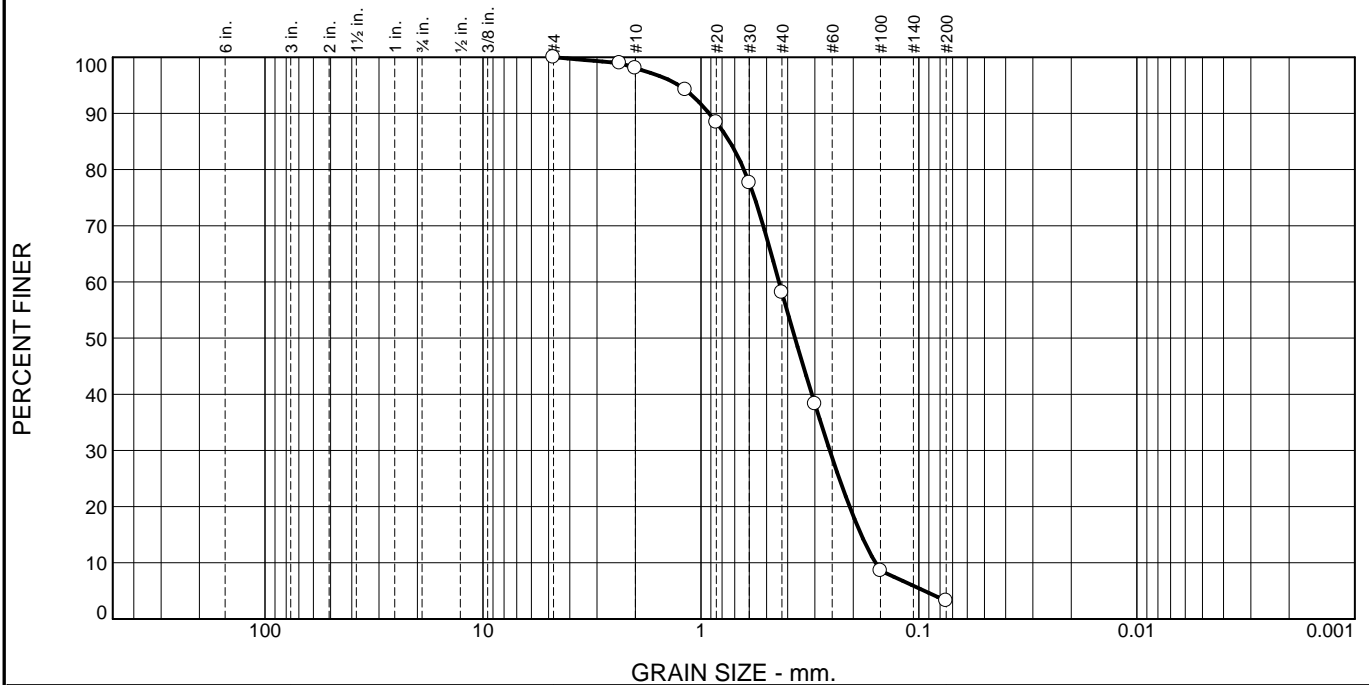
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 815A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.9	40.0	54.9	3.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.0		
#10	98.1		
#16	94.2		
#20	88.4		
#30	77.7		
#40	58.1		
#50	38.3		
#100	8.6		
#200	3.2		

* (no specification provided)

Material Description
Medium brown sand

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients
D₉₀= 0.9169 D₈₅= 0.7387 D₆₀= 0.4384
D₅₀= 0.3703 D₃₀= 0.2564 D₁₅= 0.1840
D₁₀= 0.1582 C_u= 2.77 C_c= 0.95

Remarks
Moisture content 17.4%

Date Received: 10/26/2021 **Date Tested:** 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-2 SS03

Sample Number: 3521-801

Depth: 5'-7'

Date Sampled: 10/18/2021



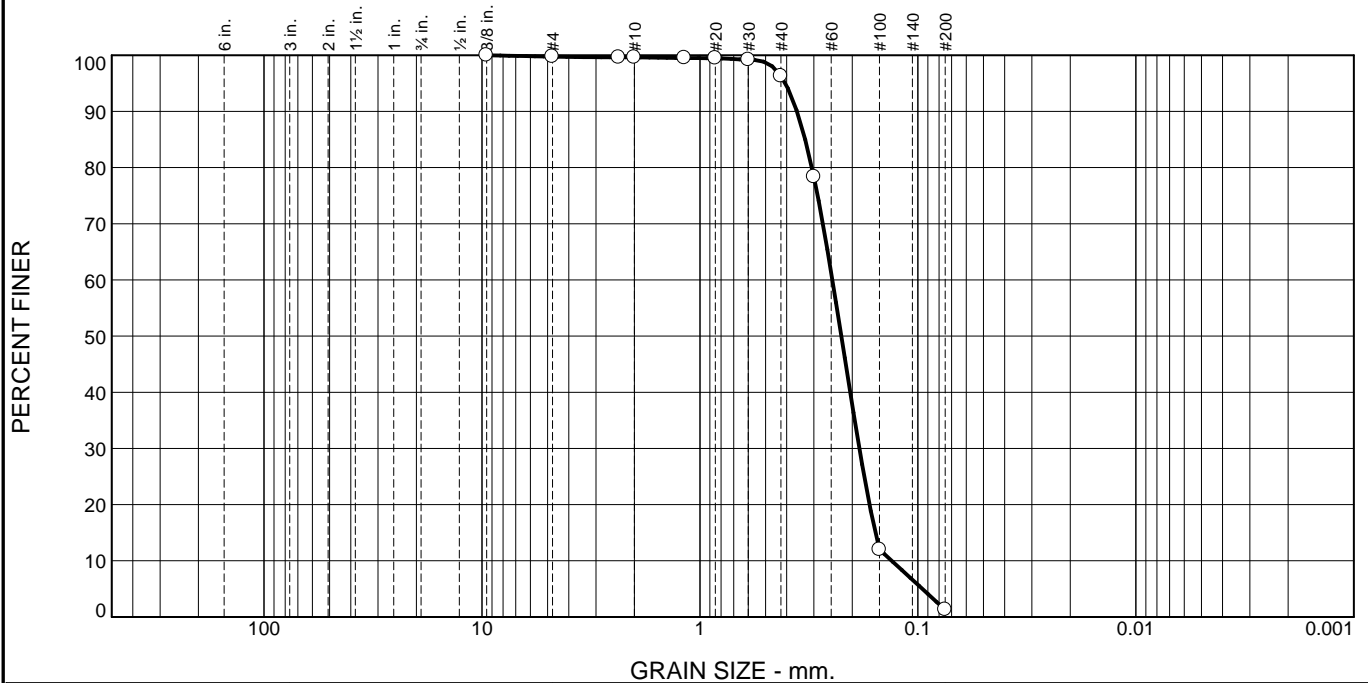
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 801A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.2	3.3	95.0	1.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.8		
#8	99.6		
#10	99.6		
#16	99.5		
#20	99.5		
#30	99.2		
#40	96.3		
#50	78.3		
#100	12.0		
#200	1.3		

* (no specification provided)

Material Description
 Medium brown sand

Atterberg Limits (ASTM D 4318)
 PL= - LL= - PI= -

Classification
 USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients

D ₉₀ = 0.3589	D ₈₅ = 0.3289	D ₆₀ = 0.2467
D ₅₀ = 0.2245	D ₃₀ = 0.1856	D ₁₅ = 0.1566
D ₁₀ = 0.1319	C _u = 1.87	C _c = 1.06

Remarks
 Moisture content 26.9%

Date Received: 10/26/2021 Date Tested: 11/5/2021
 Tested By: Matt Watson
 Checked By: Robert Faria
 Title: Lab Manager

Location: C/B-2 SS06

Sample Number: 3521-800

Depth: 20'-22'

Date Sampled: 10/18/2021



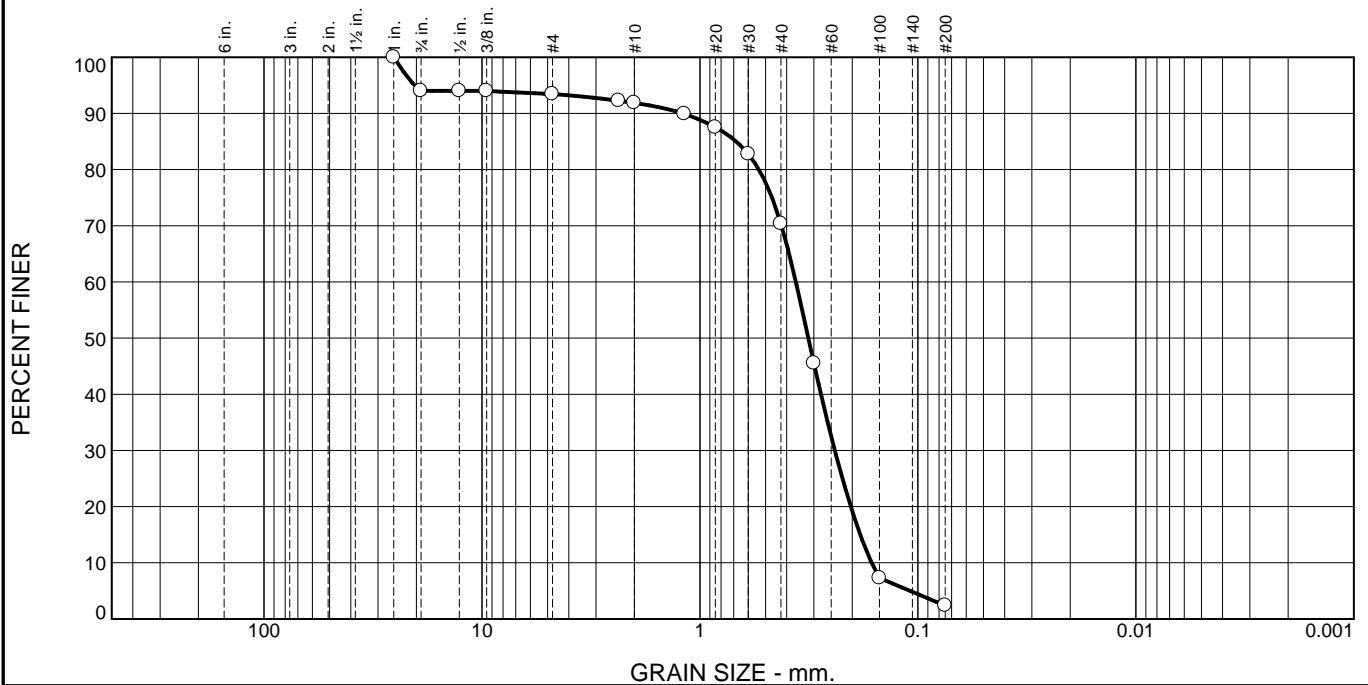
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 800A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.0	0.6	1.5	21.5	68.0	2.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	94.0		
1/2"	94.0		
3/8"	94.0		
#4	93.4		
#8	92.3		
#10	91.9		
#16	89.9		
#20	87.5		
#30	82.8		
#40	70.4		
#50	45.5		
#100	7.3		
#200	2.4		

* (no specification provided)

Material Description

Light brown and medium brown sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients

D₉₀= 1.1995 D₈₅= 0.6813 D₆₀= 0.3631
 D₅₀= 0.3182 D₃₀= 0.2405 D₁₅= 0.1839
 D₁₀= 0.1631 C_u= 2.23 C_c= 0.98

Remarks

Moisture content 24.1%

Date Received: 10/26/2021 Date Tested: 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-3 SS04

Sample Number: 3521-806

Depth: 10'-12'

Date Sampled: 10/18/2021



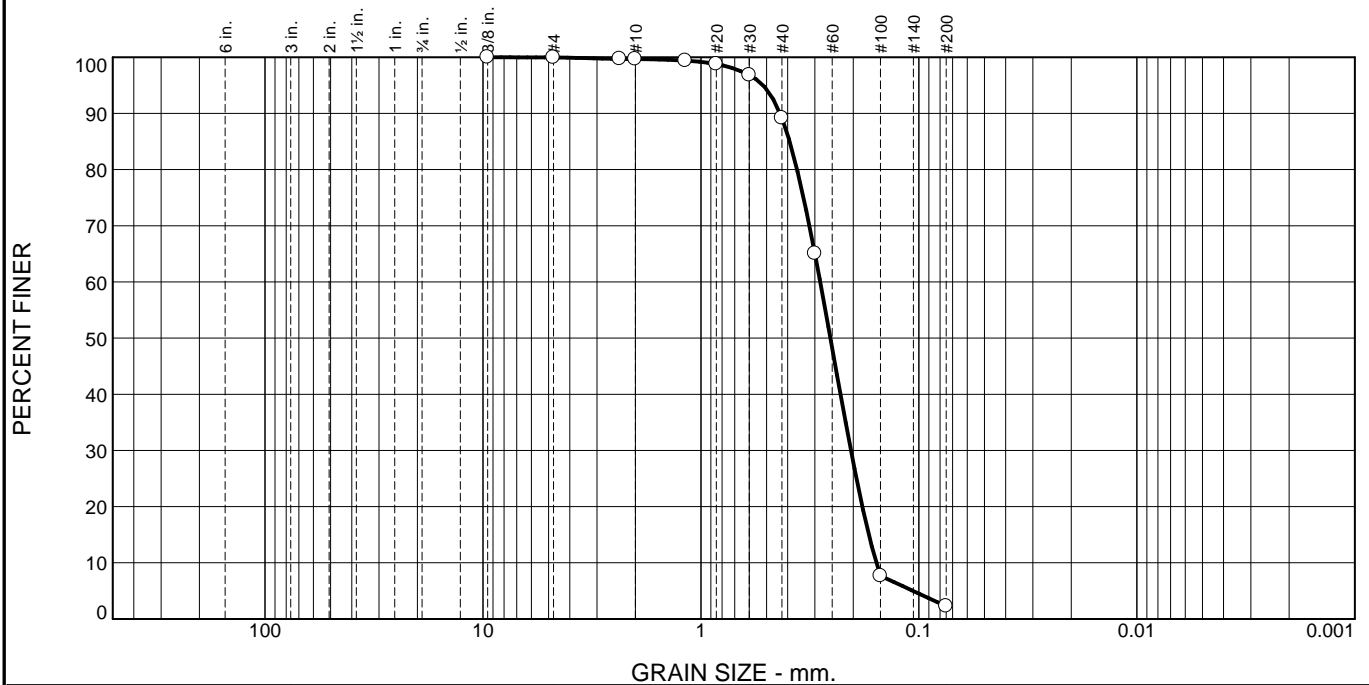
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 806A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	10.5	86.9	2.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	100.0		
#8	99.7		
#10	99.7		
#16	99.4		
#20	98.8		
#30	96.8		
#40	89.2		
#50	65.0		
#100	7.7		
#200	2.3		

* (no specification provided)

Material Description

Medium brown sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients

D₉₀= 0.4334 D₈₅= 0.3918 D₆₀= 0.2835
D₅₀= 0.2546 D₃₀= 0.2050 D₁₅= 0.1697
D₁₀= 0.1567 C_u= 1.81 C_c= 0.95

Remarks

Moisture content 26.3%

Date Received: 10/26/2021 Date Tested: 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-3 SS05

Sample Number: 3521-802

Depth: 10'-12'

Date Sampled: 10/18/2021



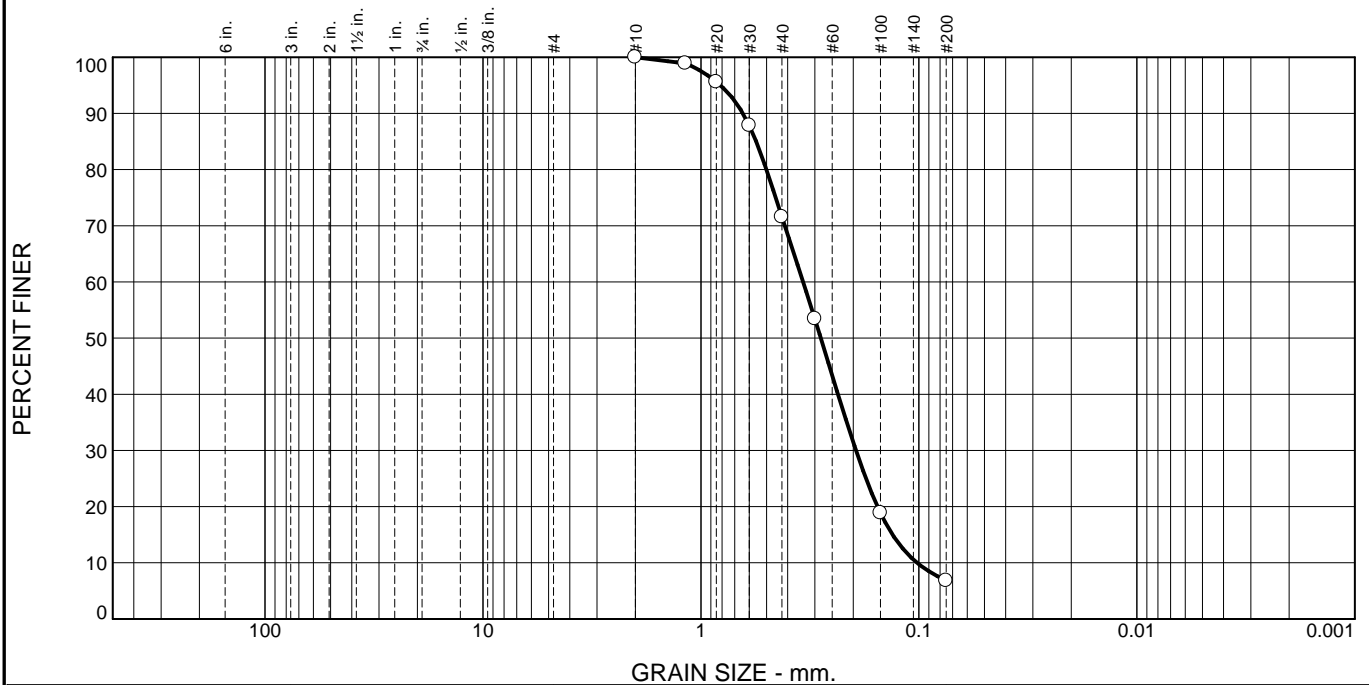
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 802A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	28.4	64.8	6.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	98.9		
#20	95.6		
#30	87.8		
#40	71.6		
#50	53.4		
#100	18.9		
#200	6.8		

* (no specification provided)

Material Description
Light brown and dark brown sand with silt

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients
D₉₀= 0.6417 D₈₅= 0.5583 D₆₀= 0.3398
D₅₀= 0.2818 D₃₀= 0.1944 D₁₅= 0.1321
D₁₀= 0.1020 C_u= 3.33 C_c= 1.09

Remarks
Moisture content 5.2%

Date Received: 10/26/2021 **Date Tested:** 11/1/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-4 SS01

Sample Number: 3521-779

Depth: 0'-2'

Date Sampled: 10/18/2021



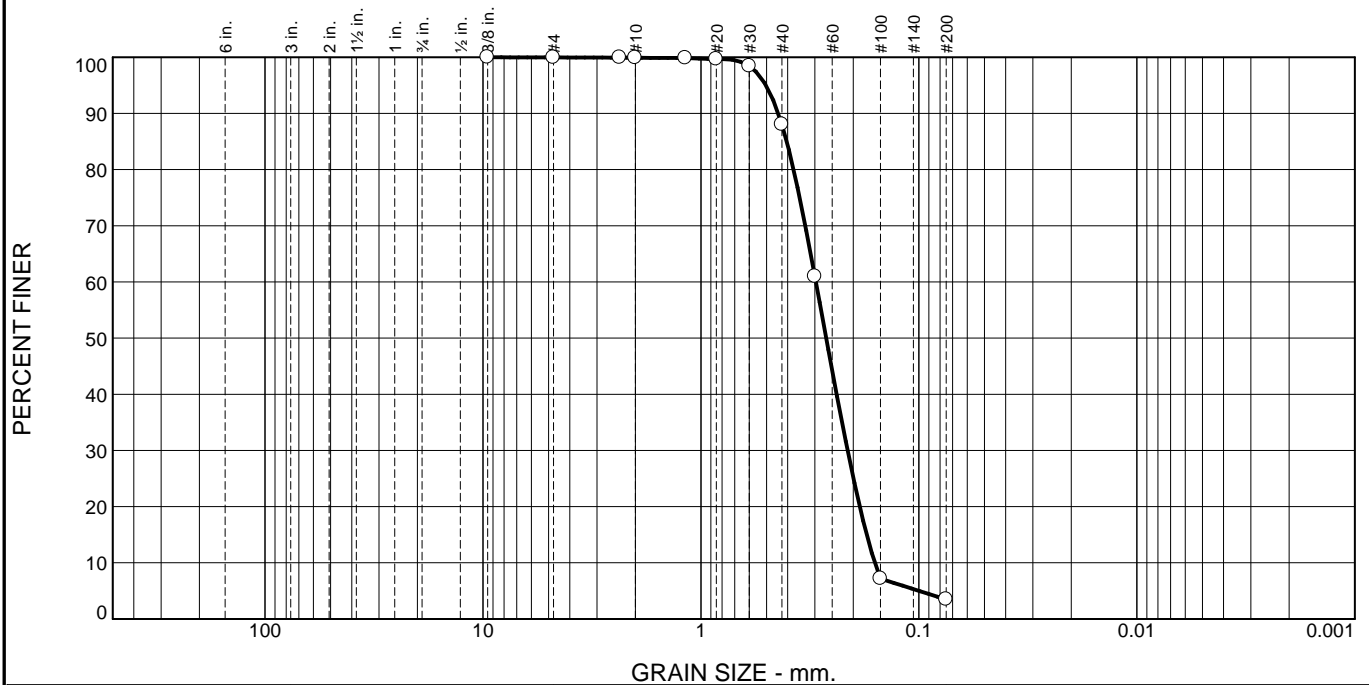
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 779A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	11.9	84.5	3.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.9		
#20	99.7		
#30	98.4		
#40	88.0		
#50	61.0		
#100	7.2		
#200	3.5		

* (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

D₉₀= 0.4416 D₈₅= 0.4040 D₆₀= 0.2968
D₅₀= 0.2662 D₃₀= 0.2124 D₁₅= 0.1735
D₁₀= 0.1592 C_u= 1.86 C_c= 0.95

Remarks

Moisture content 26.8%

Date Received: 10/26/2021 **Date Tested:** 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-4 SS06

Sample Number: 3521-807

Depth: 20'-22'

Date Sampled: 10/18/2021



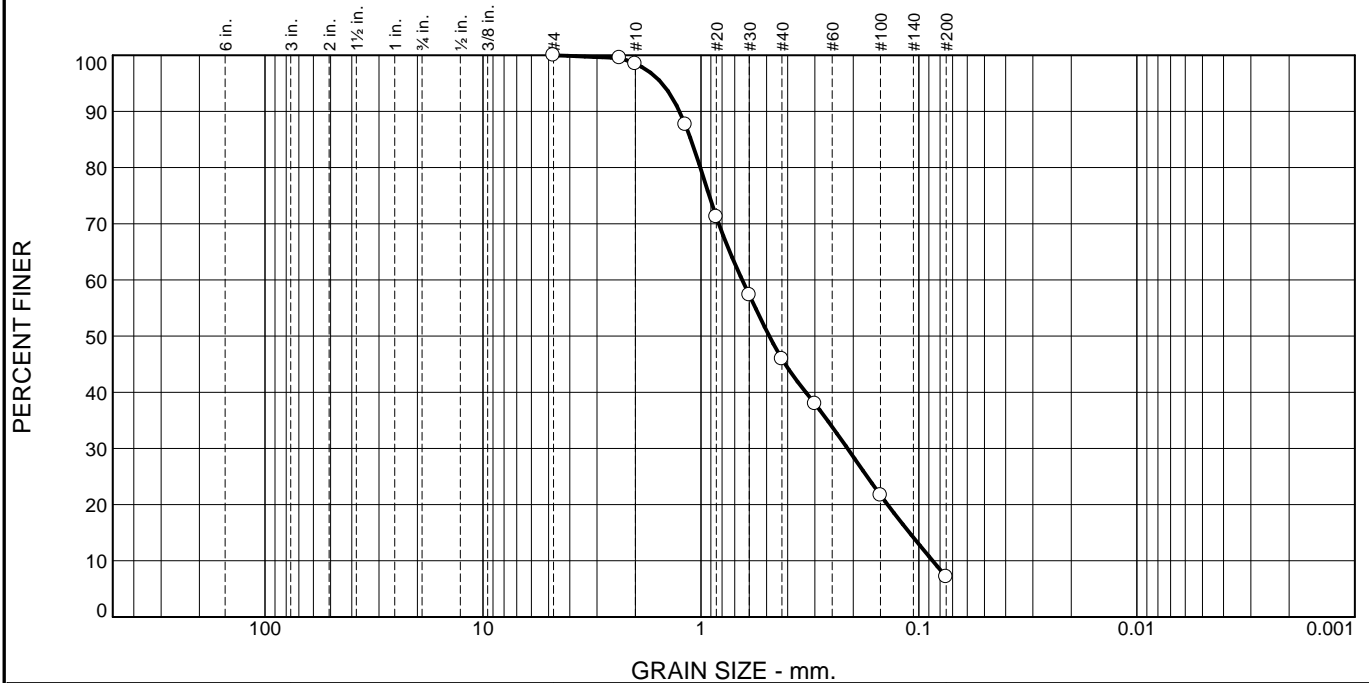
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 807A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.5	52.6	38.7	7.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	98.5		
#16	87.7		
#20	71.2		
#30	57.3		
#40	45.9		
#50	38.0		
#100	21.7		
#200	7.2		

* (no specification provided)

Material Description
Orangish brown sand with silt

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients
D₉₀= 1.2535 D₈₅= 1.1117 D₆₀= 0.6467
D₅₀= 0.4860 D₃₀= 0.2126 D₁₅= 0.1104
D₁₀= 0.0865 C_u= 7.48 C_c= 0.81

Remarks
Moisture content 8.3%

Date Received: 10/26/2021 **Date Tested:** 11/2/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-5 SS02

Sample Number: 3521-783

Depth: 2'-4'

Date Sampled: 10/18/2021



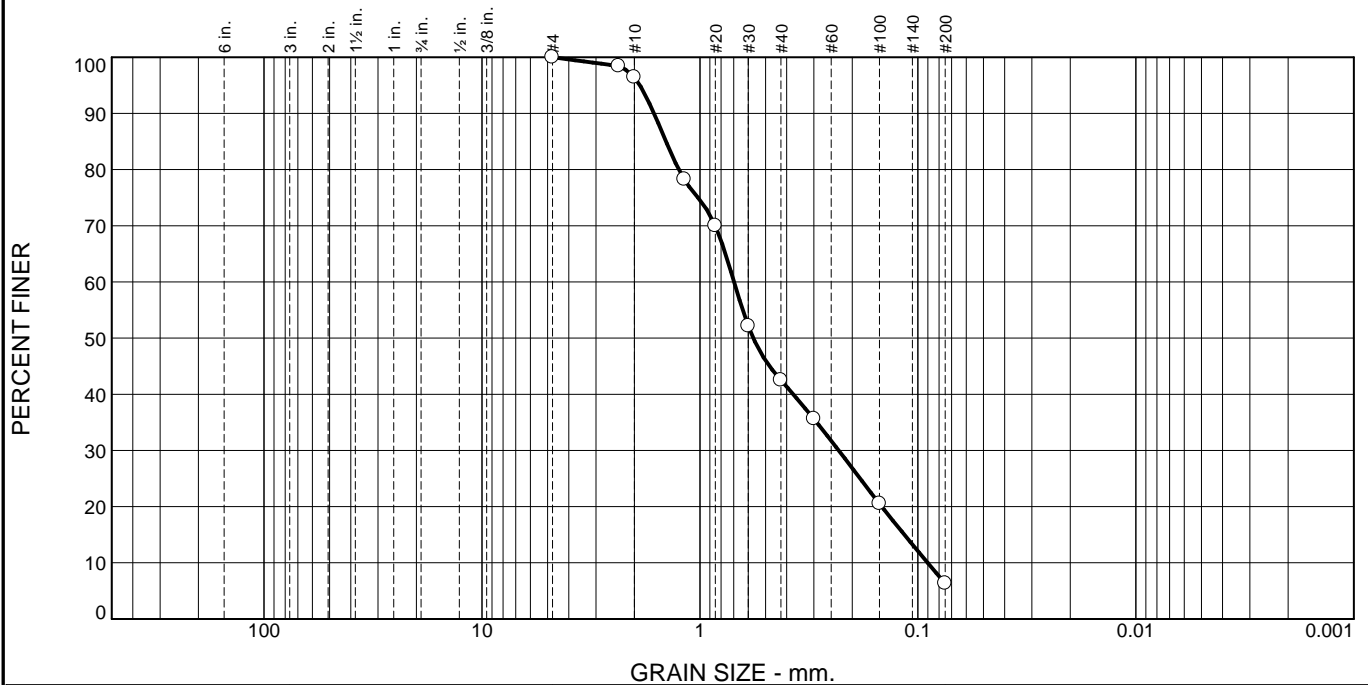
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 783A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.6	53.9	36.2	6.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	98.4		
#10	96.4		
#16	78.3		
#20	70.0		
#30	52.1		
#40	42.5		
#50	35.6		
#100	20.5		
#200	6.3		

* (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

D₉₀= 1.6250 D₈₅= 1.4320 D₆₀= 0.6975
D₅₀= 0.5694 D₃₀= 0.2308 D₁₅= 0.1154
D₁₀= 0.0902 C_u= 7.73 C_c= 0.85

Remarks

Moisture content 5.5%

Date Received: 10/26/2021 Date Tested: 11/3/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-6 SS01

Sample Number: 3521-787

Depth: 0'-2'

Date Sampled: 10/18/2021



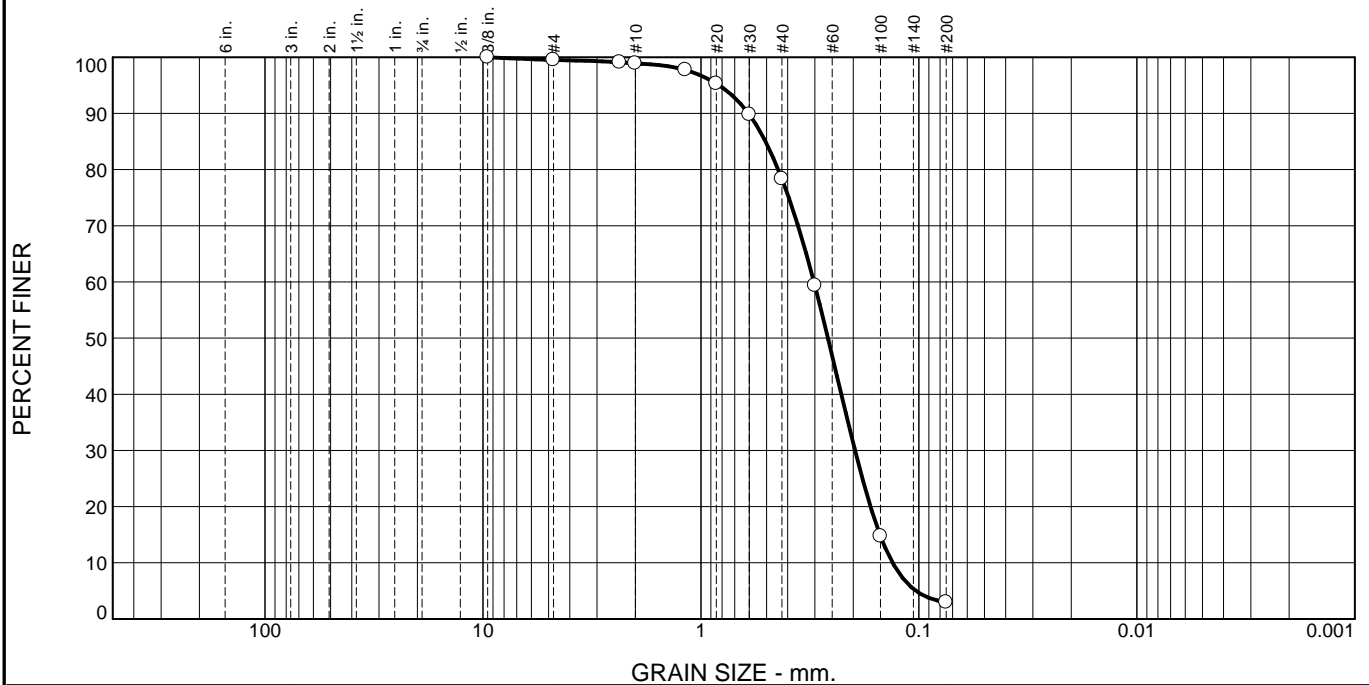
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 787A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.6	20.6	75.3	3.0	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.5		
#8	99.1		
#10	98.9		
#16	97.7		
#20	95.3		
#30	89.8		
#40	78.3		
#50	59.4		
#100	14.7		
#200	3.0		

* (no specification provided)

Material Description

Medium brown sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients

D₉₀= 0.6052 D₈₅= 0.5057 D₆₀= 0.3029
D₅₀= 0.2613 D₃₀= 0.1964 D₁₅= 0.1509
D₁₀= 0.1319 C_u= 2.30 C_c= 0.96

Remarks

Moisture content 25.9%

Date Received: 10/26/2021 Date Tested: 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-6 SS05

Sample Number: 3521-803

Depth: 10'-12'

Date Sampled: 10/18/2021



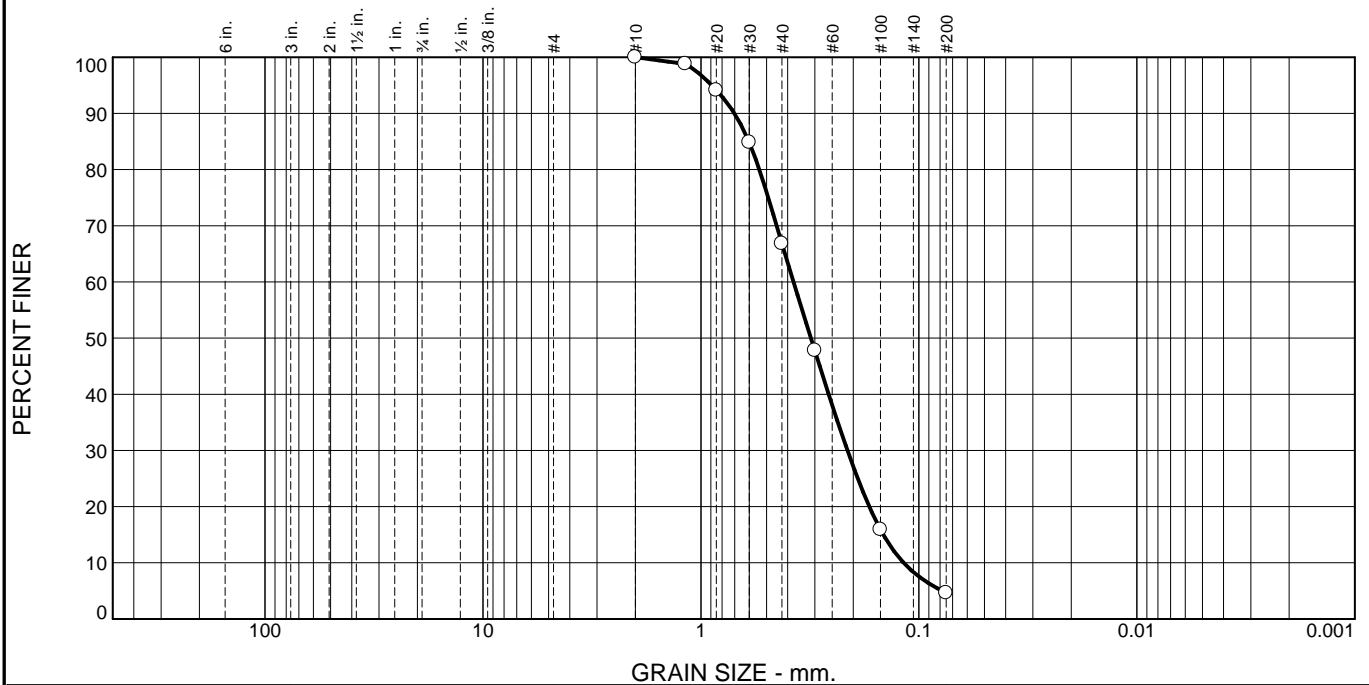
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 803A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	33.2	62.2	4.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	98.8		
#20	94.1		
#30	84.8		
#40	66.8		
#50	47.8		
#100	15.9		
#200	4.6		

* (no specification provided)

Material Description

Brown sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients

D₉₀= 0.7020 D₈₅= 0.6026 D₆₀= 0.3761
D₅₀= 0.3128 D₃₀= 0.2127 D₁₅= 0.1456
D₁₀= 0.1175 C_u= 3.20 C_c= 1.02

Remarks

Moisture content 3.4%

Date Received: 10/26/2021 **Date Tested:** 11/1/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-7 SS01

Sample Number: 3521-778

Depth: 0'-2'

Date Sampled: 10/18/2021



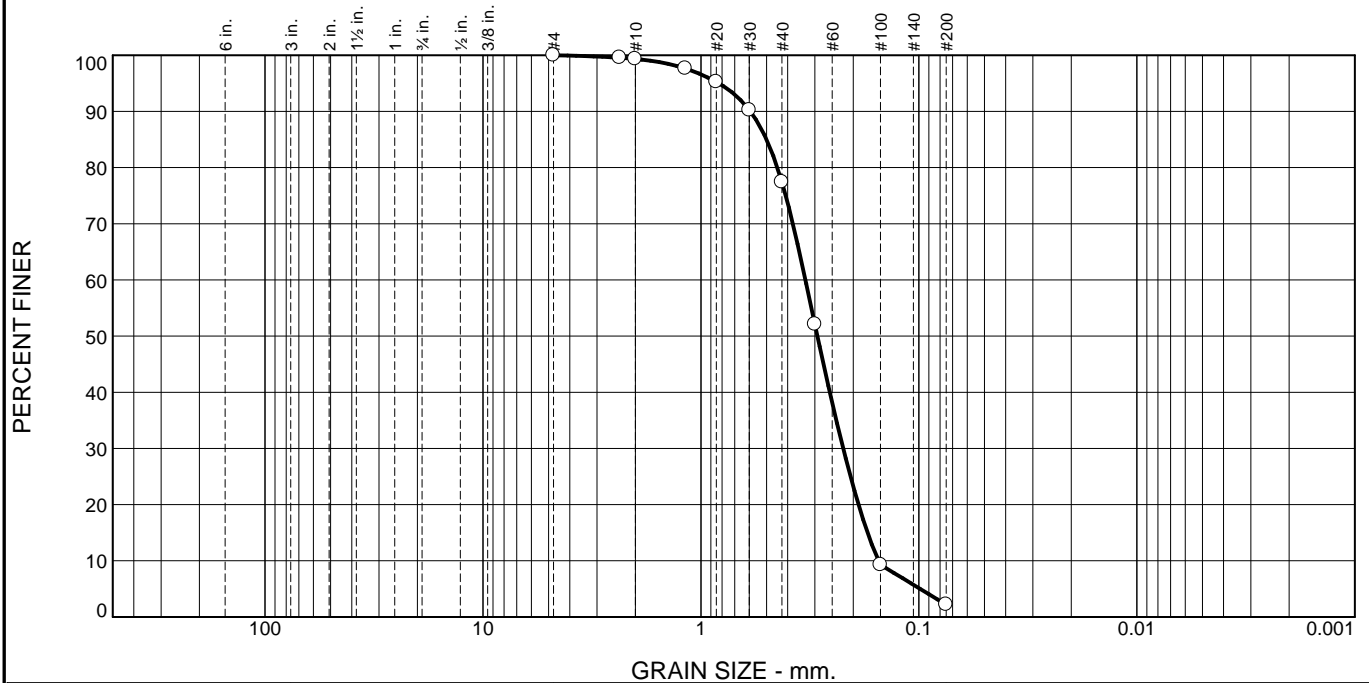
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 778A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.7	21.9	75.2	2.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.6		
#10	99.3		
#16	97.6		
#20	95.2		
#30	90.2		
#40	77.4		
#50	52.1		
#100	9.3		
#200	2.2		

* (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
 D₉₀= 0.5936 D₈₅= 0.5002 D₆₀= 0.3316
 D₅₀= 0.2921 D₃₀= 0.2225 D₁₅= 0.1720
 D₁₀= 0.1530 C_u= 2.17 C_c= 0.98

Remarks
Moisture content 28.7%

Date Received: 10/26/2021 **Date Tested:** 11/4/2021
Tested By: Matt Watson
Checked By: Robert Faria
Title: Lab Manager

Location: C/B-7 SS05

Sample Number: 3521-796

Depth: 10'-12'

Date Sampled: 10/18/2021



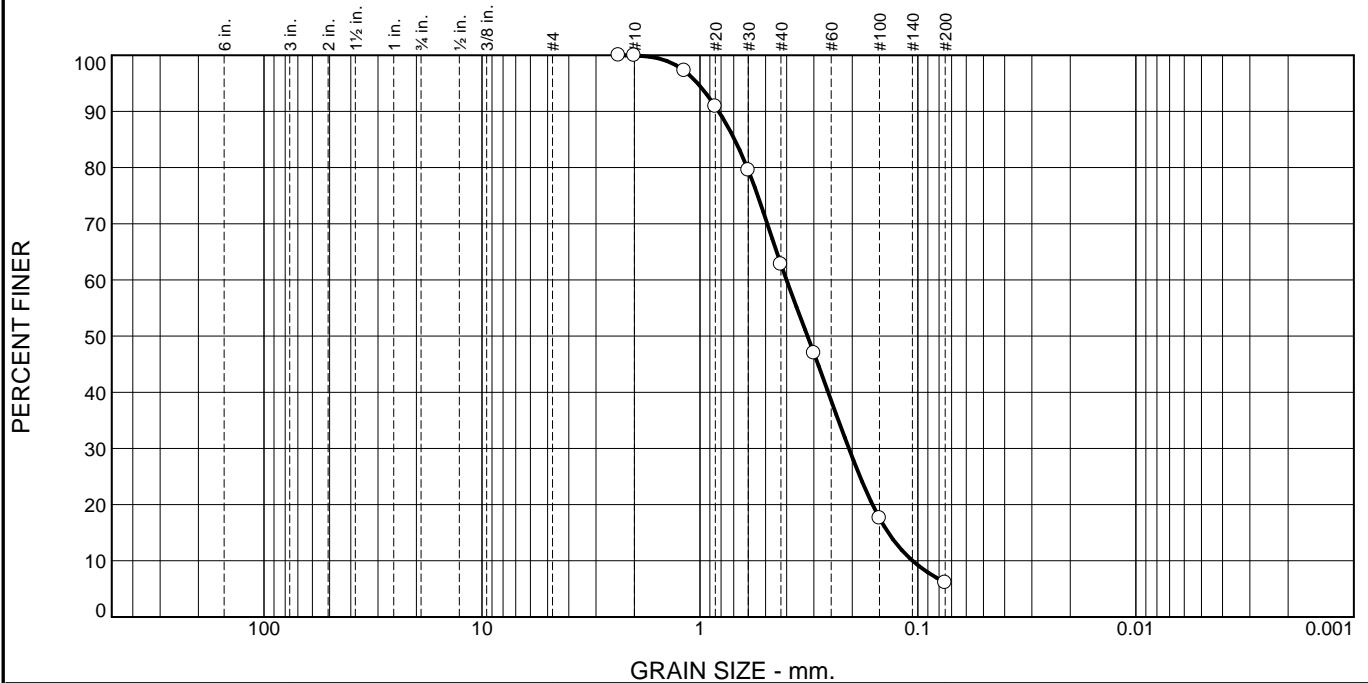
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 796A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	37.1	56.7	6.1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	99.9		
#16	97.2		
#20	90.9		
#30	79.5		
#40	62.8		
#50	47.0		
#100	17.6		
#200	6.1		

* (no specification provided)

Material Description

Brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.8211 D₈₅= 0.6934 D₆₀= 0.4009
D₅₀= 0.3209 D₃₀= 0.2074 D₁₅= 0.1367
D₁₀= 0.1058 C_u= 3.79 C_c= 1.01

Remarks

Moisture content 3.2%

Date Received: 10/26/2021 **Date Tested:** 11/2/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-8 SS01

Sample Number: 3521-782

Depth: 0'-2'

Date Sampled: 10/18/2021



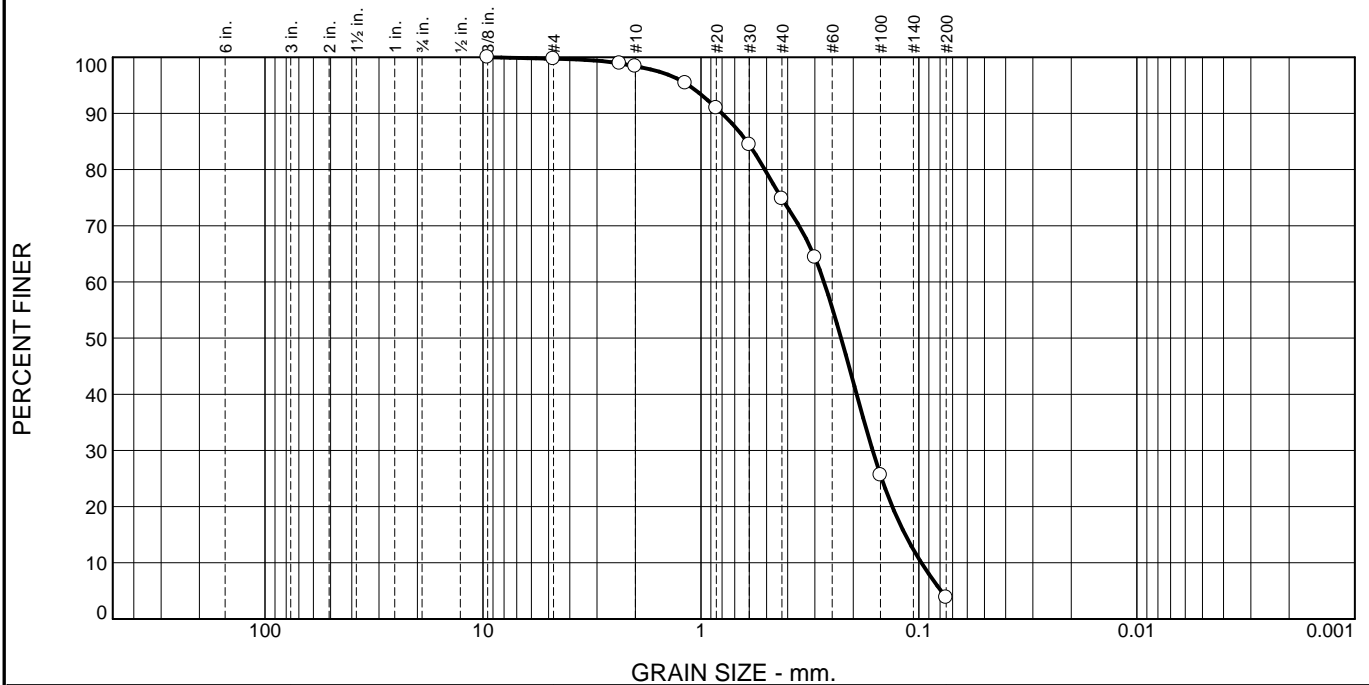
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 782A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	1.3	23.6	71.0	3.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.7		
#8	98.9		
#10	98.4		
#16	95.4		
#20	91.0		
#30	84.4		
#40	74.8		
#50	64.4		
#100	25.6		
#200	3.8		

* (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

D₉₀= 0.8002 D₈₅= 0.6152 D₆₀= 0.2724
D₅₀= 0.2274 D₃₀= 0.1630 D₁₅= 0.1156
D₁₀= 0.0975 C_u= 2.80 C_c= 1.00

Remarks

Moisture content 12.0%

Date Received: 10/26/2021 **Date Tested:** 11/4/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-8 SS03

Sample Number: 3521-792

Depth: 5'-7'

Date Sampled: 10/18/2021



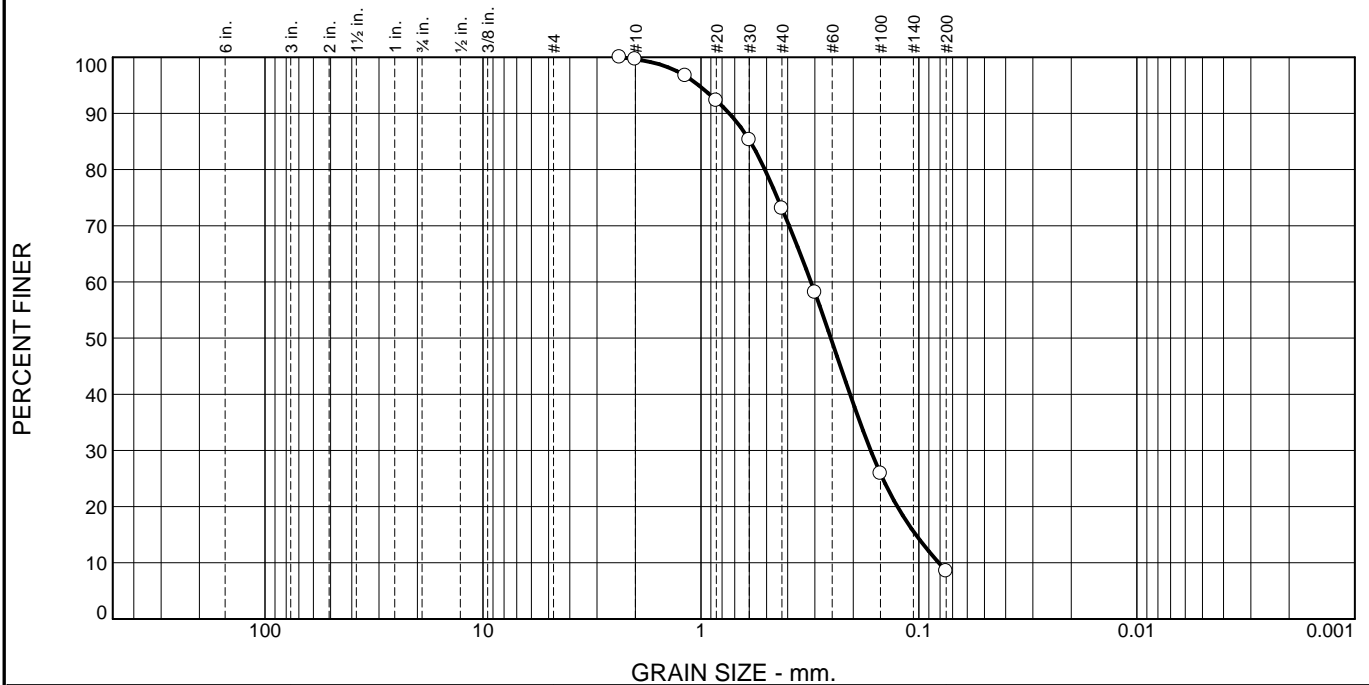
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 792A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	26.5	64.6	8.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	99.6		
#16	96.7		
#20	92.3		
#30	85.3		
#40	73.1		
#50	58.1		
#100	25.9		
#200	8.5		

* (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

D₉₀= 0.7410 D₈₅= 0.5940 D₆₀= 0.3125
D₅₀= 0.2535 D₃₀= 0.1664 D₁₅= 0.1034
D₁₀= 0.0811 C_u= 3.85 C_c= 1.09

Remarks

Moisture content 6.1%

Date Received: 10/26/2021 Date Tested: 11/3/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-9 SS01

Sample Number: 3521-786

Depth: 0'-2'

Date Sampled: 10/18/2021



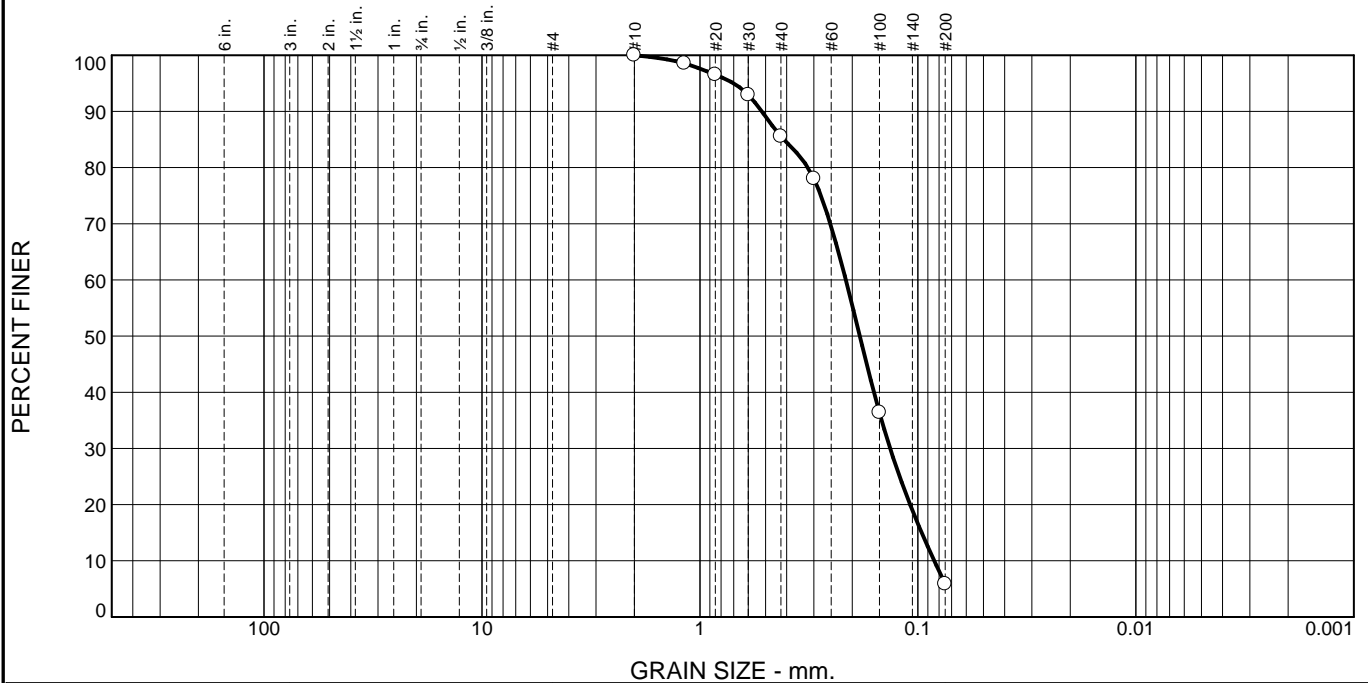
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 786A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	14.5	79.6	5.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	98.5		
#20	96.5		
#30	92.9		
#40	85.5		
#50	78.0		
#100	36.4		
#200	5.9		

* (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
D₉₀= 0.5204 D₈₅= 0.4127 D₆₀= 0.2142
D₅₀= 0.1848 D₃₀= 0.1340 D₁₅= 0.0961
D₁₀= 0.0841 C_u= 2.55 C_c= 1.00

Remarks
Moisture content 25.4%

Date Received: 10/26/2021 **Date Tested:** 11/4/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-9 SS04

Sample Number: 3521-797

Depth: 7'-9'

Date Sampled: 10/18/2021



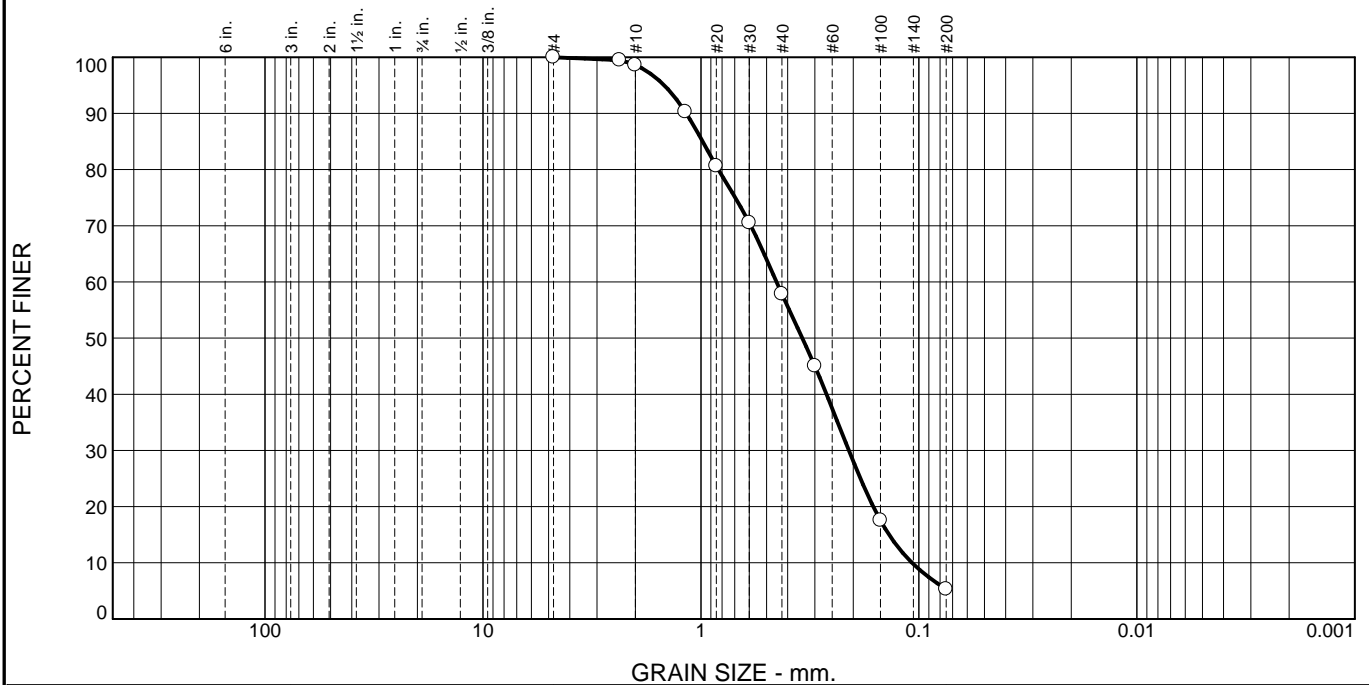
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 797A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	40.8	52.5	5.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	98.6		
#16	90.3		
#20	80.6		
#30	70.5		
#40	57.8		
#50	45.0		
#100	17.5		
#200	5.3		

* (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

D₉₀= 1.1677 D₈₅= 0.9827 D₆₀= 0.4502
D₅₀= 0.3426 D₃₀= 0.2096 D₁₅= 0.1371
D₁₀= 0.1077 C_u= 4.18 C_c= 0.91

Remarks

Moisture content 6.6%

Date Received: 10/26/2021 Date Tested: 11/3/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-10 SS02

Sample Number: 3521-788

Depth: 2'-4'

Date Sampled: 10/18/2021



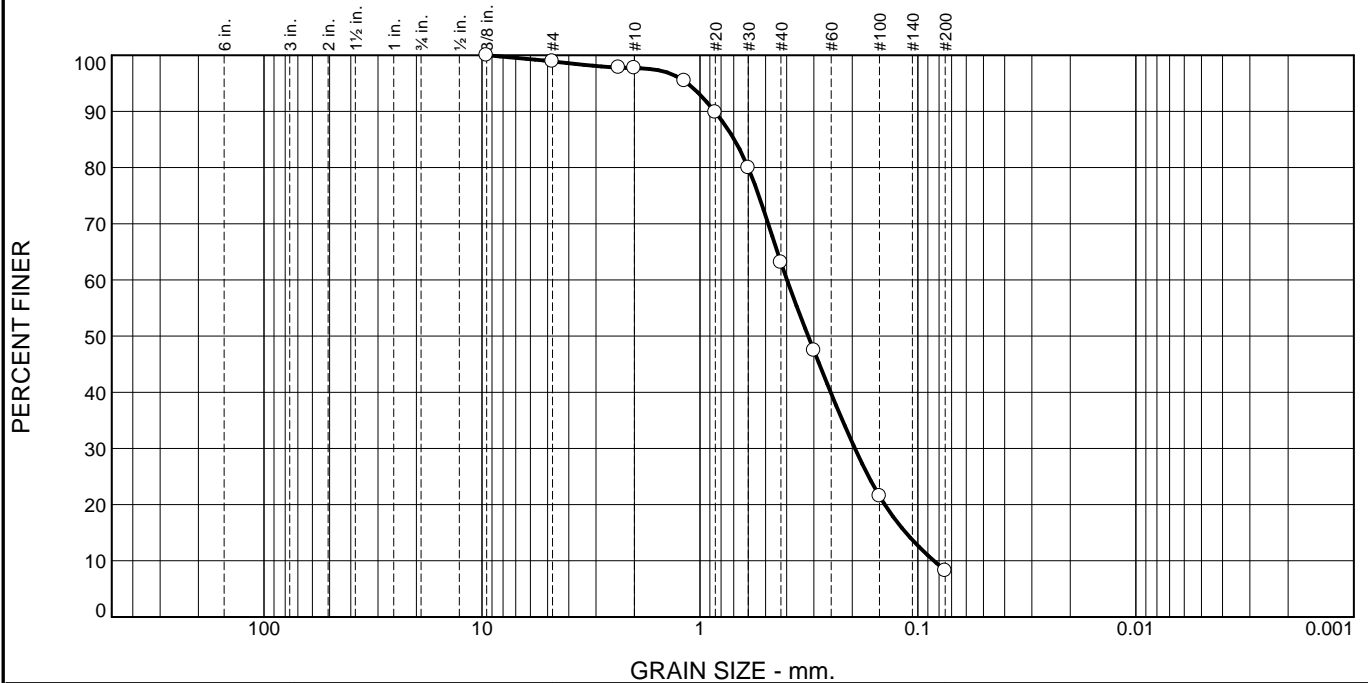
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 788A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	1.2	34.6	54.9	8.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	98.9		
#8	97.8		
#10	97.7		
#16	95.4		
#20	89.8		
#30	79.9		
#40	63.1		
#50	47.4		
#100	21.5		
#200	8.2		

* (no specification provided)

Material Description
Dark brown sand with silt

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients
D₉₀= 0.8567 D₈₅= 0.6958 D₆₀= 0.3987
D₅₀= 0.3186 D₃₀= 0.1946 D₁₅= 0.1136
D₁₀= 0.0845 C_u= 4.72 C_c= 1.12

Remarks
Moisture content 4.7%

Date Received: 10/26/2021 **Date Tested:** 11/1/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

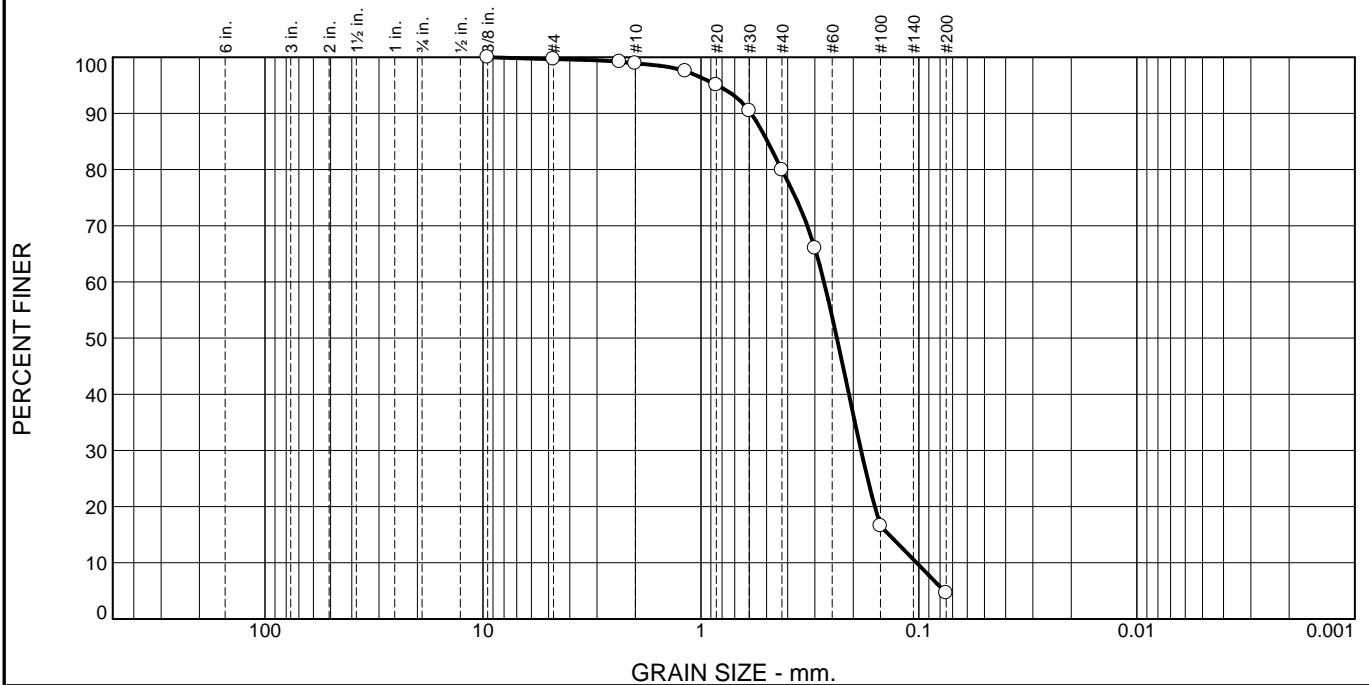
Location: C/B-11 SS01F
Sample Number: 3521-777 **Depth:** 0'-2'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 777A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.8	19.0	75.3	4.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.7		
#8	99.2		
#10	98.9		
#16	97.5		
#20	95.1		
#30	90.5		
#40	79.9		
#50	66.0		
#100	16.6		
#200	4.6		

* (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
D₉₀= 0.5884 D₈₅= 0.4948 D₆₀= 0.2724
D₅₀= 0.2376 D₃₀= 0.1843 D₁₅= 0.1370
D₁₀= 0.1024 C_u= 2.66 C_c= 1.22

Remarks
Moisture content 23.3%

Date Received: 10/26/2021 **Date Tested:** 11/4/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-11 SS05

Sample Number: 3521-793

Depth: 9'-11'

Date Sampled: 10/18/2021



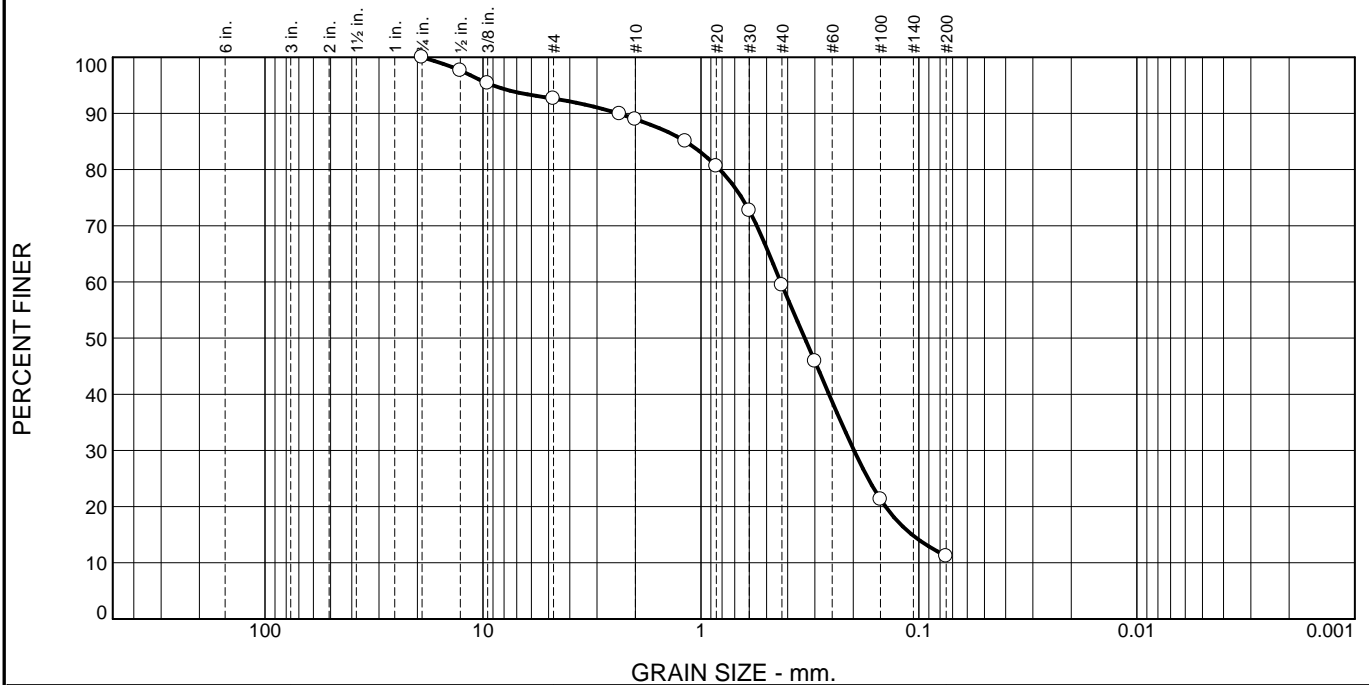
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 793A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.4	3.6	29.6	48.2	11.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	97.6		
3/8"	95.4		
#4	92.6		
#8	89.9		
#10	89.0		
#16	85.0		
#20	80.6		
#30	72.7		
#40	59.4		
#50	45.9		
#100	21.3		
#200	11.2		

* (no specification provided)

Material Description

Brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 2.4001 D₈₅= 1.1768 D₆₀= 0.4310
D₅₀= 0.3339 D₃₀= 0.1985 D₁₅= 0.1075
D₁₀= Cu= C_c=

Remarks

Moisture content 3.3%

Date Received: 10/26/2021 Date Tested: 11/2/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-12 SS01

Sample Number: 3521-781

Depth: 0'-2'

Date Sampled: 10/18/2021



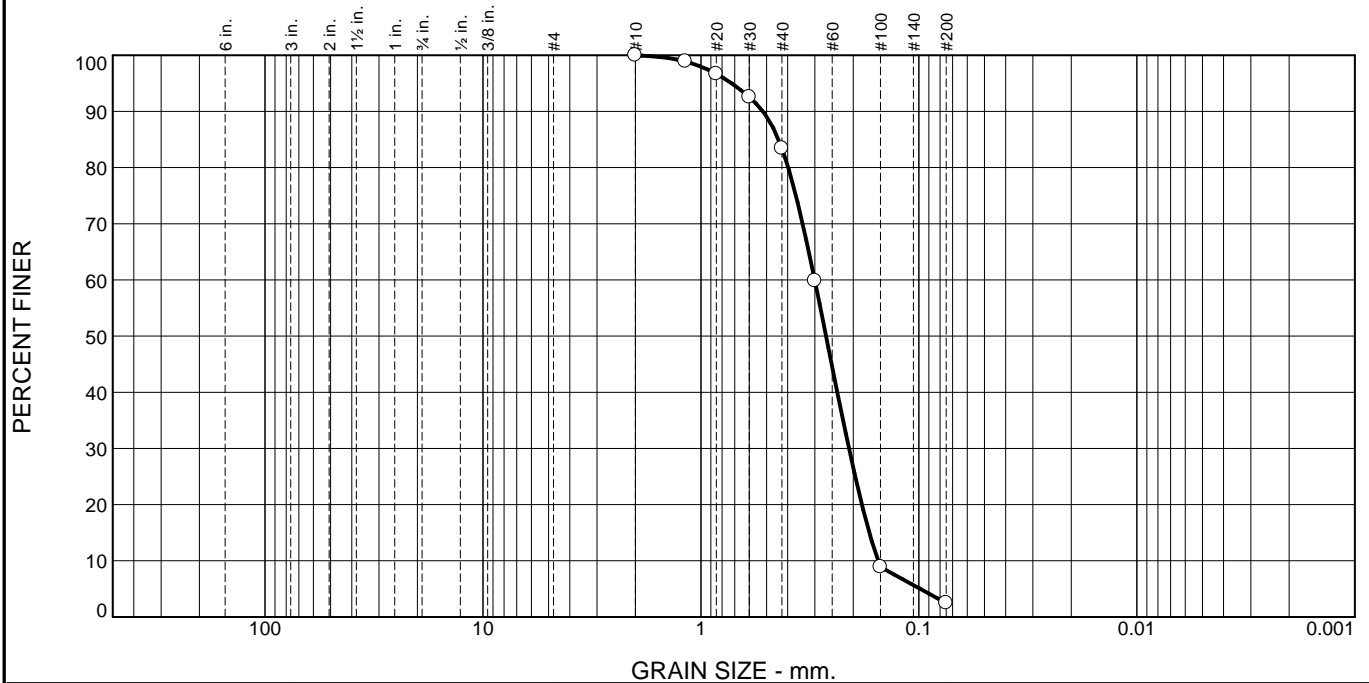
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 781A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	16.6	80.9	2.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	98.9		
#20	96.7		
#30	92.5		
#40	83.4		
#50	59.9		
#100	8.9		
#200	2.5		

* (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

D₉₀= 0.5195 D₈₅= 0.4405 D₆₀= 0.3005
D₅₀= 0.2666 D₃₀= 0.2093 D₁₅= 0.1688
D₁₀= 0.1538 C_u= 1.95 C_c= 0.95

Remarks

Moisture content 24.0%

Date Received: 10/26/2021 **Date Tested:** 11/4/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-12 SS05

Sample Number: 3521-789

Depth: 10'-12'

Date Sampled: 10/18/2021



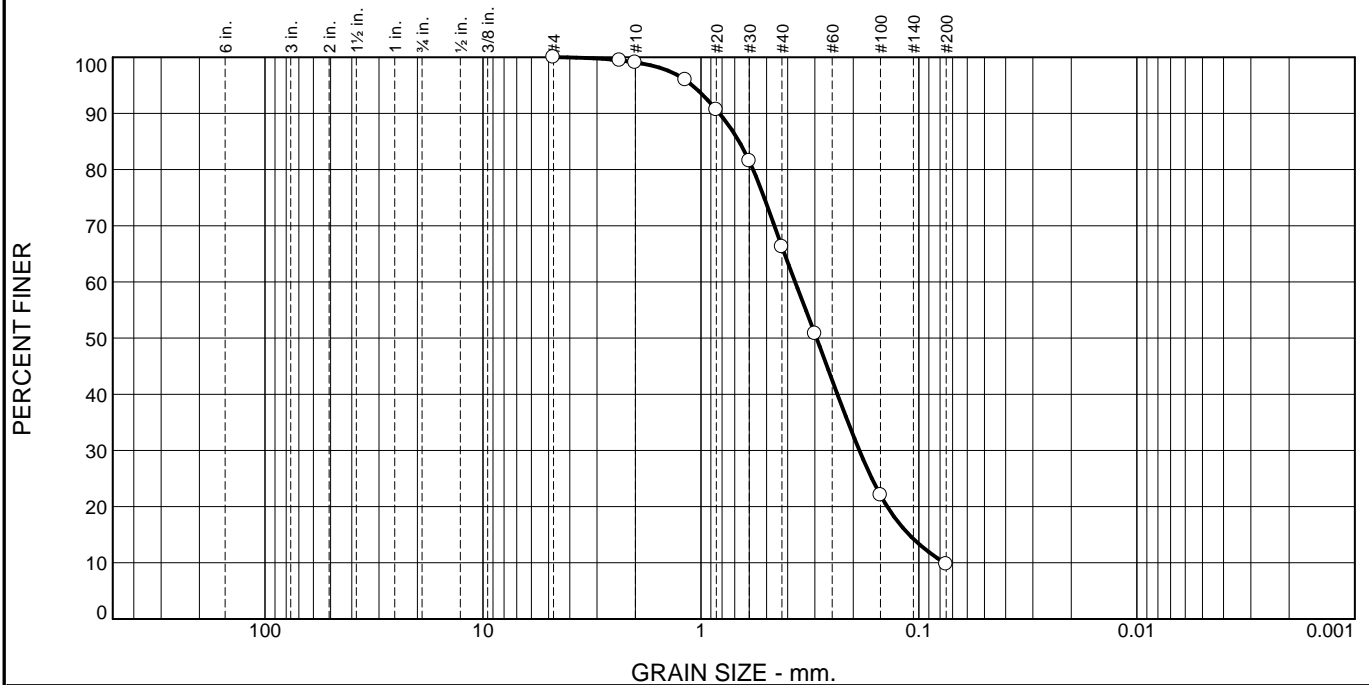
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 789A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	32.9	56.4	9.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.4		
#10	99.1		
#16	96.0		
#20	90.6		
#30	81.5		
#40	66.2		
#50	50.8		
#100	22.0		
#200	9.8		

* (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
D₉₀= 0.8230 D₈₅= 0.6678 D₆₀= 0.3699
D₅₀= 0.2947 D₃₀= 0.1875 D₁₅= 0.1110
D₁₀= 0.0766 C_u= 4.83 C_c= 1.24

Remarks
Moisture content 5.4%

Date Received: 10/26/2021 **Date Tested:** 11/3/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

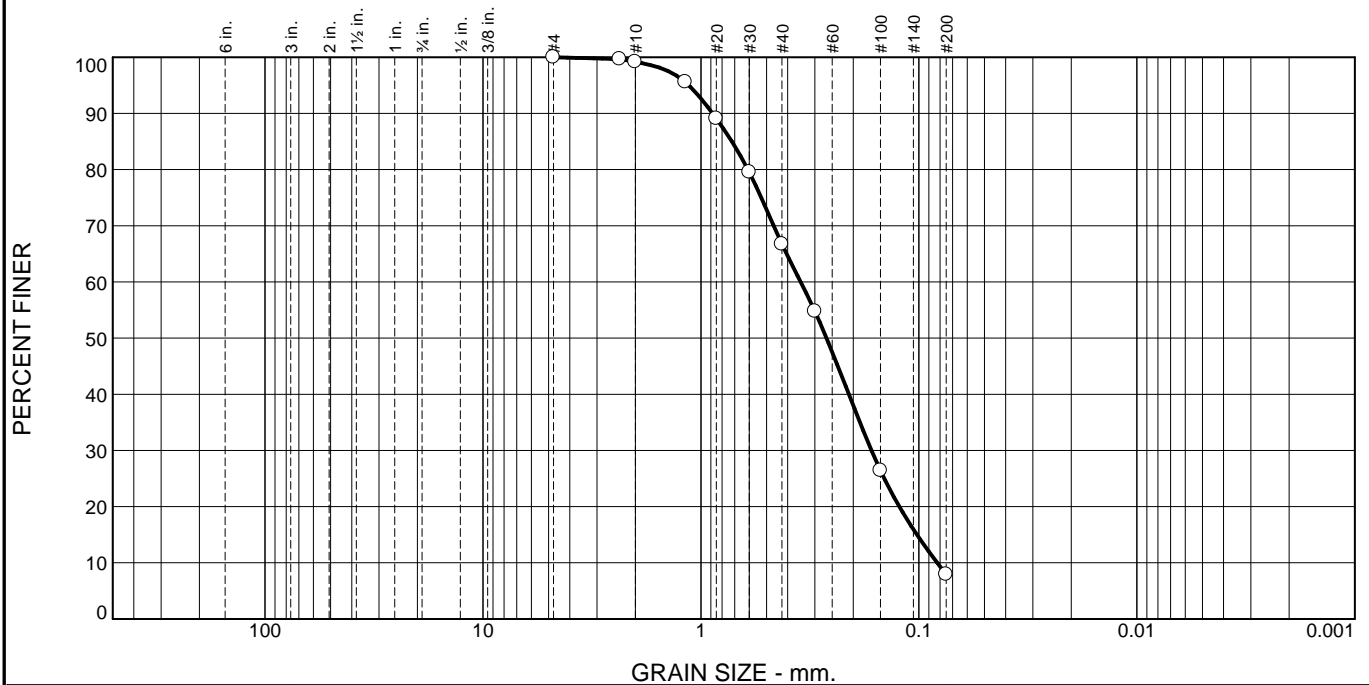
Location: C/B-13 SS01 Mid&Bott
Sample Number: 3521-785 **Depth:** 0'-2'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 785A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	32.5	58.8	7.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.7		
#10	99.2		
#16	95.6		
#20	89.1		
#30	79.5		
#40	66.7		
#50	54.8		
#100	26.4		
#200	7.9		

* (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 ₉₀ = 0.8849	D ₈₅ = 0.7211	D ₆₀ = 0.3487
D ₅₀ = 0.2653	D ₃₀ = 0.1649	D ₁₅ = 0.1021
D ₁₀ = 0.0824	C _u = 4.23	C _c = 0.95
Remarks		
Moisture content 6.6%		
Date Received: 10/26/2021 Date Tested: 10/28/2021		
Tested By: Matt Watson		
Checked By: Robert Faria		
Title: Lab Manager		

Location: C/B-13 SS02

Sample Number: 3521-751

Depth: 2'-4'

Date Sampled: 10/18/2021



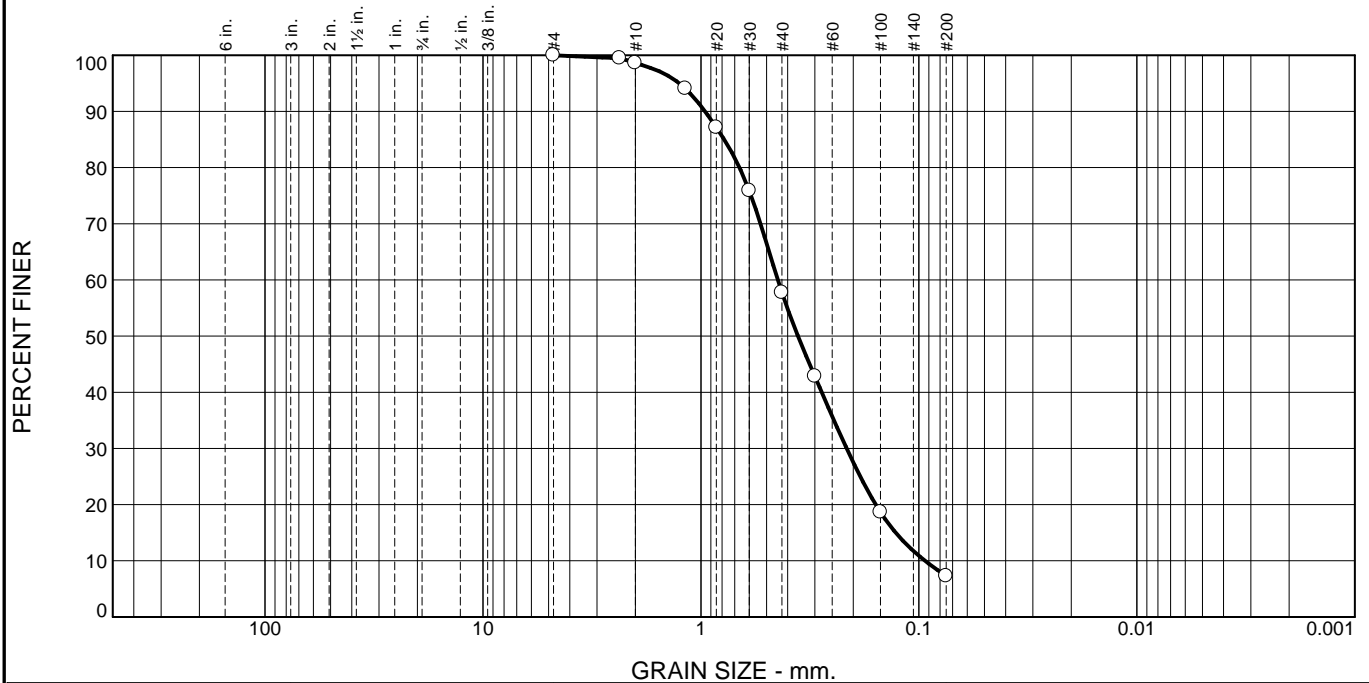
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 751A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	40.8	50.5	7.3	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	98.6		
#16	94.1		
#20	87.1		
#30	75.9		
#40	57.8		
#50	42.8		
#100	18.6		
#200	7.3		

* (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
D₉₀= 0.9581 D₈₅= 0.7825 D₆₀= 0.4438
D₅₀= 0.3588 D₃₀= 0.2145 D₁₅= 0.1278
D₁₀= 0.0937 C_u= 4.74 C_c= 1.11

Remarks
Moisture content 14.1%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-13 SS03

Sample Number: 3521-756

Depth: 5'-7'

Date Sampled: 10/18/2021



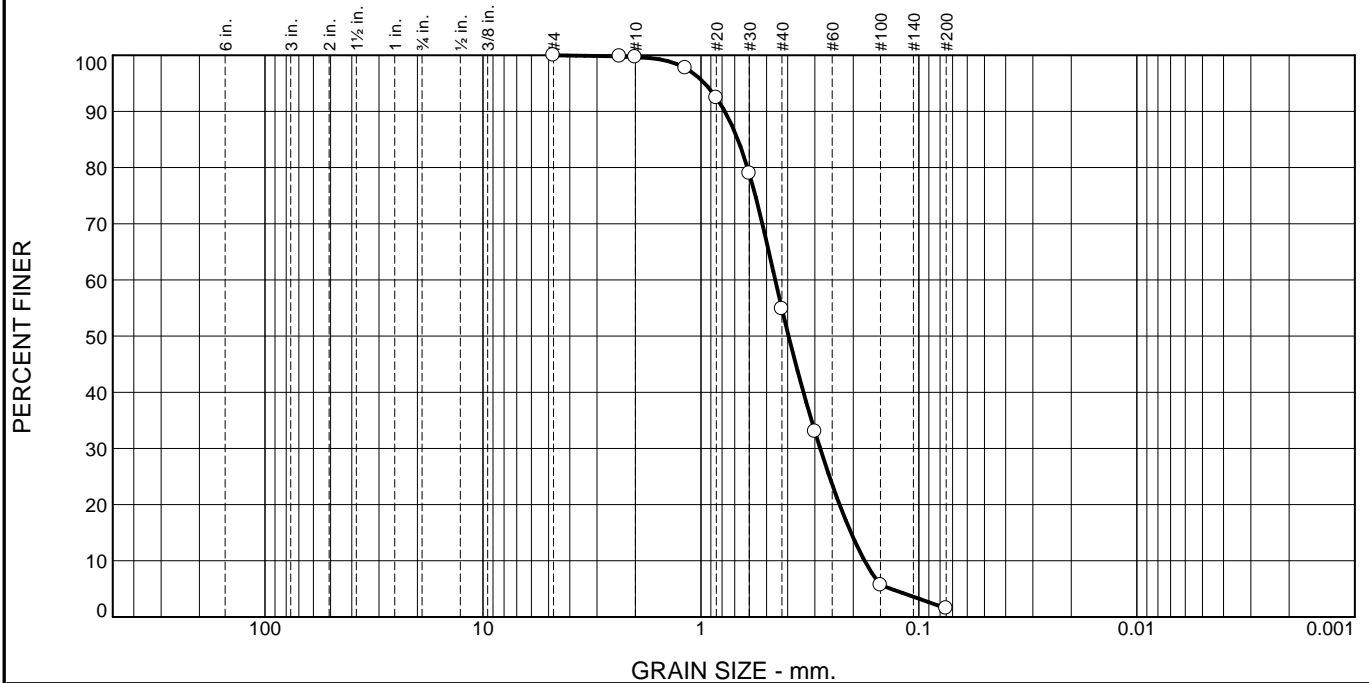
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

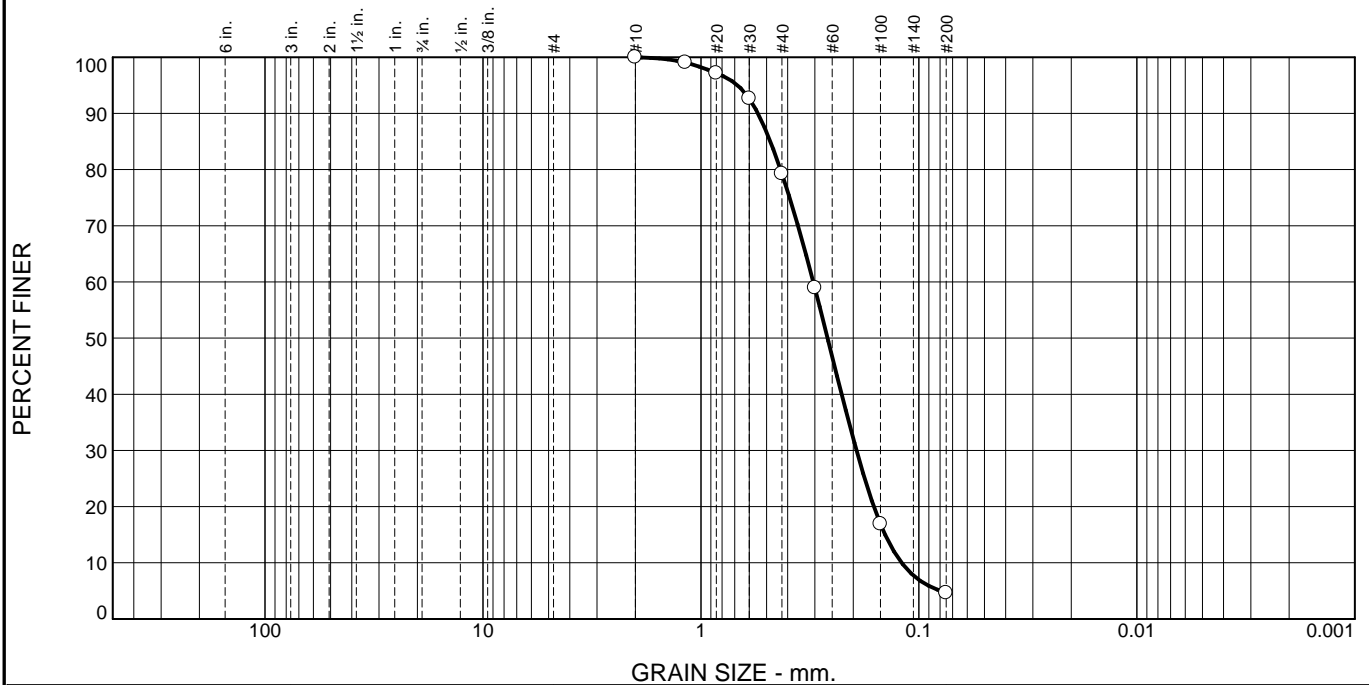
Project No: 21-04-098

Figure 756A

Particle Size Distribution Report



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	20.8	74.6	4.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	99.1		
#20	97.2		
#30	92.6		
#40	79.2		
#50	58.9		
#100	16.9		
#200	4.6		

* (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

D₉₀= 0.5478 D₈₅= 0.4805 D₆₀= 0.3050
D₅₀= 0.2624 D₃₀= 0.1933 D₁₅= 0.1428
D₁₀= 0.1200 C_u= 2.54 C_c= 1.02

Remarks

Moisture content 2.3%

Date Received: 10/26/2021 **Date Tested:** 11/1/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

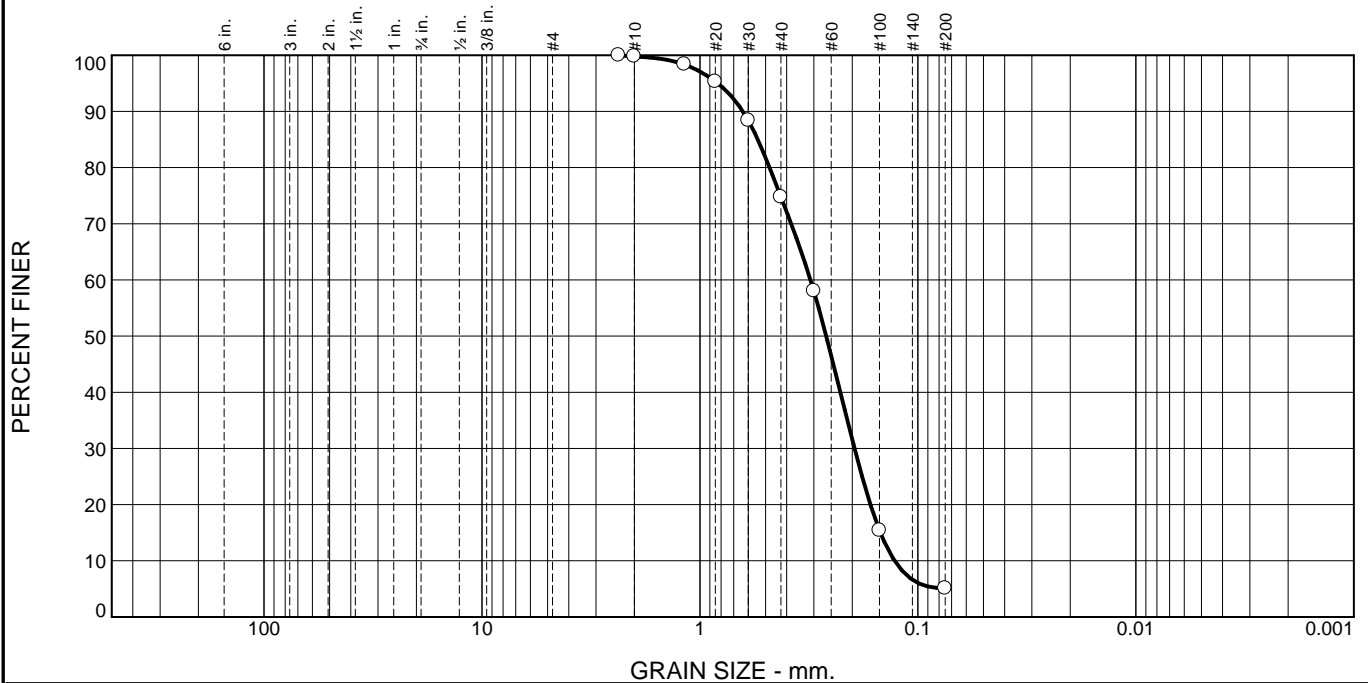
Location: C/B-14 SS01F
Sample Number: 3521-776 **Depth:** 0'-2'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 776A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	25.0	69.7	5.1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	99.8		
#16	98.4		
#20	95.3		
#30	88.4		
#40	74.8		
#50	58.0		
#100	15.4		
#200	5.1		

* (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
D₉₀= 0.6352 D₈₅= 0.5431 D₆₀= 0.3109
D₅₀= 0.2633 D₃₀= 0.1953 D₁₅= 0.1486
D₁₀= 0.1279 C_u= 2.43 C_c= 0.96

Remarks
Moisture content 8.4%

Date Received: 10/26/2021 **Date Tested:** 11/4/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-14 SS03

Sample Number: 3521-794

Depth: 5'-7'

Date Sampled: 10/18/2021



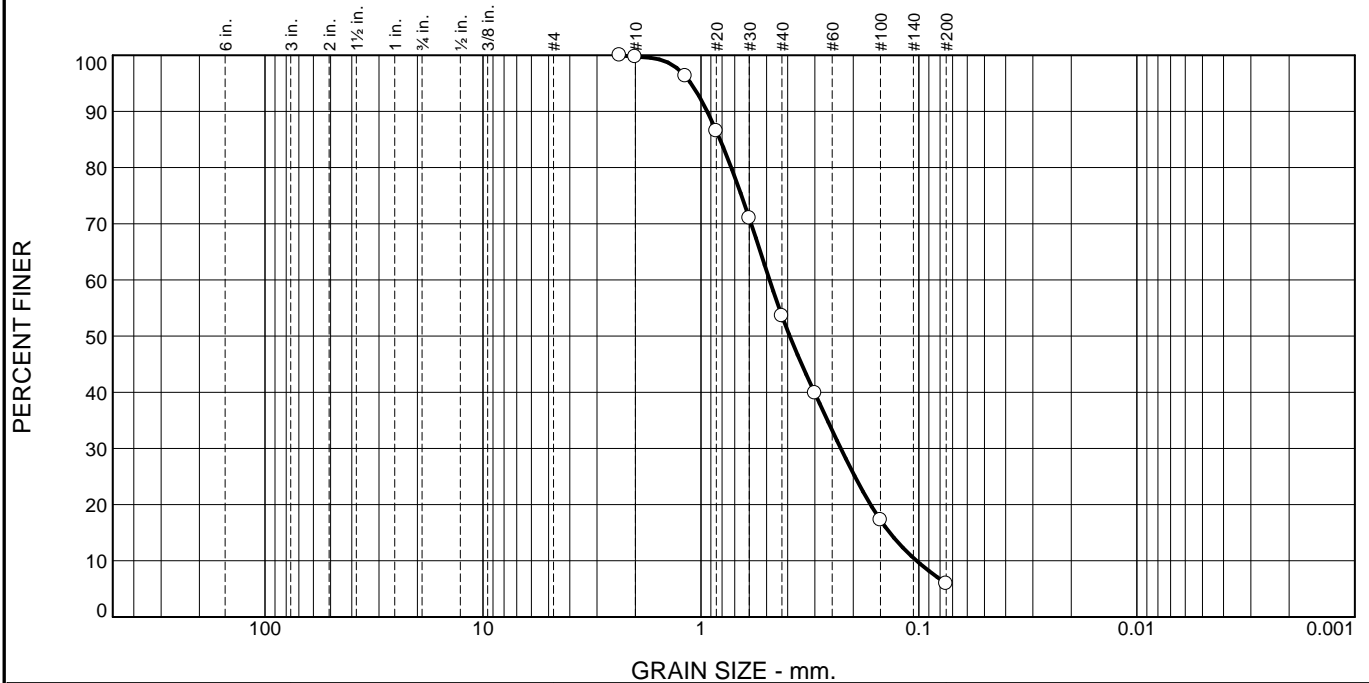
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 794A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	46.1	47.7	5.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	99.7		
#16	96.3		
#20	86.5		
#30	71.0		
#40	53.6		
#50	39.8		
#100	17.2		
#200	5.9		

* (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

D₉₀= 0.9360 D₈₅= 0.8178 D₆₀= 0.4847
D₅₀= 0.3915 D₃₀= 0.2282 D₁₅= 0.1360
D₁₀= 0.1025 C_u= 4.73 C_c= 1.05

Remarks

Moisture content 5.0%

Date Received: 10/26/2021 Date Tested: 11/1/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-15 SS01

Sample Number: 3521-780

Depth: 0'-2'

Date Sampled: 10/18/2021



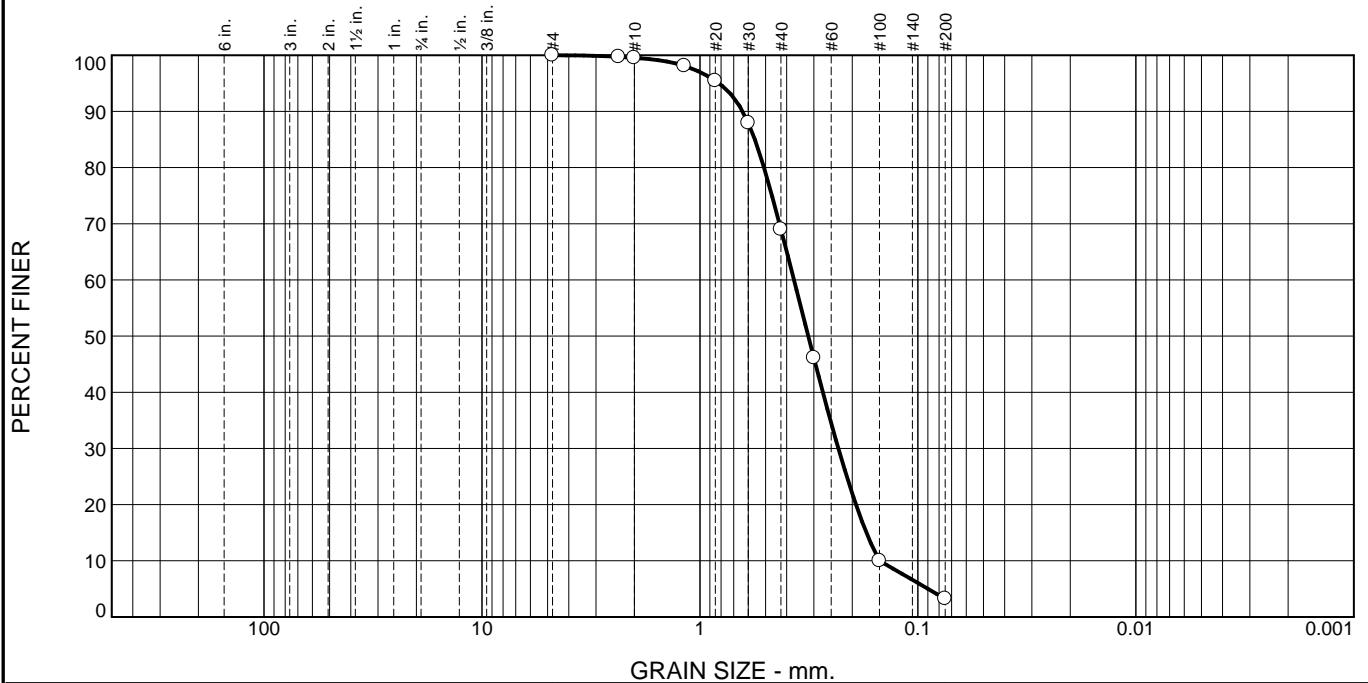
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 780A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	30.5	65.8	3.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.7		
#10	99.5		
#16	98.1		
#20	95.4		
#30	88.0		
#40	69.0		
#50	46.1		
#100	10.0		
#200	3.2		

* (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

D₉₀= 0.6366 D₈₅= 0.5601 D₆₀= 0.3703
D₅₀= 0.3183 D₃₀= 0.2317 D₁₅= 0.1723
D₁₀= 0.1500 C_u= 2.47 C_c= 0.97

Remarks

Moisture content 24.3%

Date Received: 10/26/2021 **Date Tested:** 11/4/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-15 SS05

Sample Number: 3521-798

Depth: 10'-12'

Date Sampled: 10/18/2021



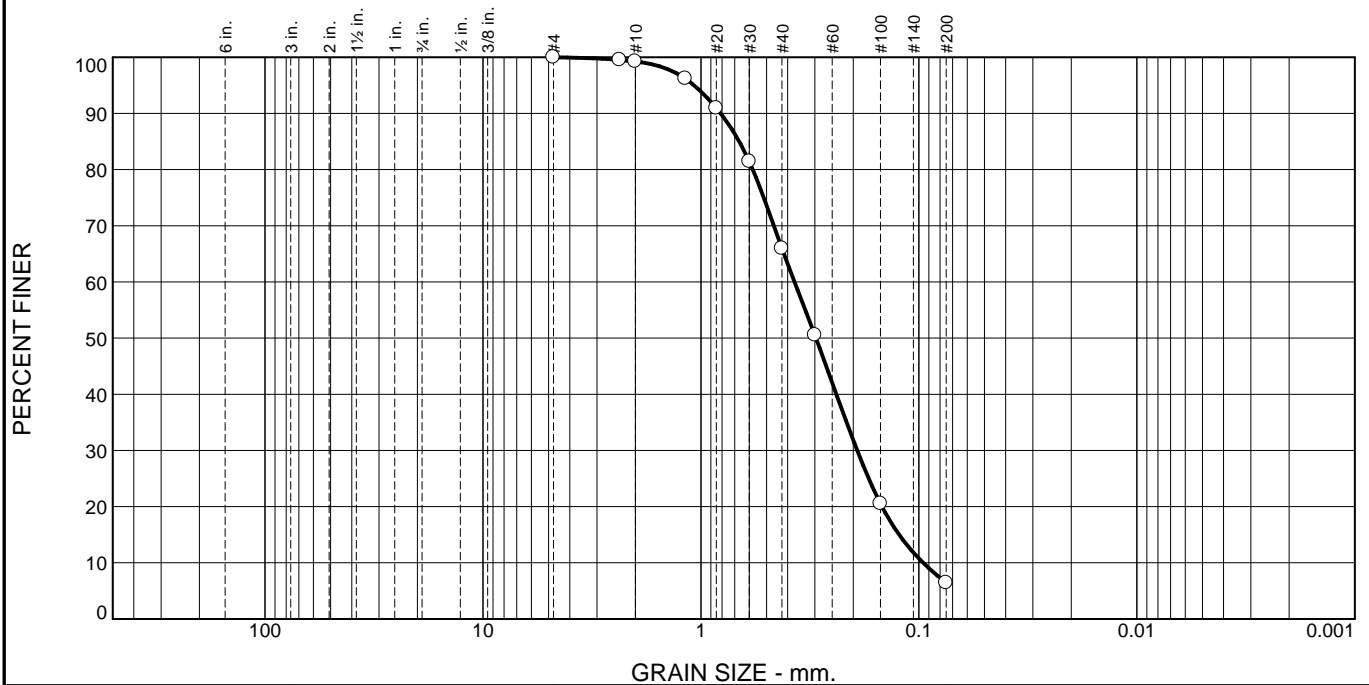
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 798A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	33.2	59.6	6.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	99.2		
#16	96.2		
#20	90.9		
#30	81.4		
#40	66.0		
#50	50.5		
#100	20.5		
#200	6.4		

* (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 ₉₀ = 0.8125	D ₈₅ = 0.6668	D ₆₀ = 0.3722
D ₅₀ = 0.2966	D ₃₀ = 0.1918	D ₁₅ = 0.1233
D ₁₀ = 0.0956	C _u = 3.89	C _c = 1.03
Remarks		
Moisture content 7.3%		
Date Received: 10/26/2021 Date Tested: 11/2/2021		
Tested By: Matt Watson		
Checked By: Robert Faria		
Title: Lab Manager		

Location: C/B-16 SS02

Sample Number: 3521-784

Depth: 2'-4'

Date Sampled: 10/18/2021



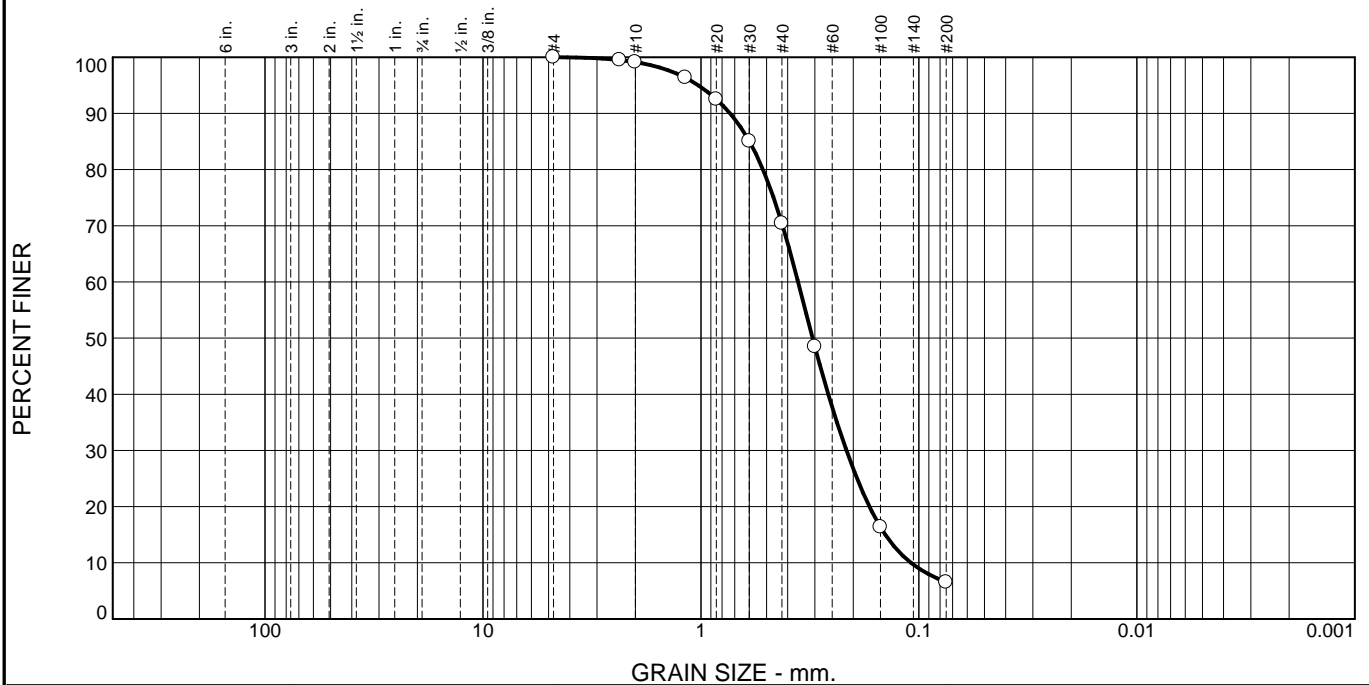
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 784A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	28.7	63.9	6.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	99.1		
#16	96.4		
#20	92.5		
#30	85.1		
#40	70.4		
#50	48.5		
#100	16.3		
#200	6.5		

* (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 ₉₀ = 0.7344	D ₈₅ = 0.5989	D ₆₀ = 0.3585
D ₅₀ = 0.3074	D ₃₀ = 0.2150	D ₁₅ = 0.1425
D ₁₀ = 0.1088	C _u = 3.29	C _c = 1.19
Remarks		
Moisture content 15.3%		
Date Received: 10/26/2021 Date Tested: 11/5/2021		
Tested By: Matt Watson		
Checked By: Robert Faria		
Title: Lab Manager		

Location: C/B-16 SS04

Sample Number: 3521-799

Depth: 7'-9'

Date Sampled: 10/18/2021



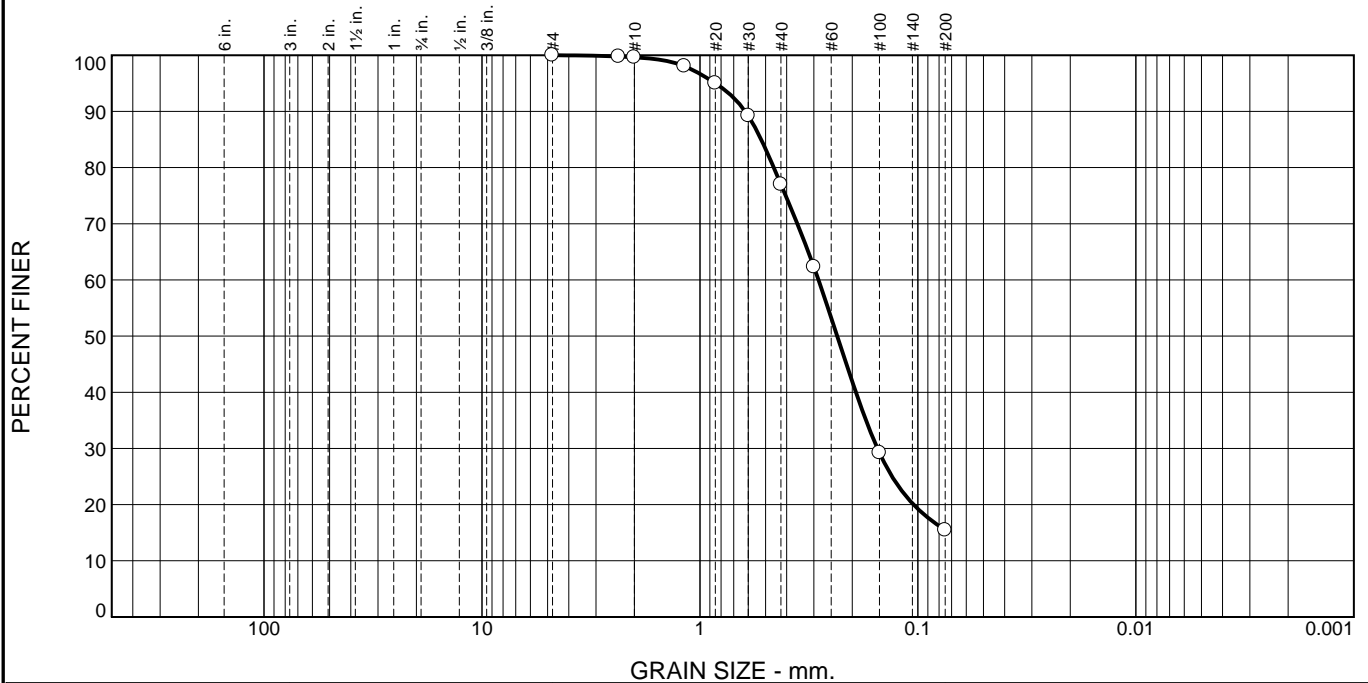
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 799A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	22.6	61.5	15.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.8		
#10	99.6		
#16	98.1		
#20	95.0		
#30	89.2		
#40	77.0		
#50	62.3		
#100	29.2		
#200	15.5		

* (no specification provided)

Material Description

Orangish brown silty sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.6193 D₈₅= 0.5238 D₆₀= 0.2857
D₅₀= 0.2345 D₃₀= 0.1533 D₁₅=
D₁₀= C_u= C_c=

Remarks

Moisture content 6.7%

Date Received: 10/26/2021 Date Tested: 10/28/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-17 SS01F
Sample Number: 3521-767

Depth: 0'-2'

Date Sampled: 10/18/2021



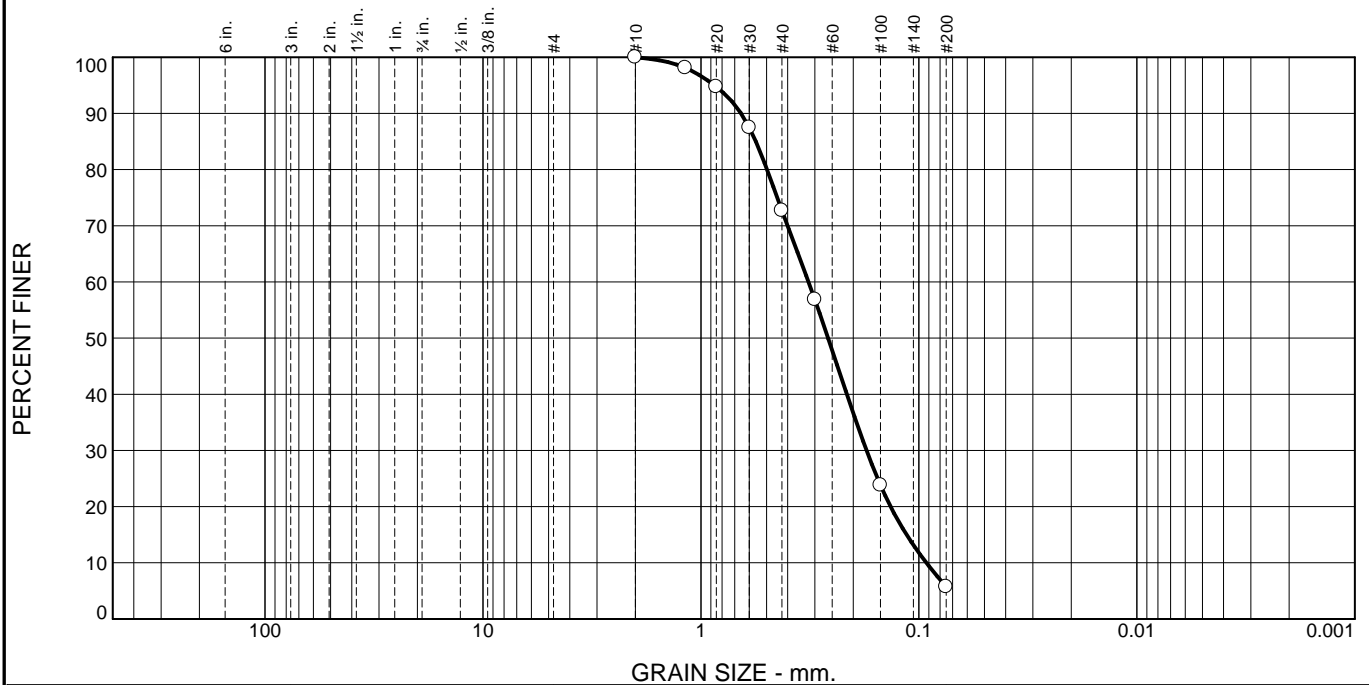
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 767A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	27.3	67.0	5.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	98.1		
#20	94.7		
#30	87.5		
#40	72.7		
#50	56.8		
#100	23.8		
#200	5.7		

* (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 ₉₀ = 0.6547	D ₈₅ = 0.5602	D ₆₀ = 0.3209
D ₅₀ = 0.2609	D ₃₀ = 0.1738	D ₁₅ = 0.1140
D ₁₀ = 0.0924	C _u = 3.47	C _c = 1.02
Remarks		
Moisture content 7.2%		
Date Received: 10/26/2021		Date Tested: 11/4/2021
Tested By: Matt Watson		
Checked By: Robert Faria		
Title: Lab Manager		

Location: C/B-17 SS03

Sample Number: 3521-795

Depth: 5'-7'

Date Sampled: 10/18/2021



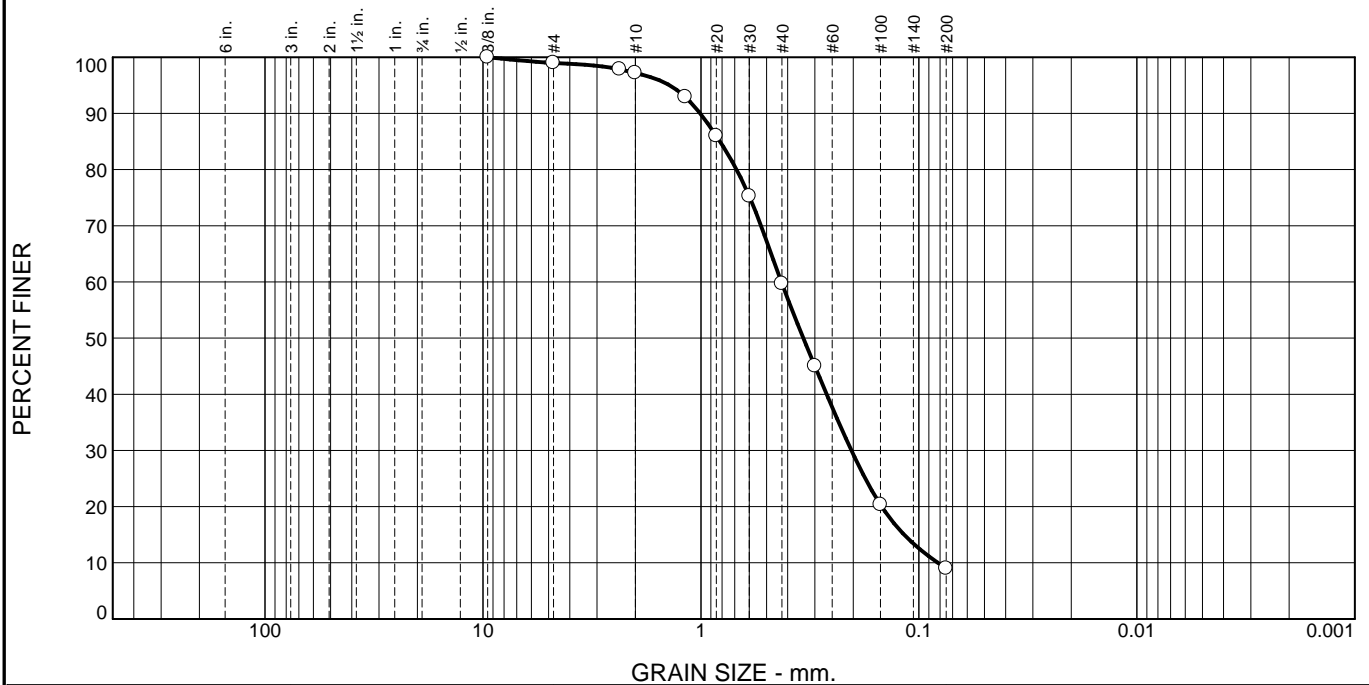
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 795A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	1.8	37.5	50.7	9.0	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.0		
#8	97.9		
#10	97.2		
#16	92.9		
#20	86.0		
#30	75.3		
#40	59.7		
#50	45.0		
#100	20.3		
#200	9.0		

* (no specification provided)

Material Description

Dark brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 1.0086 D₈₅= 0.8182 D₆₀= 0.4278
D₅₀= 0.3391 D₃₀= 0.2040 D₁₅= 0.1170
D₁₀= 0.0818 C_u= 5.23 C_c= 1.19

Remarks

Moisture content 5.6%
Sample contained peat and organics

Date Received: 10/26/2021 Date Tested: 10/28/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-18 SS01F
Sample Number: 3521-771

Depth: 0'-2'

Date Sampled: 10/18/2021



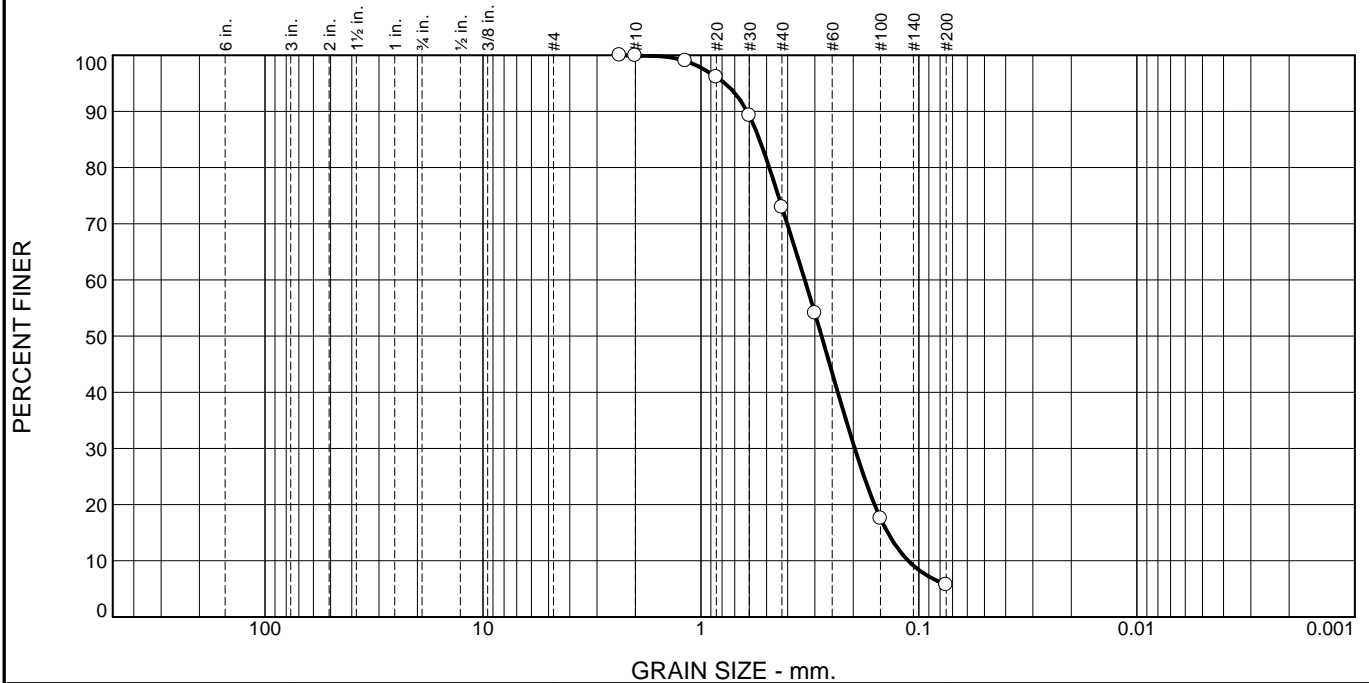
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 771A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	27.0	67.2	5.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#8	100.0		
#10	99.9		
#16	99.0		
#20	96.1		
#30	89.3		
#40	72.9		
#50	54.1		
#100	17.5		
#200	5.7		

* (no specification provided)

Material Description

Medium brown and dark brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.6135 D₈₅= 0.5389 D₆₀= 0.3338
D₅₀= 0.2795 D₃₀= 0.1970 D₁₅= 0.1389
D₁₀= 0.1121 C_u= 2.98 C_c= 1.04

Remarks

Moisture content 10.4%

Date Received: 10/26/2021 Date Tested: 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-18 SS02

Sample Number: 3521-811

Depth: 2'-4'

Date Sampled: 10/18/2021



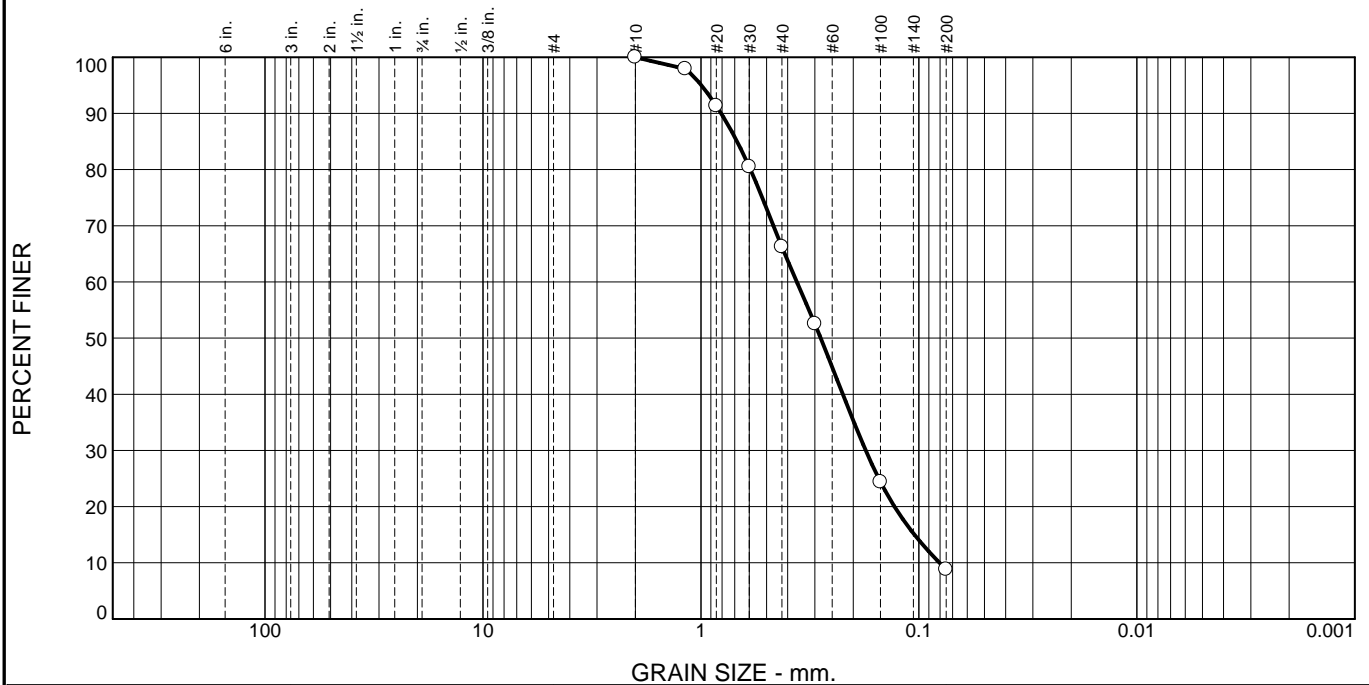
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 811A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	33.8	57.4	8.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	97.9		
#20	91.3		
#30	80.5		
#40	66.2		
#50	52.5		
#100	24.4		
#200	8.8		

* (no specification provided)

Material Description

Light brown sand with sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.8080 D₈₅= 0.6827 D₆₀= 0.3630
D₅₀= 0.2822 D₃₀= 0.1753 D₁₅= 0.1048
D₁₀= 0.0804 C_u= 4.51 C_c= 1.05

Remarks

Moisture content 4.0%

Date Received: 10/26/2021 Date Tested: 11/1/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-19 SS01F
Sample Number: 3521-775

Depth: 0'-2'

Date Sampled: 10/18/2021



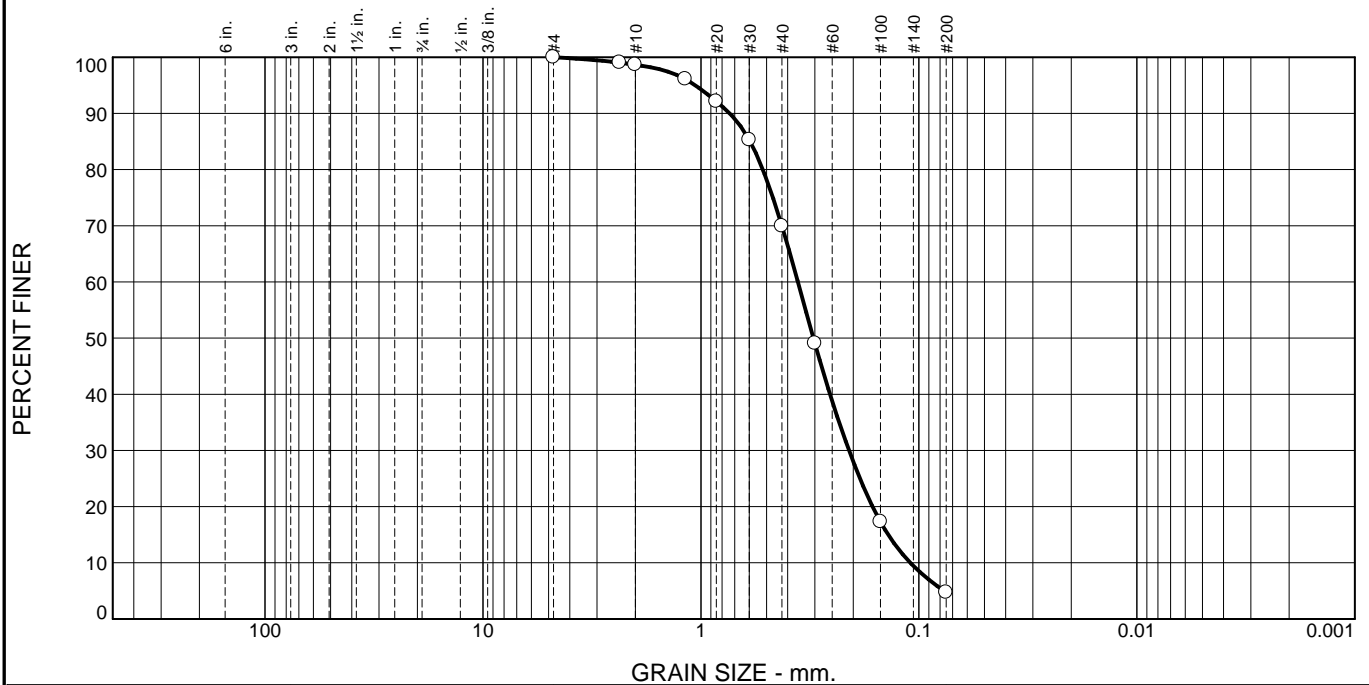
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 775A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.3	28.8	65.2	4.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.0		
#10	98.7		
#16	96.1		
#20	92.1		
#30	85.3		
#40	69.9		
#50	49.1		
#100	17.3		
#200	4.7		

* (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

D₉₀= 0.7379 D₈₅= 0.5949 D₆₀= 0.3591
D₅₀= 0.3048 D₃₀= 0.2092 D₁₅= 0.1383
D₁₀= 0.1096 C_u= 3.28 C_c= 1.11

Remarks

Moisture content 11.9%

Date Received: 10/26/2021 **Date Tested:** 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-19 SS03

Sample Number: 3521-810

Depth: 5'-7'

Date Sampled: 10/18/2021



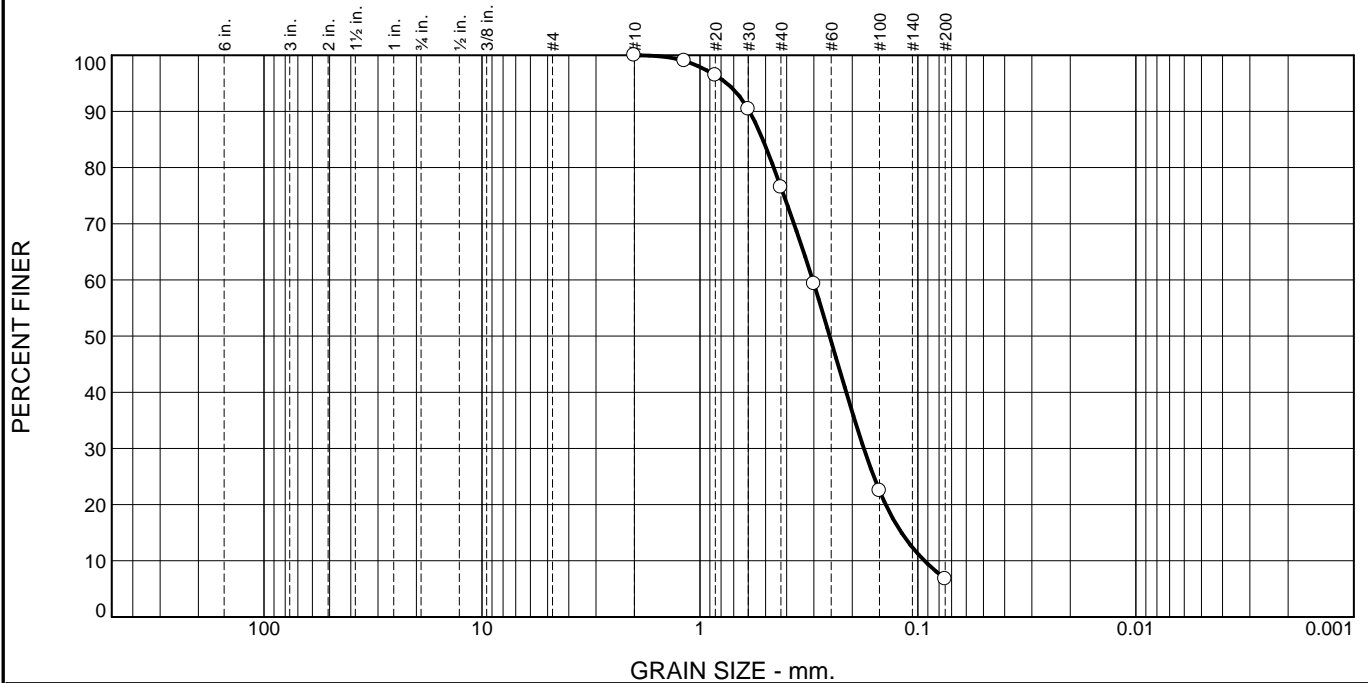
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 810A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	23.5	69.7	6.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	99.0		
#20	96.4		
#30	90.4		
#40	76.5		
#50	59.3		
#100	22.5		
#200	6.8		

* (no specification provided)

Material Description
Medium brown and light brown sand with silt

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients
D₉₀= 0.5922 D₈₅= 0.5151 D₆₀= 0.3038
D₅₀= 0.2539 D₃₀= 0.1770 D₁₅= 0.1190
D₁₀= 0.0933 C_u= 3.26 C_c= 1.11

Remarks
Moisture content 4.4%

Date Received: 10/26/2021 Date Tested: 10/28/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-20 SS01

Sample Number: 3521-766

Depth: 0'-2'

Date Sampled: 10/18/2021



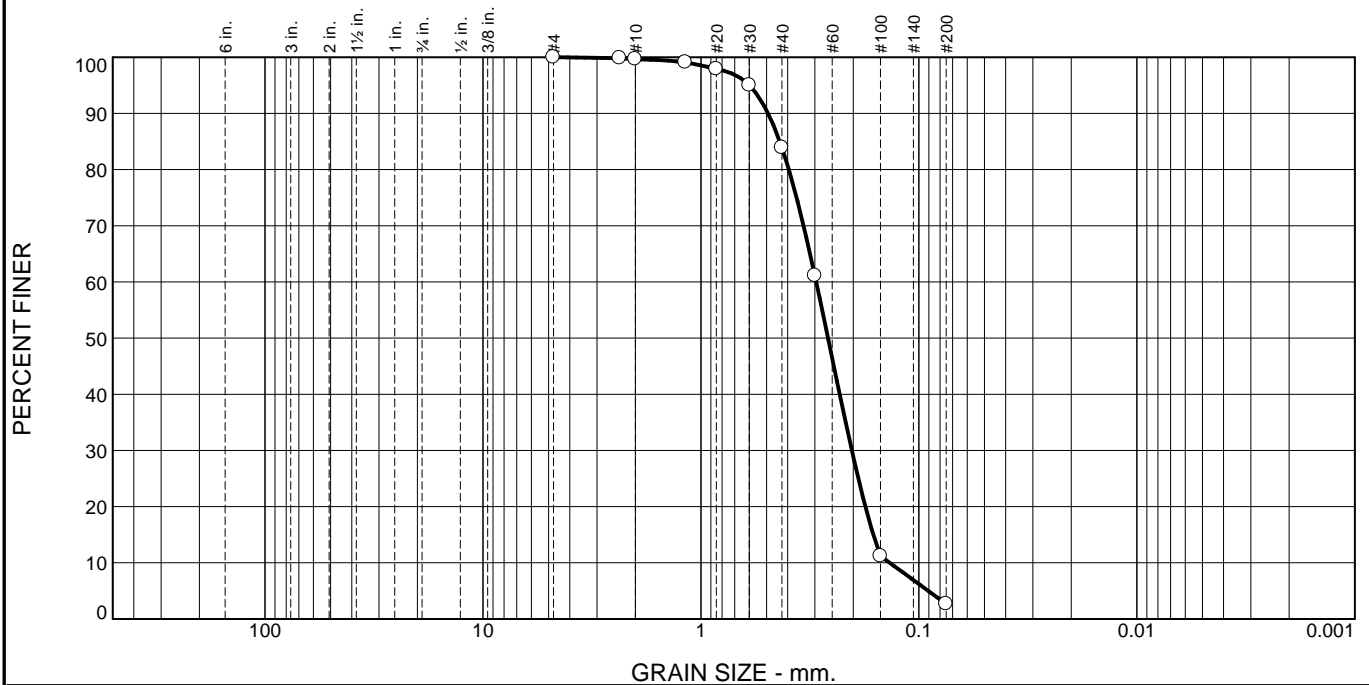
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 766A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	15.8	81.2	2.7	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.8		
#10	99.7		
#16	99.1		
#20	97.9		
#30	95.0		
#40	83.9		
#50	61.1		
#100	11.2		
#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

D₉₀= 0.4918 D₈₅= 0.4346 D₆₀= 0.2958
D₅₀= 0.2611 D₃₀= 0.2031 D₁₅= 0.1619
D₁₀= 0.1361 C_u= 2.17 C_c= 1.02

Remarks

Moisture content 21.0%

Date Received: 10/26/2021 **Date Tested:** 11/5/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-20 SS04

Sample Number: 3521-809

Depth: 7'-9'

Date Sampled: 10/18/2021



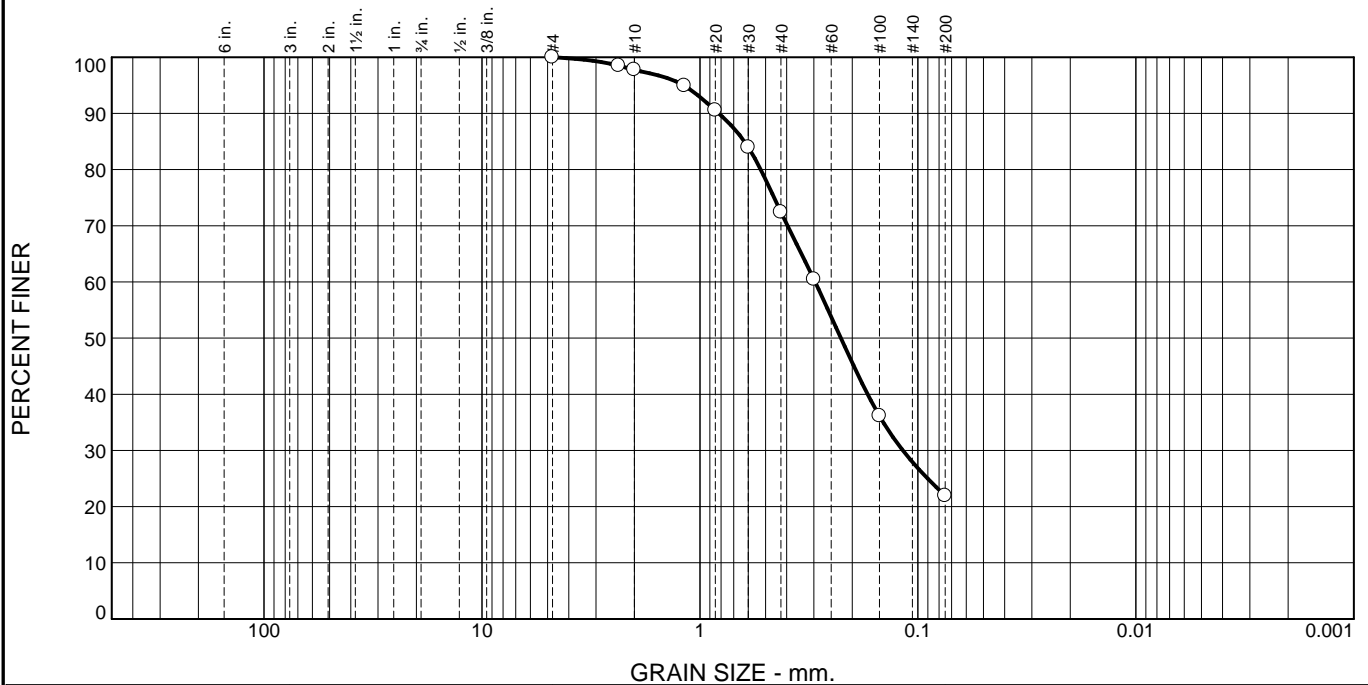
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 809A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.2	25.4	50.5	21.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	98.5		
#10	97.8		
#16	94.9		
#20	90.5		
#30	84.0		
#40	72.4		
#50	60.5		
#100	36.1		
#200	21.9		

* (no specification provided)

Material Description		
Brown and orange silty sand		
Atterberg Limits (ASTM D 4318)		
PL= -	LL= -	PI= -
Classification		
USCS (D 2487)= SM	AASHTO (M 145)= -	
Coefficients		
D ₉₀ = 0.8205	D ₈₅ = 0.6249	D ₆₀ = 0.2961
D ₅₀ = 0.2256	D ₃₀ = 0.1173	D ₁₅ =
D ₁₀ =	C _u =	C _c =
Remarks		
Moisture content 6.5%		
Date Received: 10/26/2021		Date Tested: 10/28/2021
Tested By: Eric Tavares		
Checked By: Robert Faria		
Title: Lab Manager		

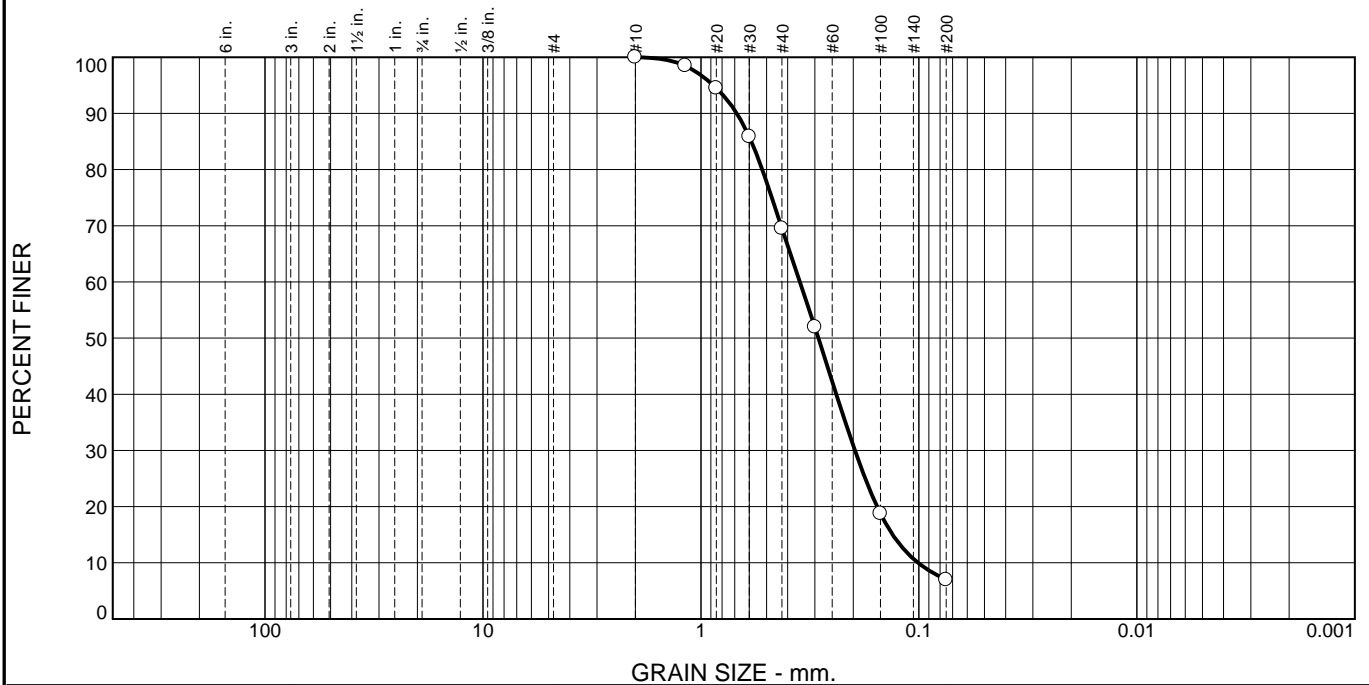
Location: C/B-25 SS01F
Sample Number: 3521-765 **Depth:** 0'-2'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
 Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 765A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	30.5	62.5	7.0	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	98.5		
#20	94.5		
#30	85.8		
#40	69.5		
#50	51.9		
#100	18.7		
#200	7.0		

* (no specification provided)

Material Description
Medium brown and light brown sand with silt

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients
D₉₀= 0.6842 D₈₅= 0.5868 D₆₀= 0.3516
D₅₀= 0.2890 D₃₀= 0.1966 D₁₅= 0.1320
D₁₀= 0.1009 C_u= 3.48 C_c= 1.09

Remarks
Moisture content 5.3%

Date Received: 10/26/2021 **Date Tested:** 10/28/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: CB-21 SS02F

Sample Number: 3521-770

Depth: 2'-4'

Date Sampled: 10/18/2021



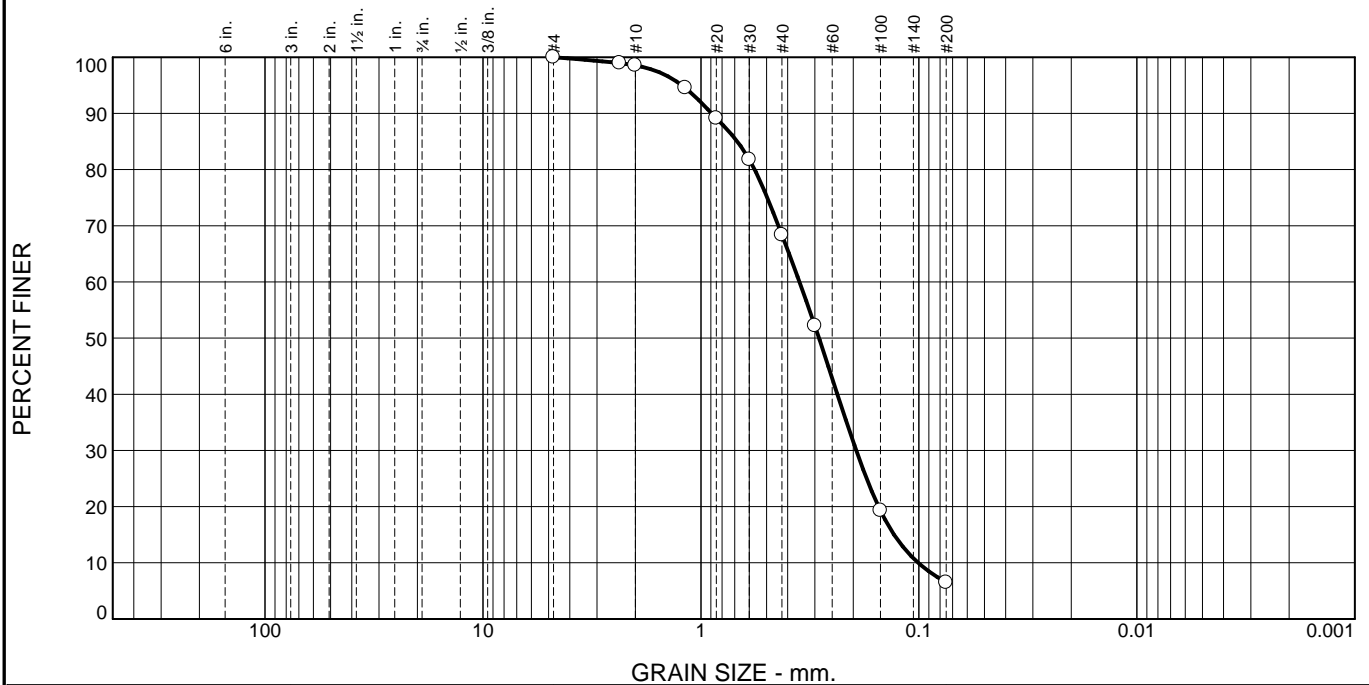
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 770A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	30.2	61.9	6.5	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	98.9		
#10	98.6		
#16	94.5		
#20	89.1		
#30	81.8		
#40	68.4		
#50	52.2		
#100	19.3		
#200	6.5		

* (no specification provided)

Material Description

Dark brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 0.8931 D₈₅= 0.6808 D₆₀= 0.3531
D₅₀= 0.2871 D₃₀= 0.1939 D₁₅= 0.1300
D₁₀= 0.1008 C_u= 3.50 C_c= 1.06

Remarks

Moisture content 7.2%

Date Received: 10/26/2021 Date Tested: 11/4/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-21 SS03

Sample Number: 3521-791

Depth: 5'-7'

Date Sampled: 10/18/2021



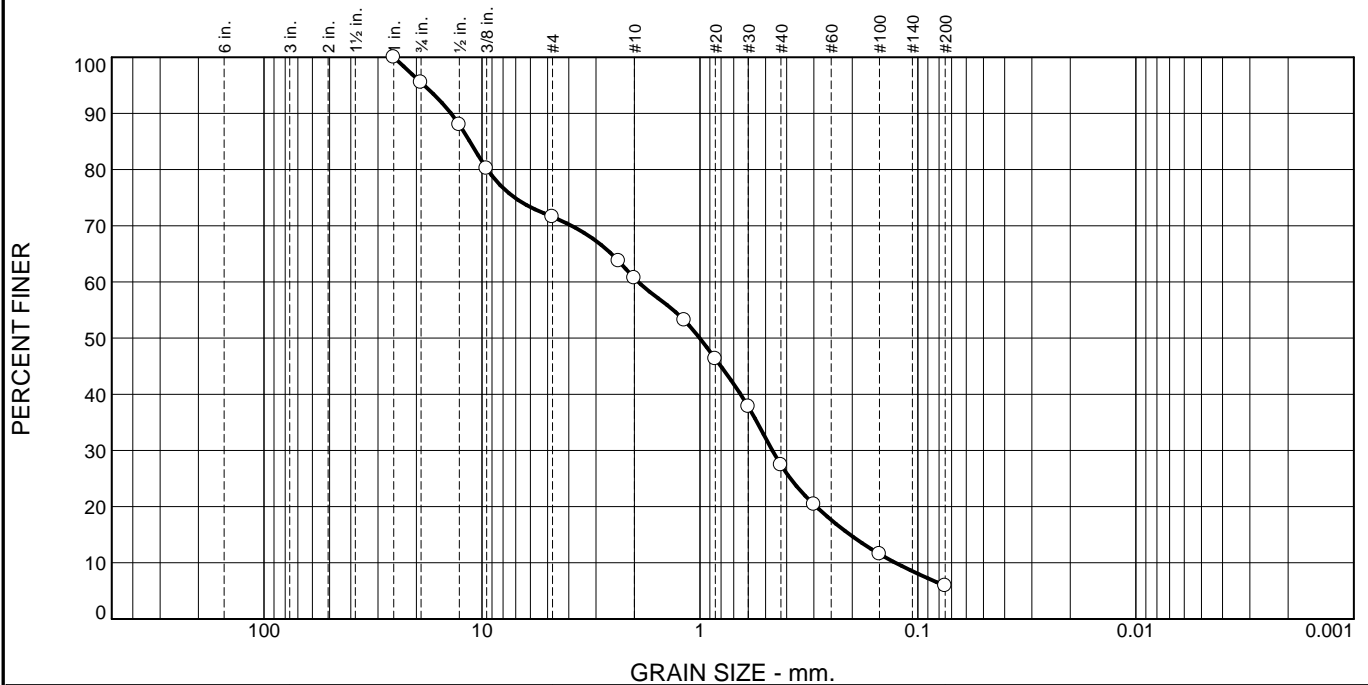
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 791A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.5	23.9	10.9	33.3	21.5	5.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	95.5		
1/2"	88.0		
3/8"	80.2		
#4	71.6		
#8	63.7		
#10	60.7		
#16	53.2		
#20	46.3		
#30	37.8		
#40	27.4		
#50	20.4		
#100	11.6		
#200	5.9		

* (no specification provided)

Material Description

Oranish-brown sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 13.8606 D₈₅= 11.3665 D₆₀= 1.9207
D₅₀= 1.0029 D₃₀= 0.4654 D₁₅= 0.2048
D₁₀= 0.1267 C_u= 15.16 C_c= 0.89

Remarks

Moisture content 1.9%

Date Received: 10/26/2021 Date Tested: 10/29/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-22 SS01B middle
Sample Number: 3521-774

Depth: 0'-2'

Date Sampled: 10/18/2021



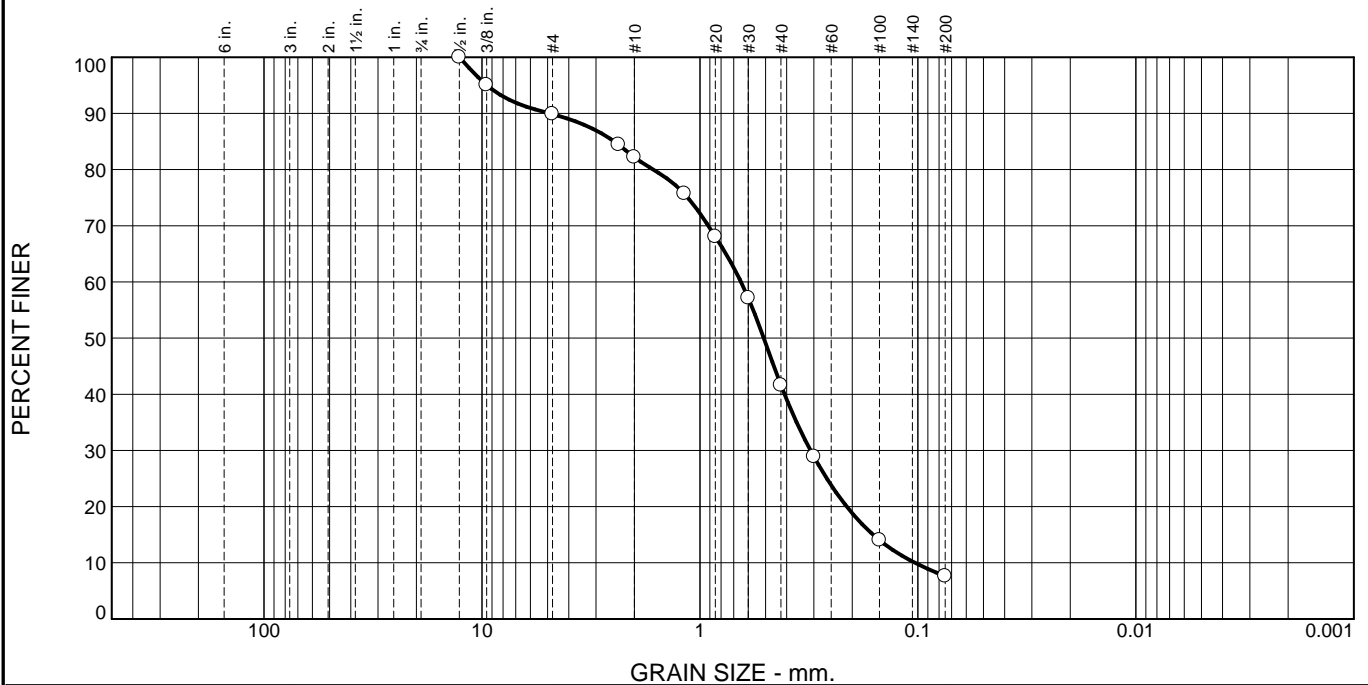
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 774A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.1	7.7	40.6	34.0	7.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	95.1		
#4	89.9		
#8	84.4		
#10	82.2		
#16	75.7		
#20	68.1		
#30	57.1		
#40	41.6		
#50	28.9		
#100	14.0		
#200	7.6		

* (no specification provided)

Material Description
Dark brown sand with silt

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SW-SM AASHTO (M 145)= -

Coefficients
D₉₀= 4.8850 D₈₅= 2.4737 D₆₀= 0.6478
D₅₀= 0.5099 D₃₀= 0.3109 D₁₅= 0.1606
D₁₀= 0.1031 C_u= 6.28 C_c= 1.45

Remarks
Moisture content 16.6%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-22 SS04

Sample Number: 3521-757

Depth: 7'-9'

Date Sampled: 10/18/2021



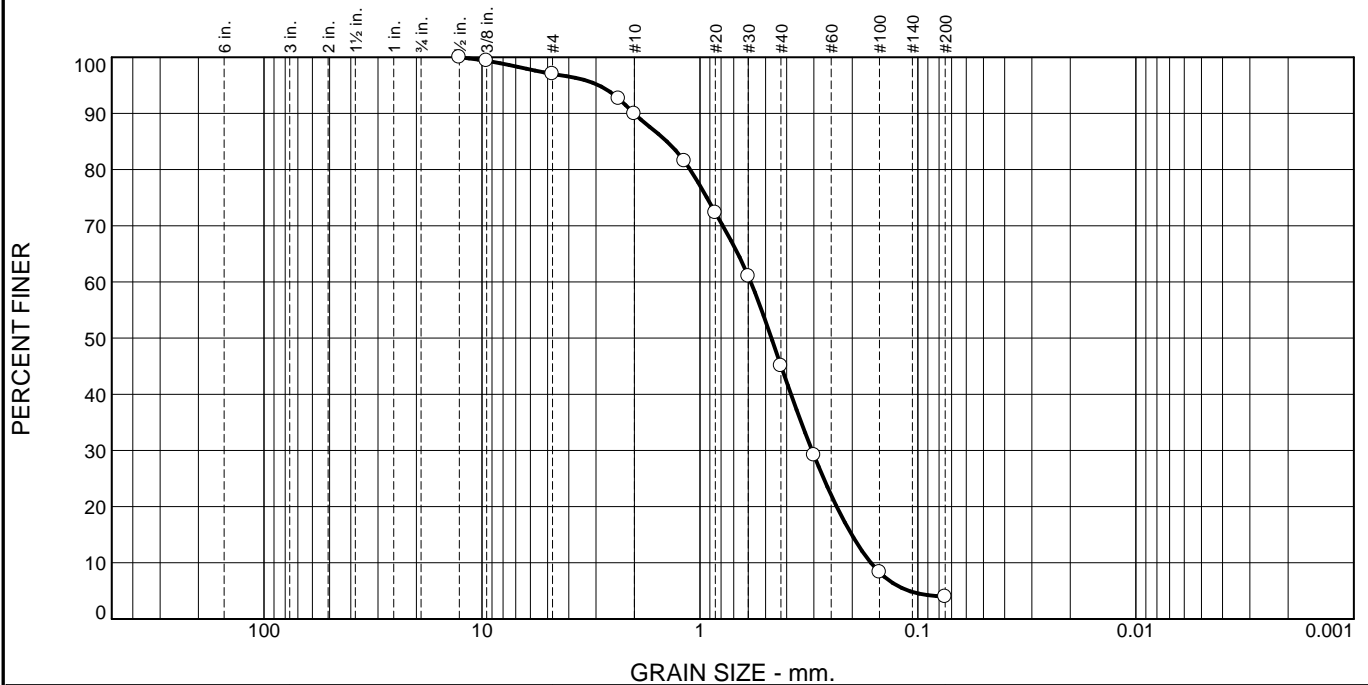
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 757A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	7.0	44.9	41.1	4.0	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	99.4		
#4	97.0		
#8	92.7		
#10	90.0		
#16	81.5		
#20	72.3		
#30	61.0		
#40	45.1		
#50	29.2		
#100	8.3		
#200	4.0		

* (no specification provided)

Material Description
Medium brown sand

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients
D₉₀= 2.0060 D₈₅= 1.4179 D₆₀= 0.5847
D₅₀= 0.4700 D₃₀= 0.3059 D₁₅= 0.2012
D₁₀= 0.1643 C_u= 3.56 C_c= 0.97

Remarks
Moisture content 16.1%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-23 SS05

Sample Number: 3521-760

Depth: 9'-11'

Date Sampled: 10/18/2021



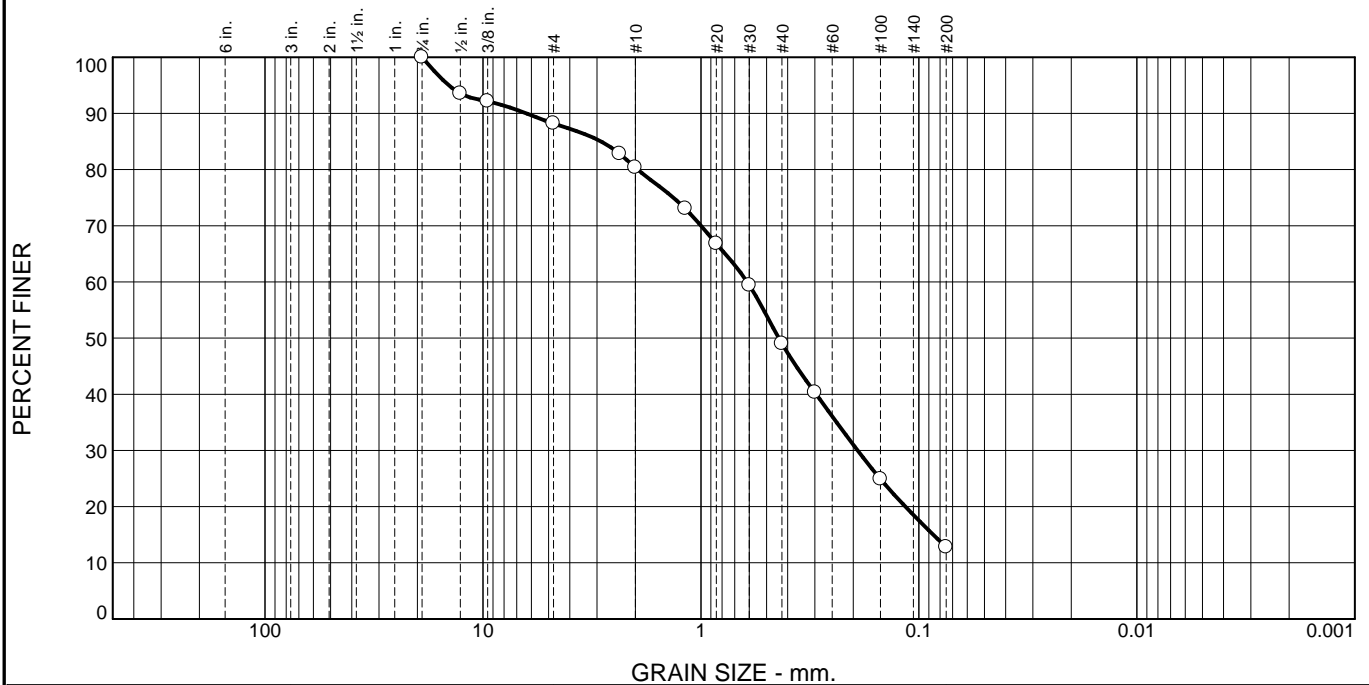
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 760A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.8	7.8	31.4	36.2	12.8	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	93.5		
3/8"	92.2		
#4	88.2		
#8	82.8		
#10	80.4		
#16	73.1		
#20	66.8		
#30	59.4		
#40	49.0		
#50	40.3		
#100	24.9		
#200	12.8		

* (no specification provided)

Material Description

Dark brown silty sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SM AASHTO (M 145)= -

Coefficients

D₉₀= 6.3335 D₈₅= 2.8717 D₆₀= 0.6136
D₅₀= 0.4395 D₃₀= 0.1911 D₁₅= 0.0859
D₁₀= Cu= C_c=

Remarks

Moisture content 11.7%
Sample contained organics

Date Received: 10/26/2021 Date Tested: 10/29/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-24 SS01F
Sample Number: 3521-772

Depth: 0'-2'

Date Sampled: 10/18/2021



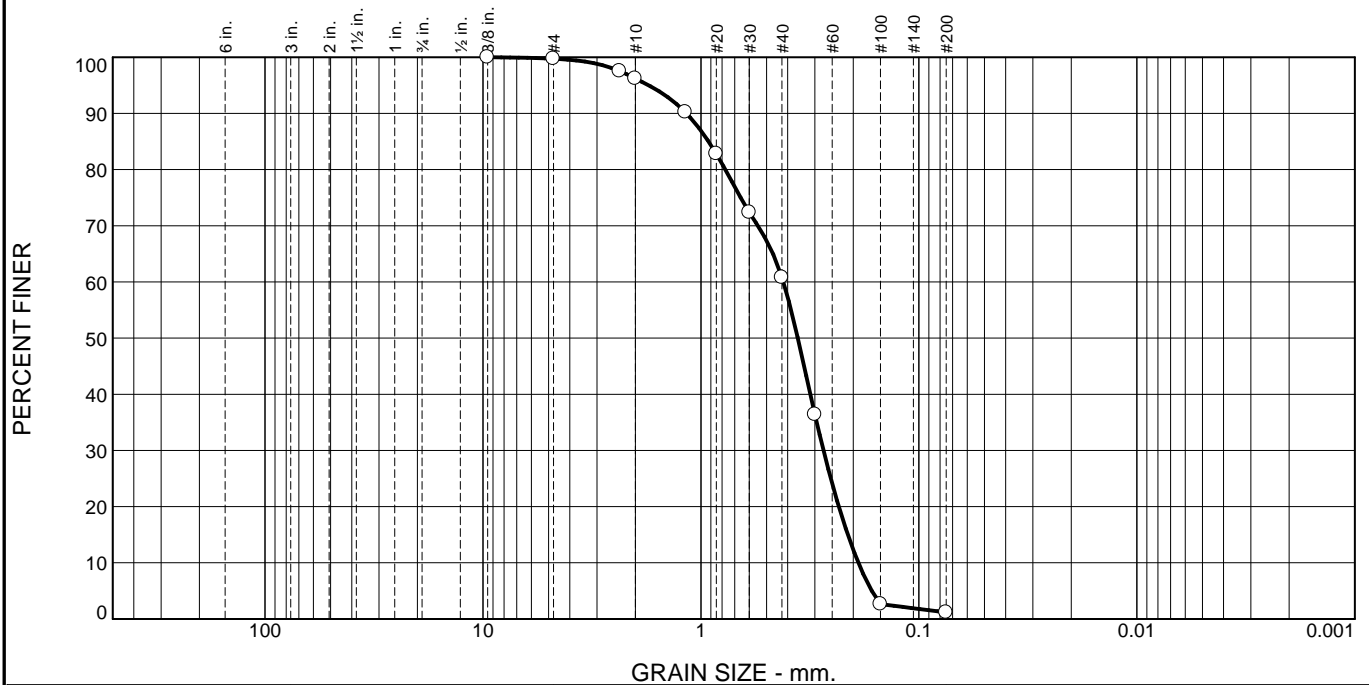
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 772A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	3.5	35.4	59.6	1.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.7		
#8	97.5		
#10	96.2		
#16	90.2		
#20	82.8		
#30	72.4		
#40	60.8		
#50	36.4		
#100	2.6		
#200	1.2		

* (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

D₉₀= 1.1652 D₈₅= 0.9231 D₆₀= 0.4187
D₅₀= 0.3595 D₃₀= 0.2739 D₁₅= 0.2119
D₁₀= 0.1896 C_u= 2.21 C_c= 0.94

Remarks

Moisture content 17.2%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-24 SS05

Sample Number: 3521-758

Depth: 9'-11'

S

Date Sampled: 10/18/2021



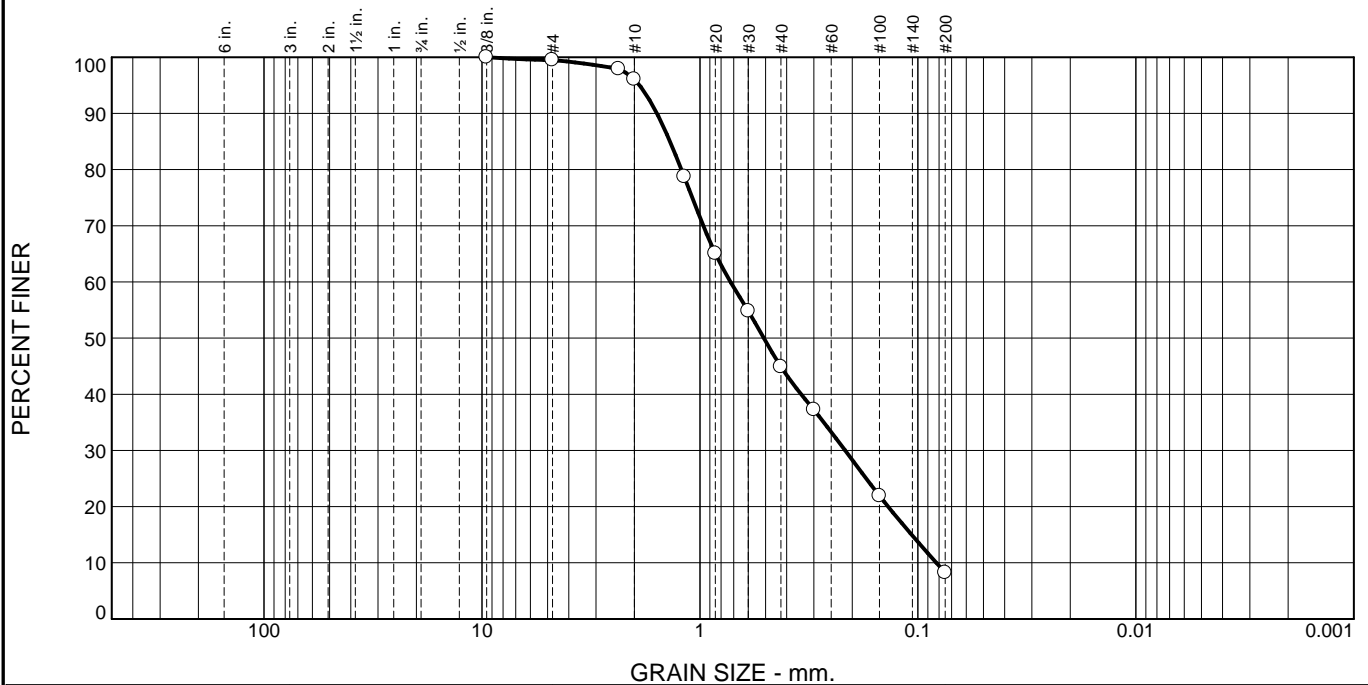
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 758A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	3.4	51.2	36.7	8.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.5		
#8	97.9		
#10	96.1		
#16	78.7		
#20	65.0		
#30	54.8		
#40	44.9		
#50	37.2		
#100	21.9		
#200	8.2		

* (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 ₉₀ = 1.5753	D ₈₅ = 1.3728	D ₆₀ = 0.7243
D ₅₀ = 0.5095	D ₃₀ = 0.2157	D ₁₅ = 0.1068
D ₁₀ = 0.0823	C _u = 8.80	C _c = 0.78
Remarks		
Moisture content 4.3%		
Date Received: 10/26/2021 Date Tested: 10/27/2021		
Tested By: Matt Watson		
Checked By: Robert Faria		
Title: Lab Manager		

Location: C/B-25 SS01

Sample Number: 3521-764

Depth: 0'-2'

Date Sampled: 10/18/2021



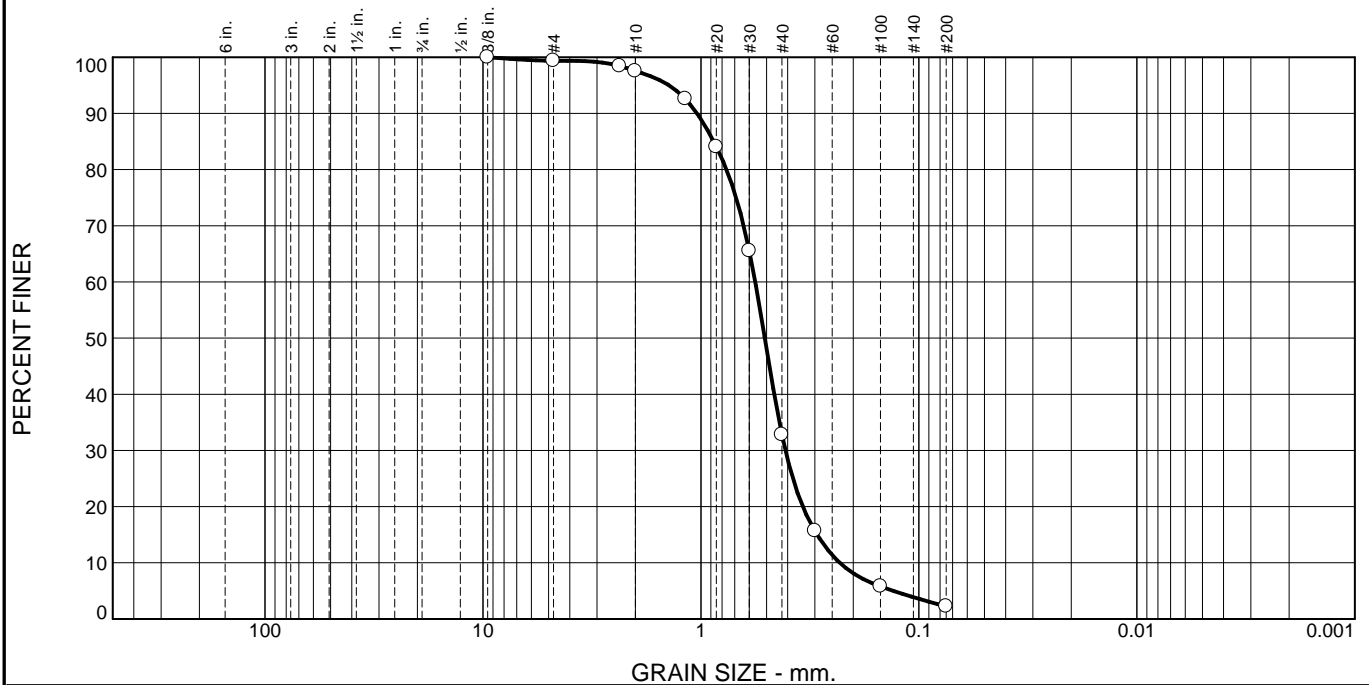
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 764A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	1.9	64.7	30.6	2.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	99.4		
#8	98.4		
#10	97.5		
#16	92.6		
#20	84.1		
#30	65.5		
#40	32.8		
#50	15.7		
#100	5.8		
#200	2.2		

* (no specification provided)

Material Description

Dark brown sand

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients

D₉₀= 1.0426 D₈₅= 0.8741 D₆₀= 0.5638
D₅₀= 0.5096 D₃₀= 0.4097 D₁₅= 0.2929
D₁₀= 0.2307 C_u= 2.44 C_c= 1.29

Remarks

Moisture content 13.8%

Date Received: 10/26/2021 Date Tested: 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-25 SS05

Sample Number: 3521-762

Depth: 9'-11'

Date Sampled: 10/18/2021



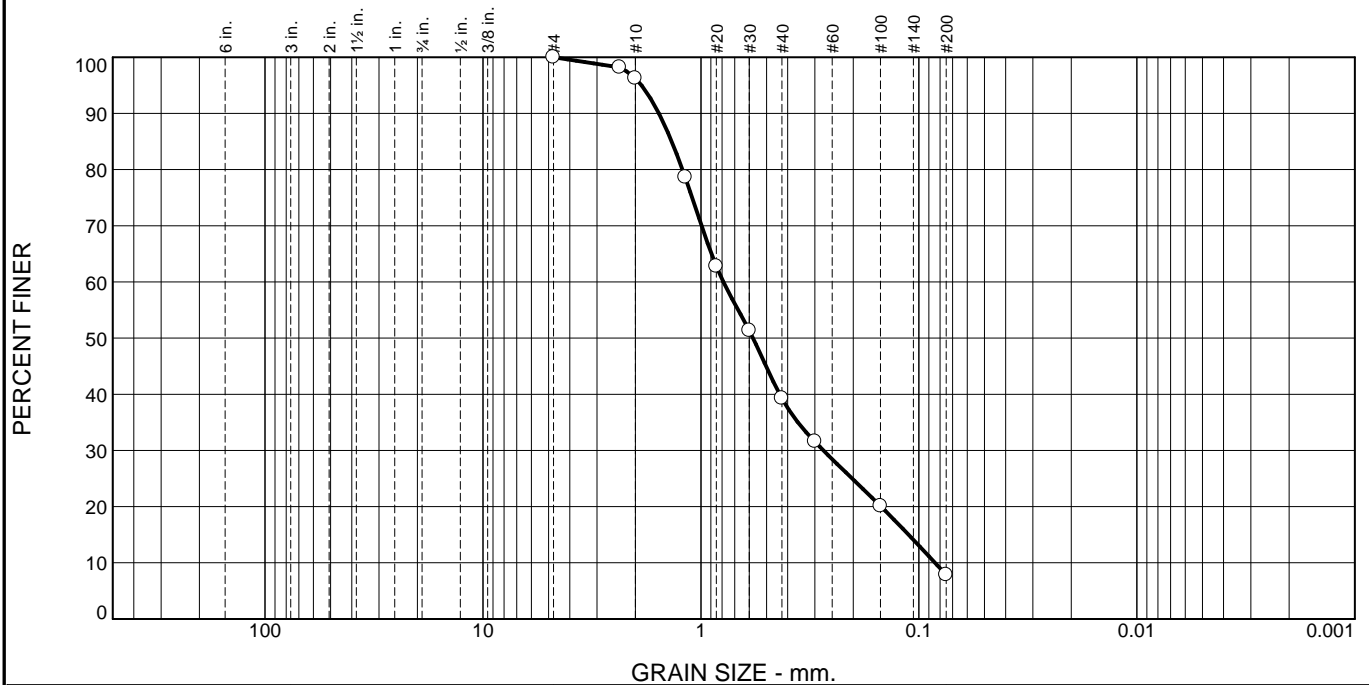
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 762A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.8	56.9	31.4	7.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	98.2		
#10	96.2		
#16	78.6		
#20	62.8		
#30	51.3		
#40	39.3		
#50	31.6		
#100	20.1		
#200	7.9		

* (no specification provided)

Material Description
Light brown sand with silt

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SW-SM AASHTO (M 145)= -

Coefficients
D₉₀= 1.5591 D₈₅= 1.3620 D₆₀= 0.7895
D₅₀= 0.5771 D₃₀= 0.2740 D₁₅= 0.1116
D₁₀= 0.0844 C_u= 9.36 C_c= 1.13

Remarks
Moisture content 3.3%

Date Received: 10/26/2021 **Date Tested:** 10/29/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

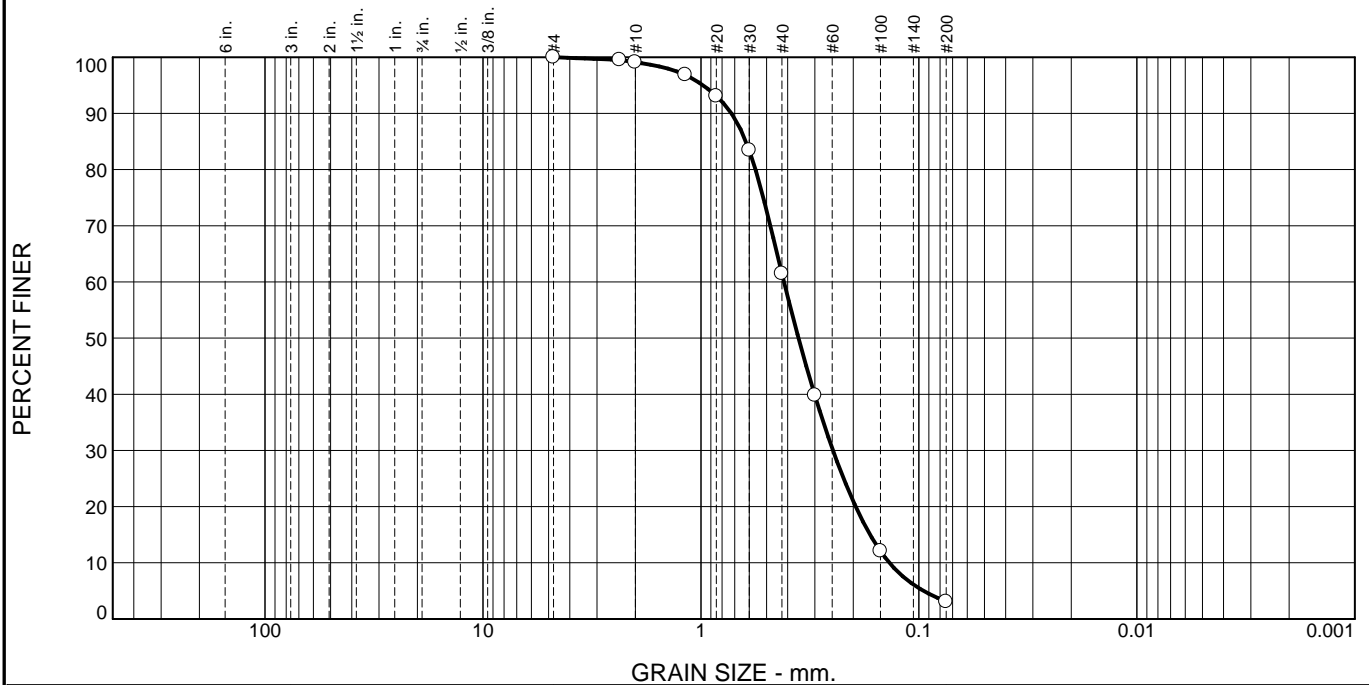
Location: C/B-26 SS01F
Sample Number: 3521-773 **Depth:** 0'-2'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 773A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	37.6	58.4	3.1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	99.1		
#16	96.9		
#20	93.1		
#30	83.4		
#40	61.5		
#50	39.8		
#100	12.1		
#200	3.1		

* (no specification provided)

Material Description
Medium brown sand

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP AASHTO (M 145)= -

Coefficients
D₉₀= 0.7244 D₈₅= 0.6215 D₆₀= 0.4160
D₅₀= 0.3568 D₃₀= 0.2478 D₁₅= 0.1675
D₁₀= 0.1366 C_u= 3.05 C_c= 1.08

Remarks
Moisture content 14.5%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

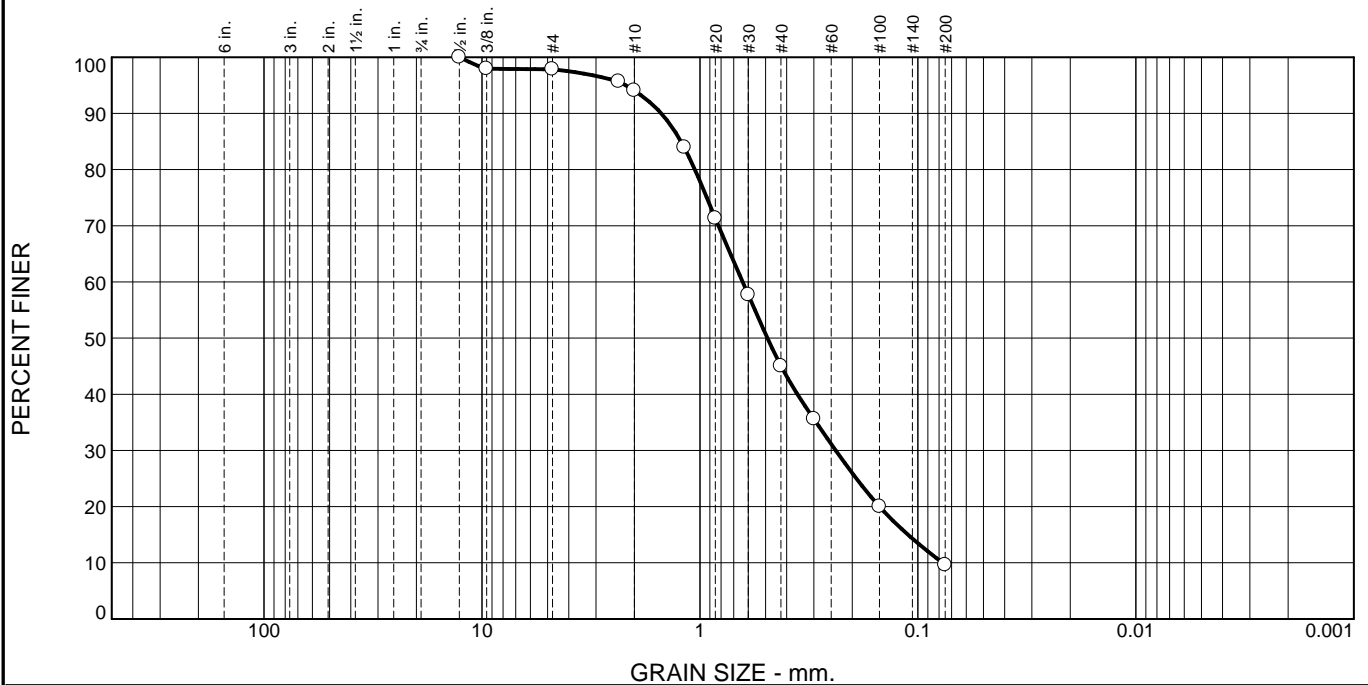
Location: C/B-26 SS04
Sample Number: 3521-761 **Depth:** 7'-9'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 761A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.2	3.7	49.1	35.4	9.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	98.0		
#4	97.8		
#8	95.7		
#10	94.1		
#16	83.9		
#20	71.3		
#30	57.7		
#40	45.0		
#50	35.6		
#100	20.0		
#200	9.6		

* (no specification provided)

Material Description

Light brown sand with silt

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SW-SM AASHTO (M 145)= -

Coefficients

D₉₀= 1.5048 D₈₅= 1.2209 D₆₀= 0.6367
D₅₀= 0.4904 D₃₀= 0.2382 D₁₅= 0.1111
D₁₀= 0.0772 C_u= 8.25 C_c= 1.15

Remarks

Moisture content 4.6%

Date Received: 10/26/2021 Date Tested: 10/28/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-27 SS01F
Sample Number: 3521-768

Depth: 0'-2'

Date Sampled: 10/18/2021



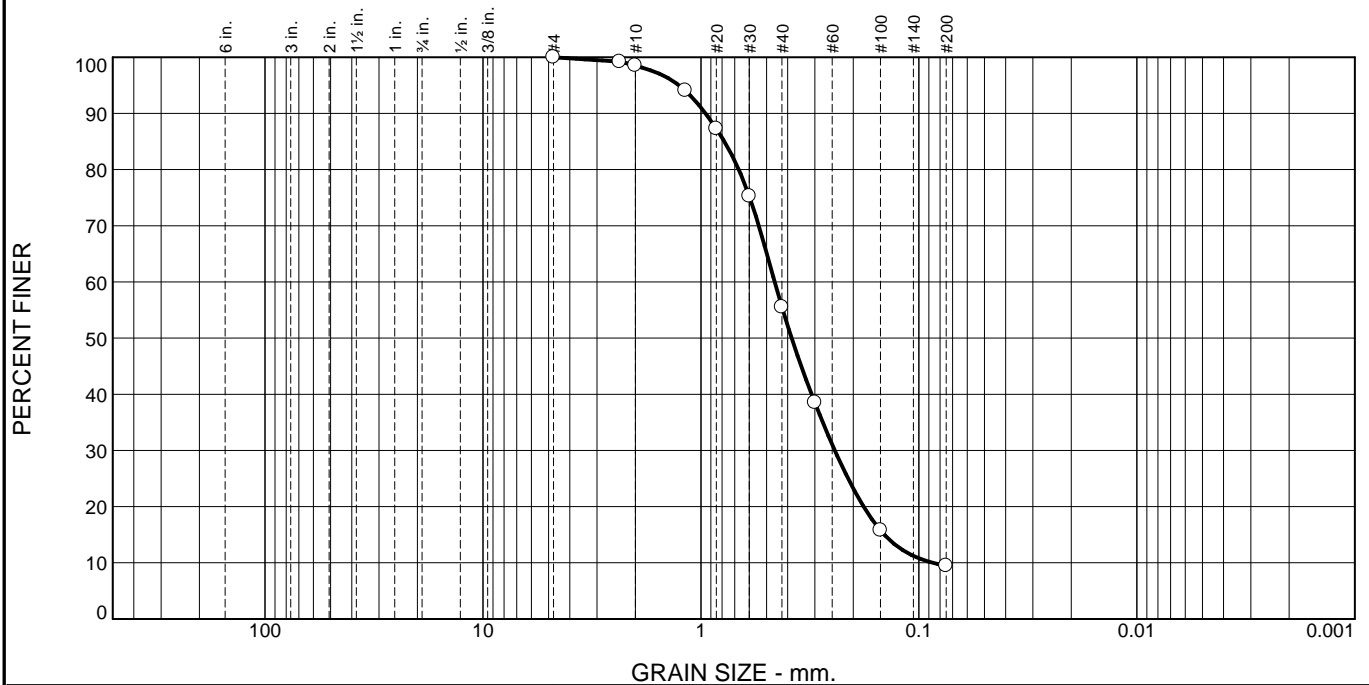
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 768A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.5	43.0	46.1	9.4	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.2		
#10	98.5		
#16	94.1		
#20	87.3		
#30	75.3		
#40	55.5		
#50	38.5		
#100	15.8		
#200	9.4		

* (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 ₉₀ = 0.9528	D ₈₅ = 0.7809	D ₆₀ = 0.4589
D ₅₀ = 0.3838	D ₃₀ = 0.2431	D ₁₅ = 0.1440
D ₁₀ = 0.0862	C _u = 5.33	C _c = 1.49
Remarks		
Moisture content 8.8%		
Date Received: 10/26/2021 Date Tested: 10/27/2021		
Tested By: Matt Watson		
Checked By: Robert Faria		
Title: Lab Manager		

Location: C/B-27 SS02

Sample Number: 3521-763

Depth: 2'-4'

Date Sampled: 10/18/2021



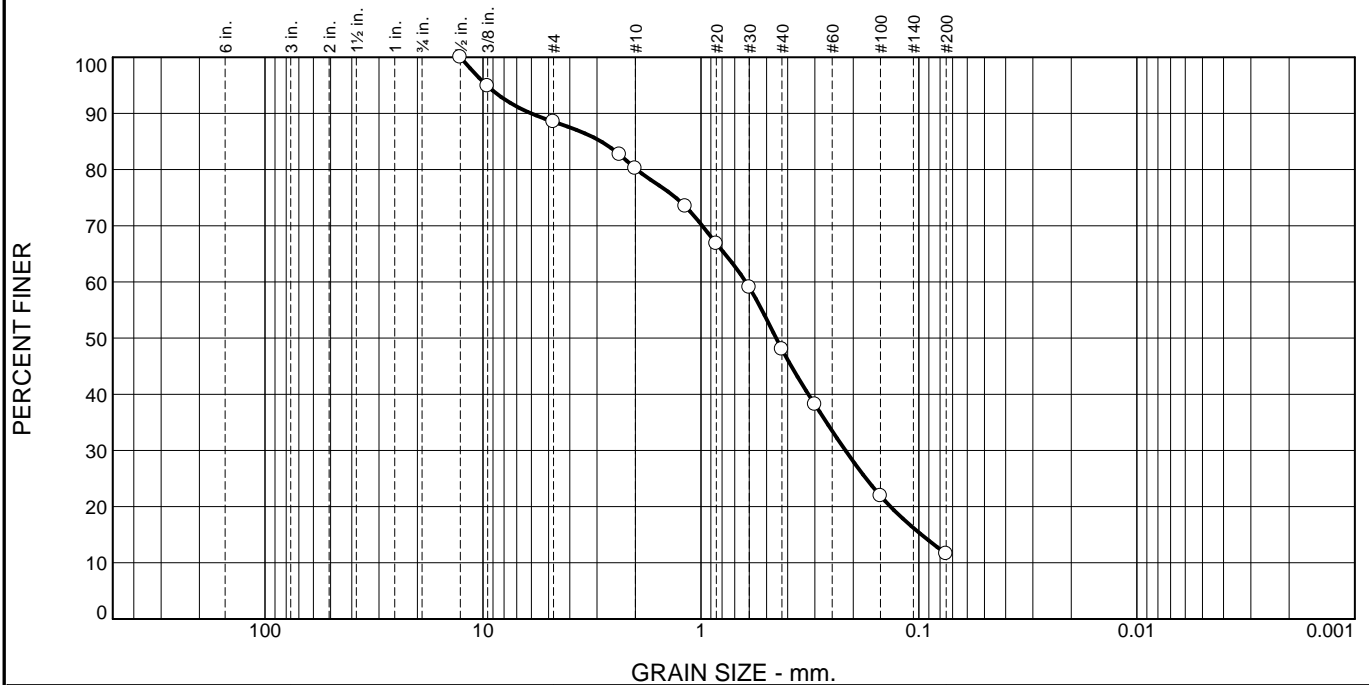
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 763A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.5	8.3	32.2	36.4	11.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	94.9		
#4	88.5		
#8	82.7		
#10	80.2		
#16	73.5		
#20	66.8		
#30	59.0		
#40	48.0		
#50	38.2		
#100	21.9		
#200	11.6		

* (no specification provided)

Material Description
Brown sand with silt

Atterberg Limits (ASTM D 4318)
 PL= - LL= - PI= -

Classification
 USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients
 D₉₀= 6.0168 D₈₅= 2.8734 D₆₀= 0.6221
 D₅₀= 0.4521 D₃₀= 0.2173 D₁₅= 0.0973
 D₁₀= Cu= C_c=

Remarks
Moisture content 3.5%

Date Received: 10/26/2021 **Date Tested:** 10/28/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

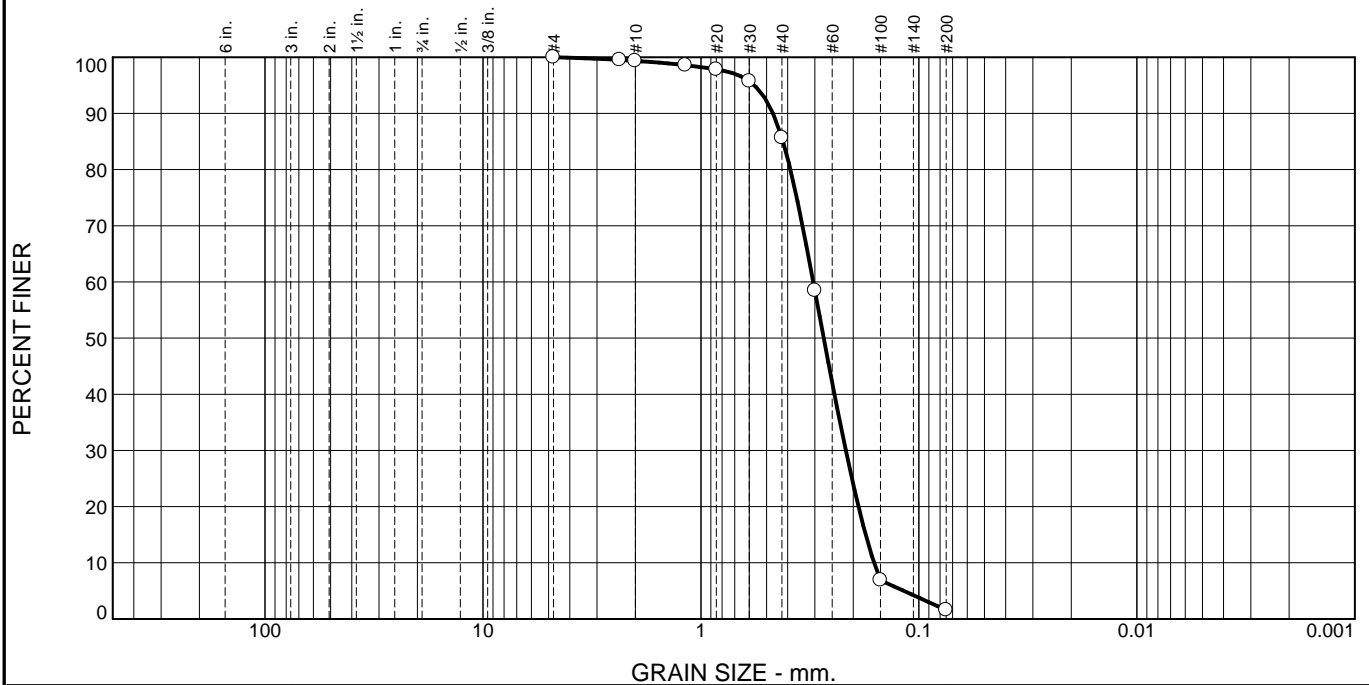
Location: C/B-28 SS01F
Sample Number: 3521-769 **Depth:** 0'-2'

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
 Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 769A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	13.7	84.1	1.6	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	99.4		
#16	98.6		
#20	97.8		
#30	95.7		
#40	85.7		
#50	58.4		
#100	6.9		
#200	1.6		

* (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

D₉₀= 0.4670 D₈₅= 0.4201 D₆₀= 0.3053
D₅₀= 0.2732 D₃₀= 0.2164 D₁₅= 0.1755
D₁₀= 0.1605 C_u= 1.90 C_c= 0.96

Remarks

Moisture content 14.1%

Date Received: 10/26/2021 **Date Tested:** 10/27/2021

Tested By: Matt Watson

Checked By: Robert Faria

Title: Lab Manager

Location: C/B-28 SS04

Sample Number: 3521-759

Depth: 7'-9'

Date Sampled: 10/18/2021



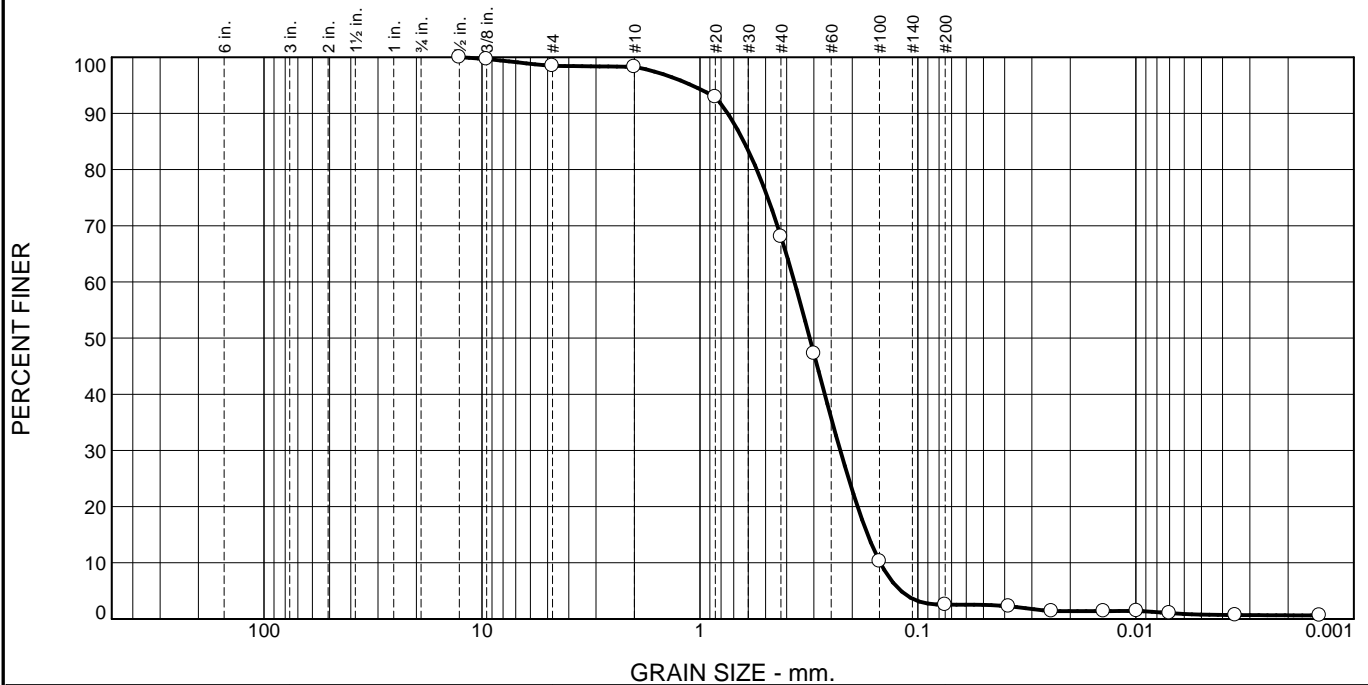
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 759A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.5	0.2	30.2	65.5	1.8	0.8

Test Results (ASTM D 422 & ASTM D 7928)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	99.7		
#4	98.5		
#10	98.3		
#20	92.9		
#40	68.1		
#50	47.3		
#100	10.3		
#200	2.6		
0.0383 mm.	2.3		
0.0244 mm.	1.4		
0.0141 mm.	1.4		
0.0099 mm.	1.4		
0.0070 mm.	1.0		
0.0035 mm.	0.7		
0.0014 mm.	0.6		

* (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
D₉₀= 0.7458 D₈₅= 0.6288 D₆₀= 0.3686
D₅₀= 0.3133 D₃₀= 0.2270 D₁₅= 0.1700
D₁₀= 0.1488 C_u= 2.48 C_c= 0.94

Remarks
Moisture content 9.4%

Date Received: 10/26/2021 **Date Tested:** 11/1/2021
Tested By: Eric Tavares
Checked By: Robert Faria
Title: Lab Manager

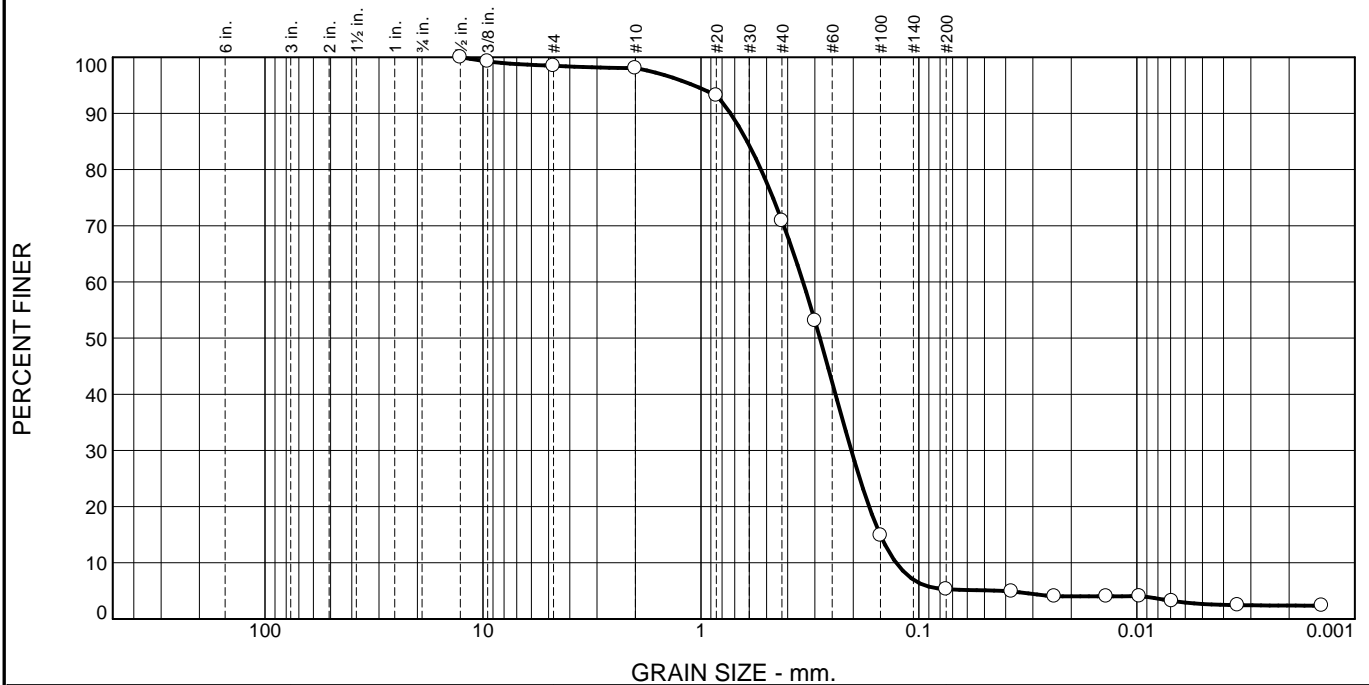
Location: IT-1
Sample Number: 3521-820 **Depth:** 36"-42"

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 820A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.5	0.4	27.2	65.6	2.6	2.7

Test Results (ASTM D 422 & ASTM D 7928)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1/2"	100.0		
3/8"	99.3		
#4	98.5		
#10	98.1		
#20	93.2		
#40	70.9		
#50	53.1		
#100	14.9		
#200	5.3		
0.0376 mm.	4.9		
0.0239 mm.	4.0		
0.0138 mm.	4.0		
0.0097 mm.	4.1		
0.0069 mm.	3.2		
0.0034 mm.	2.5		
0.0014 mm.	2.4		

* (no specification provided)

Material Description		
Dark brown sand with silt		
Atterberg Limits (ASTM D 4318)		
PL= -	LL= -	PI= -
Classification		
USCS (D 2487)= SP-SM	AASHTO (M 145)= -	
Coefficients		
D ₉₀ = 0.7320	D ₈₅ = 0.6131	D ₆₀ = 0.3401
D ₅₀ = 0.2845	D ₃₀ = 0.2042	D ₁₅ = 0.1505
D ₁₀ = 0.1272	C _u = 2.67	C _c = 0.96
Remarks		
Moisture content 16.8%		
Date Received: 10/26/2021 Date Tested: 11/1/2021		
Tested By: Eric Tavares		
Checked By: Robert Faria		
Title: Lab Manager		

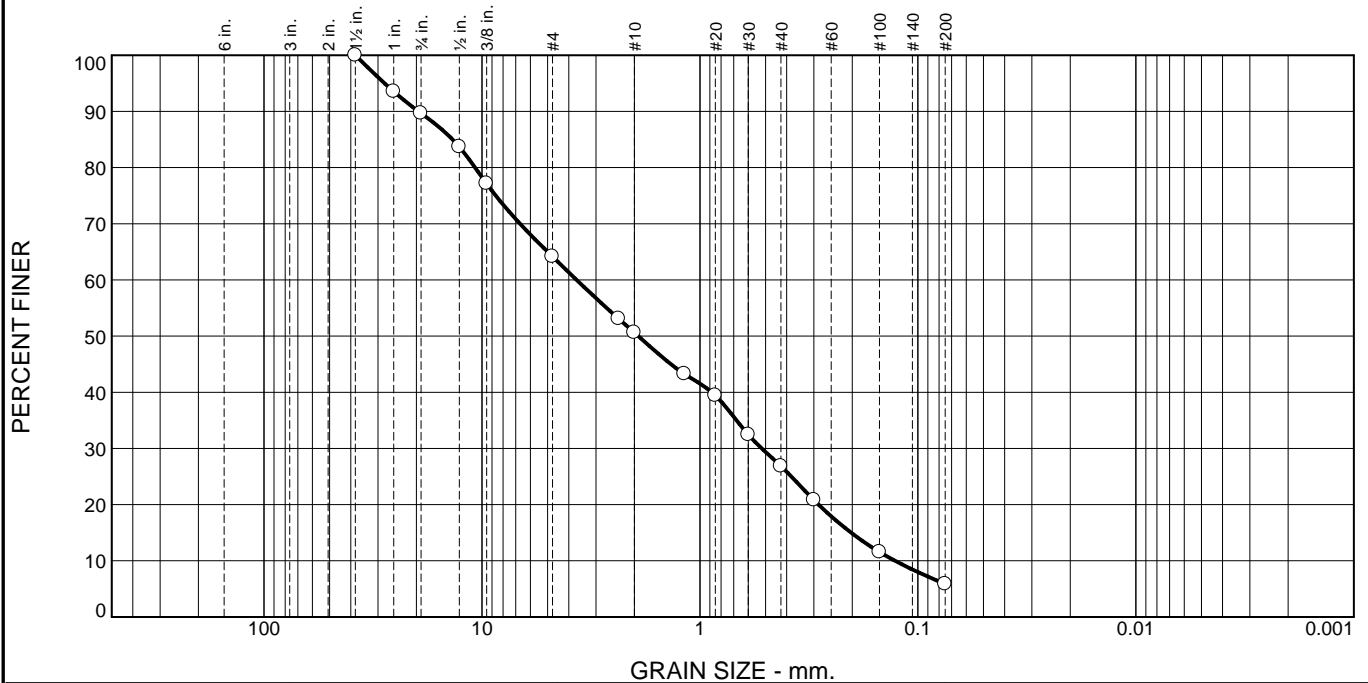
Location: IT-2
Sample Number: 3521-821 Depth: 36"-42"

Date Sampled: 10/18/2021



Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 Figure 821A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.3	25.5	13.6	23.8	20.9	5.9	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1 1/2"	100.0		
1"	93.5		
3/4"	89.7		
1/2"	83.7		
3/8"	77.1		
#4	64.2		
#8	53.1		
#10	50.6		
#16	43.3		
#20	39.4		
#30	32.4		
#40	26.8		
#50	20.8		
#100	11.6		
#200	5.9		

* (no specification provided)

Material Description

Dark brown sand with silt and gravel

Atterberg Limits (ASTM D 4318)

PL= - LL= - PI= -

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients

D₉₀= 19.5506 D₈₅= 13.6304 D₆₀= 3.6794
D₅₀= 1.9162 D₃₀= 0.5208 D₁₅= 0.2025
D₁₀= 0.1274 C_u= 28.88 C_c= 0.58

Remarks

Moisture content 1.5%

Date Received: 10/26/2021 Date Tested: 11/8/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: Composite 1

Sample Number: 3521-818

Depth: 0'-2'

Date Sampled: 10/18/2021



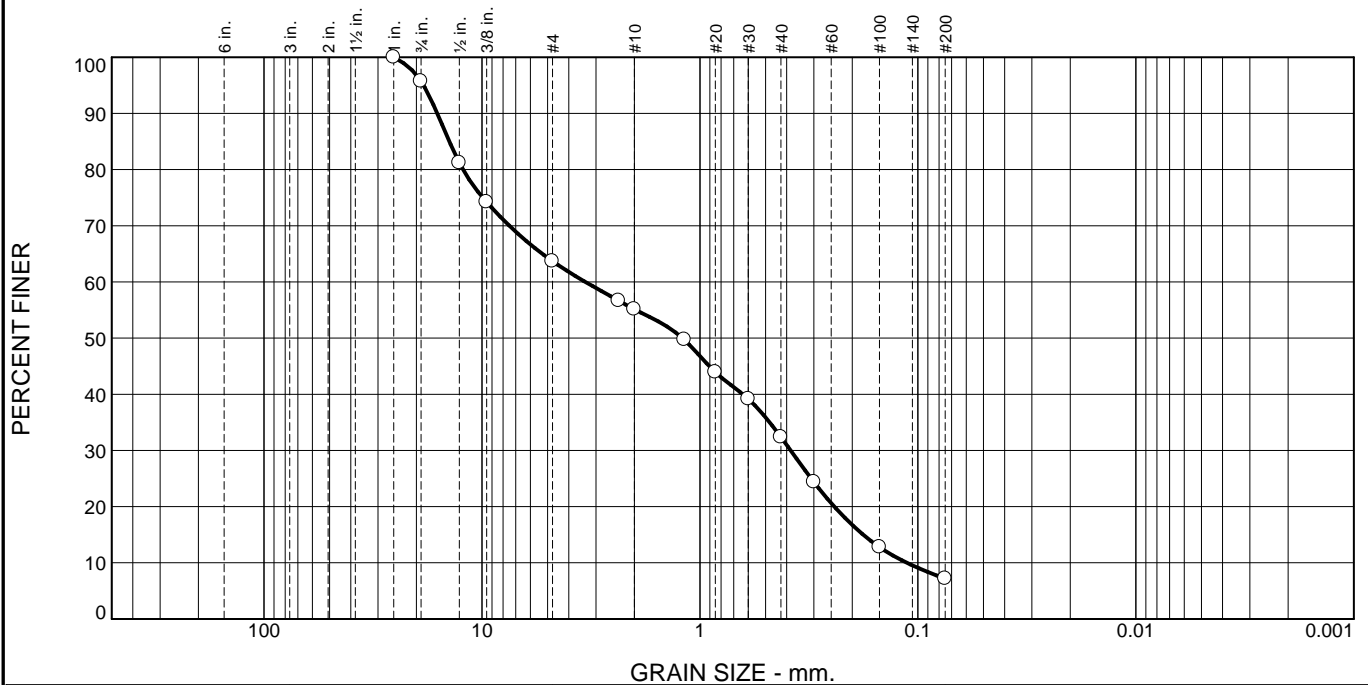
Client: McFarland-Johnson, Inc.

Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH

Project No: 21-04-098

Figure 818A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.3	32.0	8.6	22.7	25.2	7.2	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	95.7		
1/2"	81.2		
3/8"	74.2		
#4	63.7		
#8	56.7		
#10	55.1		
#16	49.7		
#20	43.9		
#30	39.2		
#40	32.4		
#50	24.4		
#100	12.8		
#200	7.2		

* (no specification provided)

Material Description
Dark brown sand with silt and gravel

Atterberg Limits (ASTM D 4318)
PL= - LL= - PI= -

Classification
USCS (D 2487)= SP-SM AASHTO (M 145)= -

Coefficients
D₉₀= 16.0435 D₈₅= 14.1167 D₆₀= 3.3553
D₅₀= 1.2028 D₃₀= 0.3835 D₁₅= 0.1782
D₁₀= 0.1125 C_u= 29.82 C_c= 0.39

Remarks
Moisture content 3.3%

Date Received: 10/26/2021 **Date Tested:** 11/8/2021

Tested By: Eric Tavares

Checked By: Robert Faria

Title: Lab Manager

Location: Composite 2
Sample Number: 3521-819 **Depth:** 0'-2'

Date Sampled: 10/18/2021

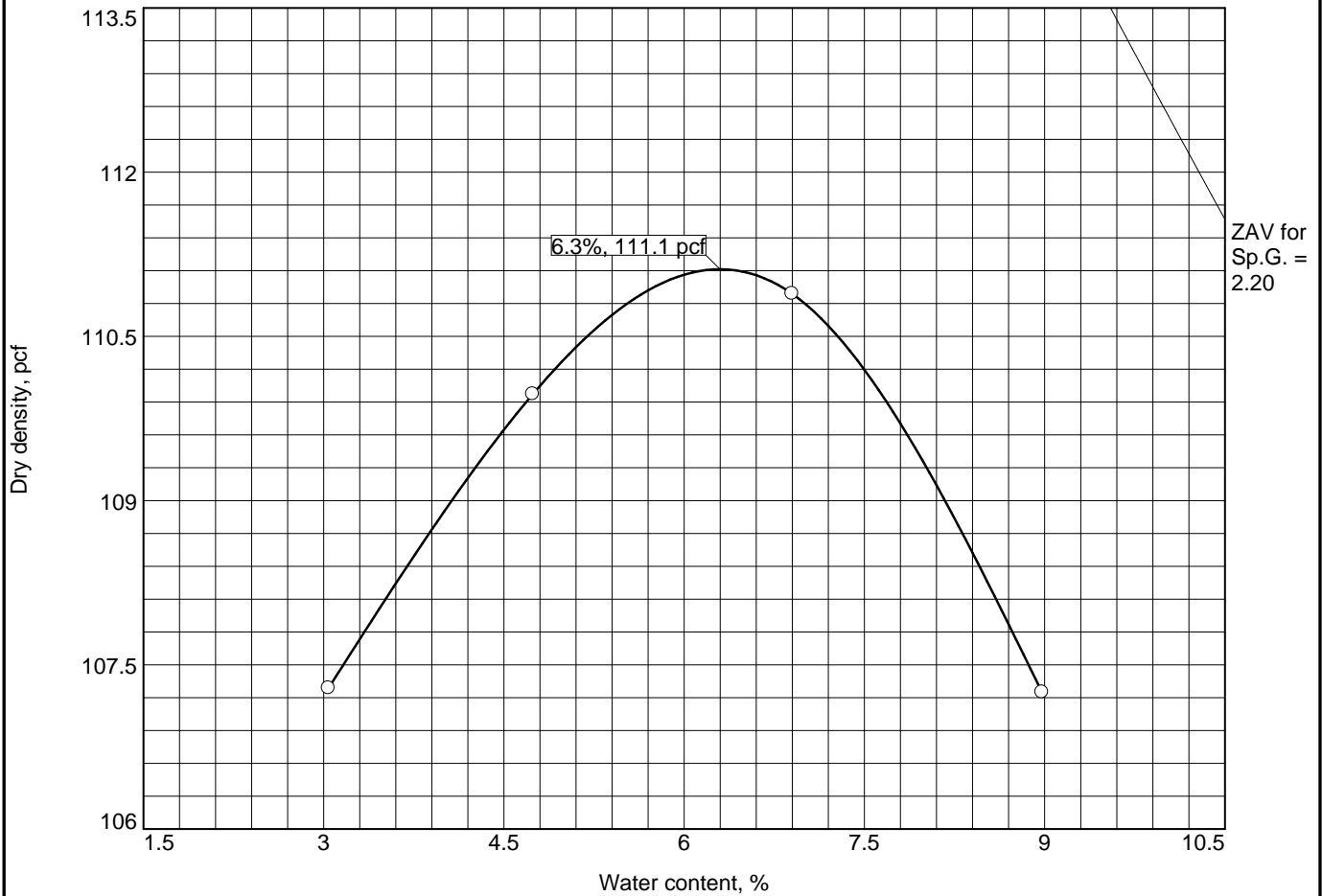


Client: McFarland-Johnson, Inc.
Project: Task order #8 Green Drive cargo facility apron and access road
Manchester-Boston Regional Airport - Manchester, NH
Project No: 21-04-098 **Figure** 819A

APPENDIX D: LABORATORY PROCTOR & CBR TESTING RESULTS

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Moisture Density Report For Curve No. 3521-822



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	-	-	-	2.65	-	-	0	-


TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 111.1 pcf Optimum moisture = 6.3 %	Light brown sand
Project No. 21-04-098 Client: McFarland-Johnson, Inc. Project: Task order #8 Green Drive cargo facility apron and access road Manchester-Boston Regional Airport - Manchester, NH Date: 11/2/2021 Location: CBR-1/ B-2 Sample Number: 3521-822	Remarks:
	

Figure 822A

Tested By: Andy Backus **Checked By:** Robert Faria



Report of California Bearing Ratio (ASTM D1883)

Client: McFarland-Johnson, Inc.
49 Court Street Suite 240
Binghamton, NY 13901

Project: Task Order #8
Green Drive Cargo Facility Apron and Access Rd.
Manchester-Boston Regional Airport
Manchester, NH 03103

Date: November 10, 2021

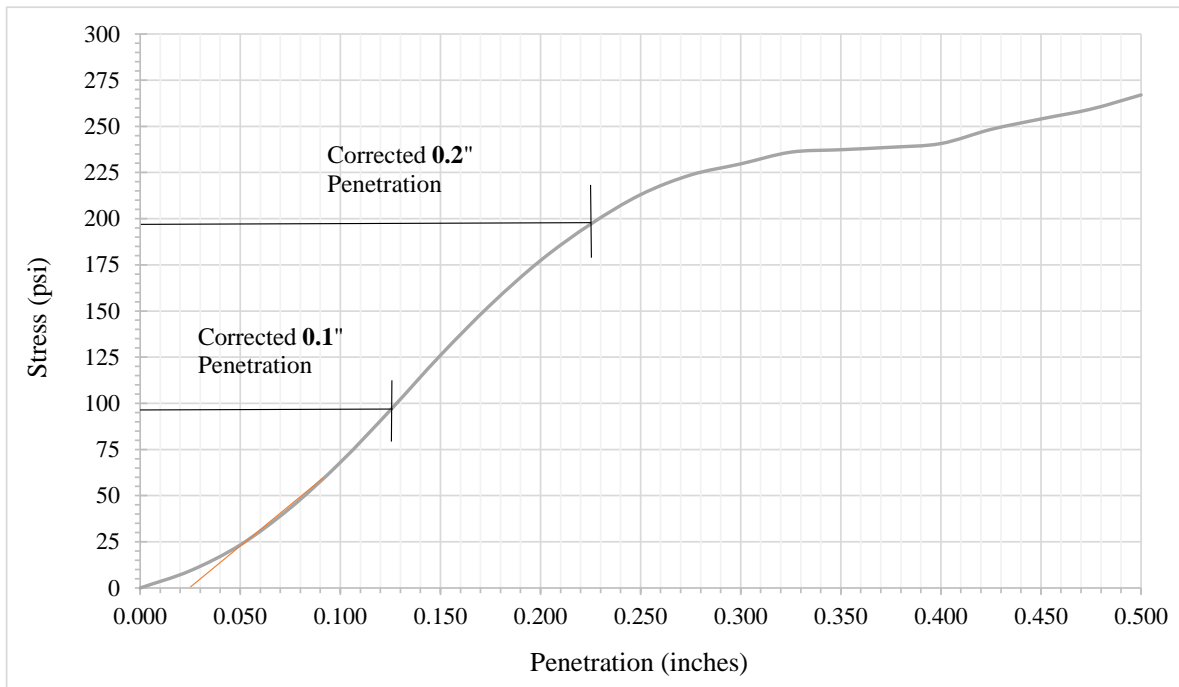
Report #: 21-04-098-001

Sample Source: CBR-1/B-2
Material ID#: 3521-822
Date Received: 10/26/2021
Method of Test: ASTM D1883
Soak Time: 96 Hours
Compaction: 98%
Moisture Content: 7.6%

Material Type: Light brown sand
Intended Use: -
Sampled by: Tom McIntosh
Tested by: Robert Faria
Moisture After Soak: 18.0%
Swell: 0.0%
Modified Proctor: 111.1 pcf at 6.3% Optimum moisture

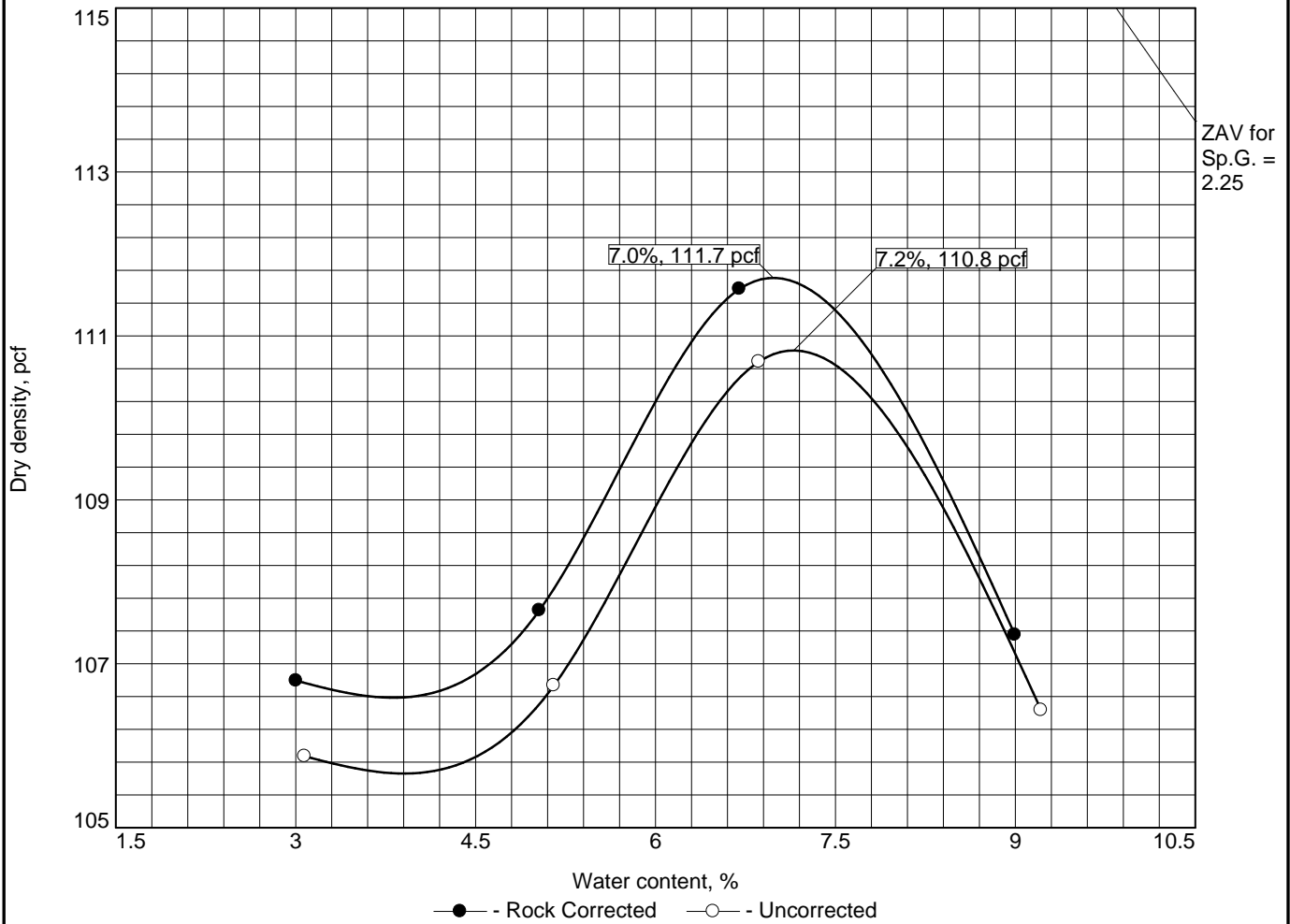
Uncorrected CBR @ 0.100": 7
Uncorrected CBR @ 0.200": 12

Corrected CBR @ 0.100": 10
Corrected CBR @ 0.200": 13



Remarks:

Moisture Density Report For Curve No. 3521-823



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						
	-	-	-	2.65	-	-	2.4	-

ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 111.7 pcf		110.8 pcf	Dark brown silty sand
Optimum moisture = 7.0 %		7.2 %	
<div><div><div><div><div>Project No.</div><div>21-04-098</div></div><div><div>Client:</div><div>McFarland-Johnson, Inc.</div></div><div><div>Project:</div><div>Task order #8 Green Drive cargo facility apron and access road</div></div><div><div>Manchester-Boston Regional Airport - Manchester, NH</div><div>Date: 11/3/2021</div></div><div><div>Location: CBR-2 / B-3</div><div>Sample Number: 3521-823</div></div></div><div><div><div><div><div></div><div>JOHN TURNER</div><div>CONSULTING</div></div></div></div></div></div></div>			Remarks:
<div><div><div><div></div><div>JOHN TURNER</div><div>CONSULTING</div></div></div></div>			
			Figure 823A

Figure 823A

Tested By: Matt Watson **Checked By:** Robert Faria



Report of California Bearing Ratio (ASTM D1883)

Client: McFarland-Johnson, Inc.
49 Court Street Suite 240
Binghamton, NY 13901

Project: Task Order #8
Green Drive Cargo Facility Apron and Access Rd.
Manchester-Boston Regional Airport
Manchester, NH 03103

Date: November 10, 2021

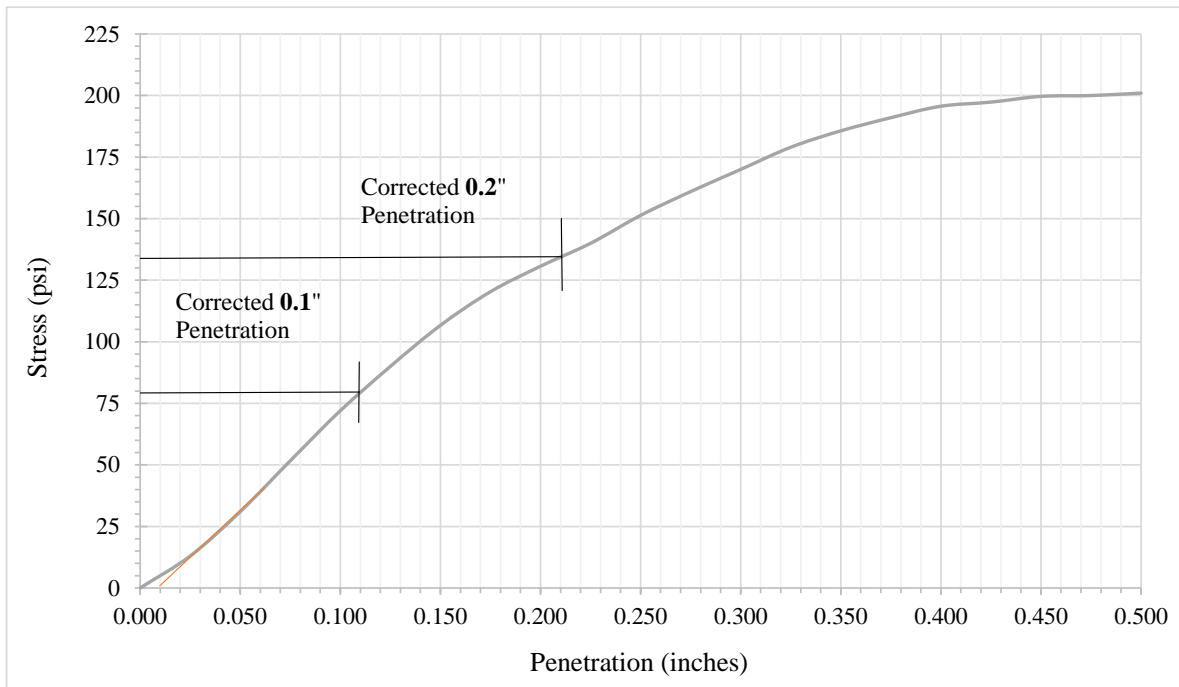
Report #: 21-04-098-002

Sample Source: CBR-2/B-3
Material ID#: 3521-823
Date Received: 10/26/2021
Method of Test: ASTM D1883
Soak Time: 96 Hours
Compaction: 97%
Moisture Content: 6.8%

Material Type: Dark brown silty sand
Intended Use: -
Sampled by: Tom McIntosh
Tested by: Robert Faria
Moisture After Soak: 17.4%
Swell: 0.0%
Modified Proctor: 111.7 pcf at 7.0% Optimum moisture

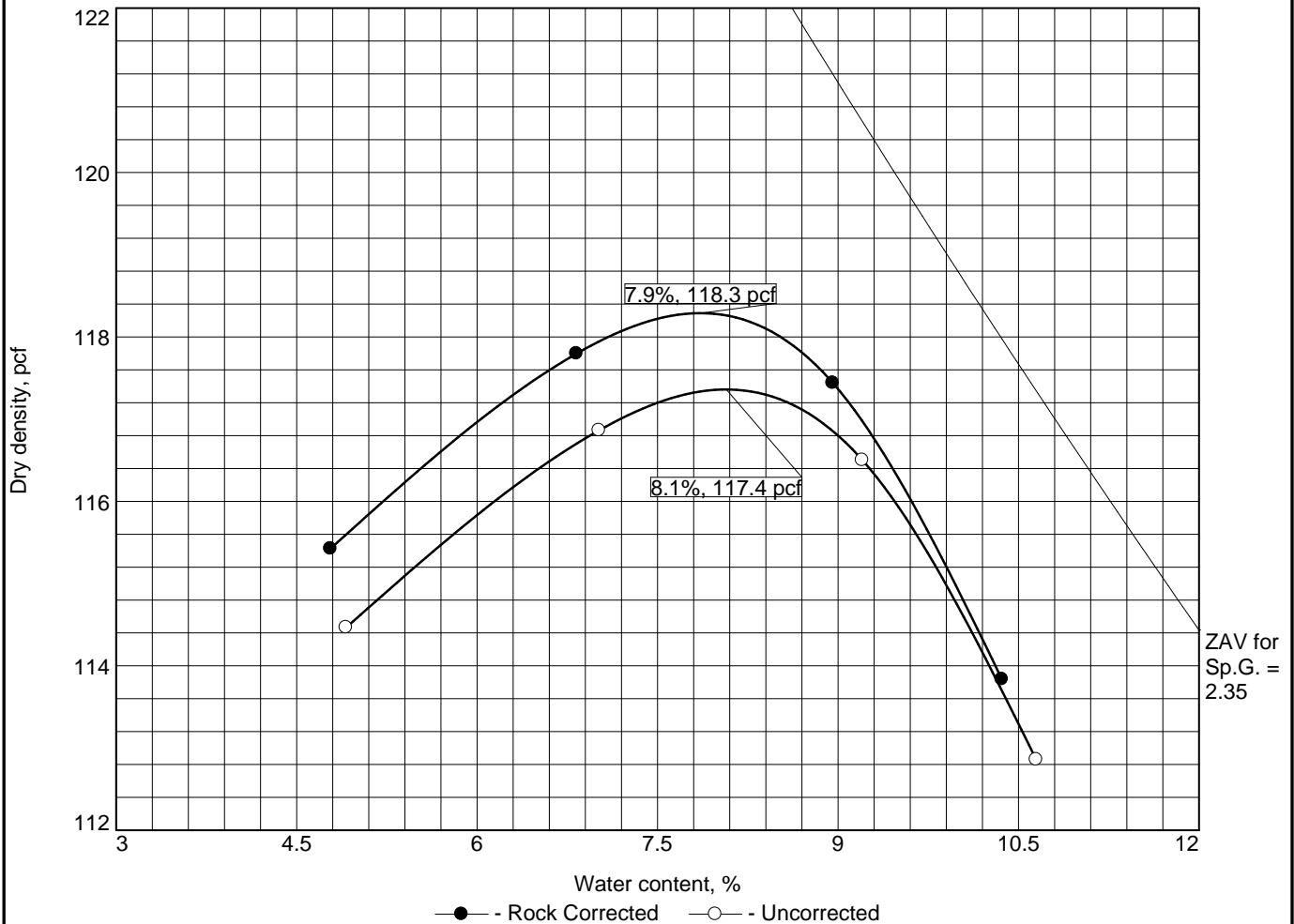
Uncorrected CBR @ 0.100": 7
Uncorrected CBR @ 0.200": 9

Corrected CBR @ 0.100": 8
Corrected CBR @ 0.200": 9



Remarks:

Moisture Density Report For Curve No. 3521-824



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						
	-	-	-	2.65	-	-	2.7	-


ROCK CORRECTED TEST RESULTS		UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 118.3 pcf		117.4 pcf	Light brown and dark brown silty sand
Optimum moisture = 7.9 %		8.1 %	
Project No. 21-04-098 Client: McFarland-Johnson, Inc. Project: Task order #8 Green Drive cargo facility apron and access road Manchester-Boston Regional Airport - Manchester, NH Date: 11/2/2021 Location: CBR-3 Sample Number: 3521-824			Remarks:
<div></div>			
			Figure 824A

Figure 824A

Tested By: Matt Watson

Checked By: Robert Faria



Report of California Bearing Ratio (ASTM D1883)

Client: McFarland-Johnson, Inc.
49 Court Street Suite 240
Binghamton, NY 13901

Project: Task Order #8
Green Drive Cargo Facility Apron and Access Rd.
Manchester-Boston Regional Airport
Manchester, NH 03103

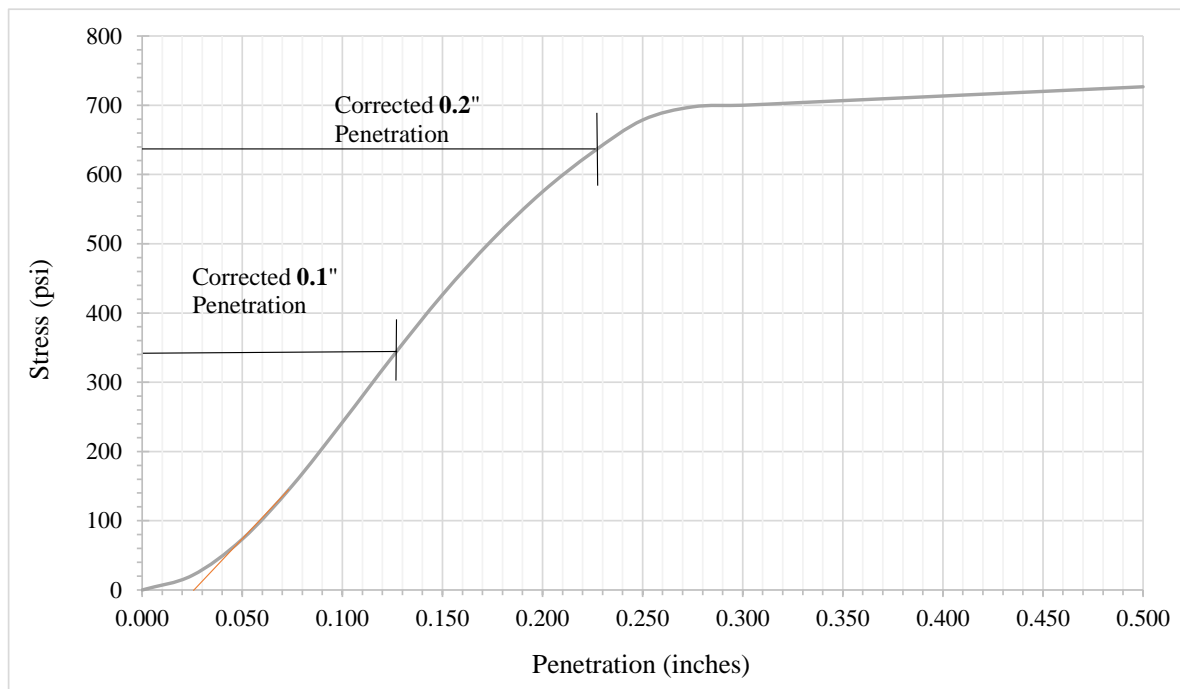
Date: November 10, 2021

Report #: 21-04-098-003

Sample Source: CBR-3	Material Type: Light brown and dark brown silty sand
Material ID#: 3521-824	Intended Use: -
Date Received: 10/26/2021	Sampled by: Tom McIntosh
Method of Test: ASTM D1883	Tested by: Robert Faria
Soak Time: 96 Hours	Moisture After Soak: 13.3%
Compaction: 98.4%	Swell: 0.0%
Moisture Content: 8.1%	Modified Proctor: 118.3 pcf at 7.9% Optimum moisture

Uncorrected CBR @ 0.100": 24
Uncorrected CBR @ 0.200": 38

Corrected CBR @ 0.100": 34
Corrected CBR @ 0.200": 43



Remarks:

APPENDIX E: SITE PHOTOGRAPHS

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**Green Dr. Cargo Facility Apron & Access Drive
Manchester-Boston Regional Airport (MHT)
Manchester, New Hampshire**

SITE PHOTOGRAPHS



Typical Drill Rig Setup



Site - Northeast of Green Drive



Site - Southwest of Green Drive



Split-Spoon Sample - Poorly Graded Sand with Silt (SP-SM)



Split-Spoon Sample - Poorly Graded Sand (SP)



Split-Spoon Sample – Peat/Organics Observed in Sample

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TECHNICAL SPECIFICATIONS

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TECHNICAL SPECIFICATIONS
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Latest Revision: FAA Standard Specifications taken from AC 150/5370-10H dated 12/21/2018 with 08/19/20 updates

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 for this project.

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 Owned 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). The permit conditions and other requirements under the New Hampshire Department of Environmental Services Alteration of Terrain Permit shall also be covered under the Section C-102 *Temporary Air and Water Pollution, Soil Erosion, And Siltation Control*.

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, including subcontractors, 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 under this section 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 under this section 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, or complying the NHDES Alteration of Terrain Permit requirements, will not be measured separately under this section and shall be incidental to the lump sum item as outlined in Item C-102 *Temporary Air and Pollution, Soil Erosion, and Siltation Control*.

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 under this section 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 under this section 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 under this section 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*.

001-4.6. USEPA NPDES Construction General Permit (CGP) for Stormwater Discharges during Construction/SWPPP. Payment for this item will be paid as outlined in Item C-102 *Temporary Air and Pollution, Soil Erosion, and Siltation Control*.

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 General Conditions or Requirement 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	\$20,000 - Allowance
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END OF ITEM M-100

ITEM M-105
ENGINEER FIELD OFFICE

CONTRACT DOCUMENTS

105-0.1 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

105-1.1 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

105-2.1 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.

105-2.2 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

105-3.1 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.

105-3.2 Engineer's Field Office Limit. Engineer's Field Office shall be limited to **one-half (0.5) percent** of the total Schedule A project cost.

BASIS OF PAYMENT

105-4.1 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-105-1 Engineer Field Office per Lump Sum

END OF SECTION M-105

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. This document will address all construction phasing compliance requirements.
- Prepare temporary aircraft traffic control plan, including construction phasing requirements, for review and approval by the Resident Project Representative (RPR) and Owner.
- Prepare temporary roadway traffic control plan, including construction phasing requirements, for review and approval by the Resident Project Representative (RPR) and Owner.
- Providing qualified flag persons, as required, at the locations shown on the plans or as directed by the Owner's representative.
- Locating and marking of existing underground electric and lighting, including all other types of airfield circuits or FAA communication lines, 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.
- After the initial payment for temporary barricade fencing under F-162 item, any relocation of this temporary barricade fencing required for phasing of construction shall be considered as part of the maintenance and protection of the site under this item. The removal of the temporary barrier will remain as part of the F-162 item payment.
- Installation, relocation, 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.
- Provision of materials, installation, relocations (as necessary), maintenance and removal of temporary or permanent barricades, warning signs, hazard markings/markers, runway closure markings, including lighted runway marker, and taxiway closure markers. The materials are to be supplied by the Contractor, except for materials as noted within the Contract Documents to be

supplied by the Airport. **Any temporary barricades or other materials furnished for the project by the Contractor 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.
- Provision of materials, maintenance, and removal of temporary lights and lighting circuits, including “jumpers” of circuits as required.
- Provision of materials, installation, maintenance, and removal of temporary guidance sign coverings
- Provision of materials, installation, maintenance, and removal of temporary light coverings
- Provision of materials, installation, maintenance, and removal of temporary lights and lighting
- Testing and maintenance of existing, temporary, and new lighting circuitry.
- Provision of materials, installation, maintenance, and removal of any temporary pavement tapers, transitions or temporary accesses to any airport facilities, if applicable.
- Provision of materials, 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).
- Provision of materials, 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, including haul routes, 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.

200-1.2 TEMPORARY VEHICLE SERVICE ROAD. The temporary vehicle service road provides a relocation of a portion of the existing vehicle service road to allow the phasing for a large portion of the project (i.e. Phases 5A and 5B) to be constructed “Landside” for the safety and security of the Airport. The exact routing of the vehicle service road will be field determined with the RPR and MHT Operations, but an approximate routing is shown on the plans. It is anticipated that the temporary vehicle service road relocation work will include, but not limited to: unclassified excavation, base course materials, pavement materials, turf restoration materials, and all incidentals as shown on the details and specified in the within the plans and project material specifications. It will be the Contractor’s responsibility to maintain this temporary road during construction and the removal of the roadway to limits determined by the RPR and MHT Operations/Maintenance after the completion of the phased work. It is anticipated a portion of the roadway will remain for MHT Maintenance activities after the final completion of the project.

METHOD OF MEASUREMENT

200-2.1 MAINTENANCE AND PROTECTION OF TRAFFIC. 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.

200-2.2 TEMPORARY VEHICLE SERVICE ROAD. Measurement for the temporary vehicle service road will be made on a lump sum basis. The lump sum shall include all items required install a temporary vehicle service road for the construction phasing in accordance with the temporary roadway detail constructed to the approximate layout shown on the plans, maintenance of the roadway as required during the construction, removal of the temporary vehicle service road to the limits determined by the RPR and MHT Operations/Maintenance, and restoration to turf growth upon completion of the phased work to the satisfaction of the RPR.

BASIS OF PAYMENT

200-3.1 MAINTENANCE AND PROTECTION OF TRAFFIC. 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.

200-3.2 TEMPORARY VEHICLE SERVICE ROAD. The lump sum payment for the temporary vehicle service road shall include all equipment, materials, and labor necessary to provide a temporary vehicle service road for the phasing of the project to the satisfaction of the RPR. Based upon the contract lump sum price for the "Temporary Vehicle Service Road", partial payments will be allowed as follows:

- a. Upon installation of the Temporary Vehicle Service Road, 65%.
- b. Upon removal of the Temporary Vehicle Service Road, 25%, and
- c. Upon Substantial Completion or upon establishment of turf growth if sooner, the final 10%.

Payment will be made under:

Project Item M-200-1	Maintenance and Protection of Traffic (Airfield) - per Lump Sum
Project Item M-200-2	Maintenance and Protection of Traffic (Access Road) - per Lump Sum
Project Item M-200-3	Temporary Vehicle Service Road - per Lump Sum

END OF SECTION M-200

ITEM M-250 RECORD DOCUMENTS

DESCRIPTION

250-1.1 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

250-2.1 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."

250-2.2 FAA AC 150/5300-17C, "Standards for Using Remote Sensing Technologies in Airport Surveys."

250-2.3 FAA AC 150/5300-18B, "General Guidance and Specifications for Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards."

REQUIREMENTS

250-3.1 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.

250-3.2 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. 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

250-4.1 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.

250-4.2 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 existing Airport Control shall not be measured separately and shall be considered incidental to the overall GIS/Field Survey work during the installation of the work.

BASIS OF PAYMENT

250-5.1 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.

250-5.2 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.

Payment will be made under:

Project Item M-250-1	Record Documents per Lump Sum
Project Item M-250-2	Field Data Collection for GIS Survey Conversion per Lump Sum

END OF SECTION M-250

ITEM M-300
SNOW MELTER SYSTEM AND ASSOCIATED SITE IMPROVEMENTS

CONTRACT DOCUMENTS

300-0.1 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

300-1.0 General. The purpose of the requirements is to ensure that the contract work does not damage any existing property/utilities 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 proposed 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.

300-1.1 Under this item, the Contractor shall coordinate with the RPR to perform the work under this section.

a. It is the intent to install the snow melter system and all components necessary for a complete and functionally operating system as a Design/Build basis and using this section as a performance-based procurement and installation specification. The following is intended as a performance-based specification and does not necessary cover every aspect of the materials and requirements of the Snow Melter system with all associated components to provide the completely functioning system. The requirements of this specification includes, but is not limited to the snow melter system equipment and associated component procurement, snow melter system equipment installation by the Contractor with assistance from the manufacturer, pre-engineered precast concrete snow melter building, all associated site infrastructure final design and installation, site utilities necessary for the snow melter system, and other miscellaneous incidental work required for a completed in-place and functioning installation.

b. Refer to the related Basis of Design Intent and Dimensional Drawings and Specifications for additional information regarding Work to be included as part of a furnished, installed and functioning snow melter system, building, and associated work. It is noted that and all associated site work components for the completed snow melter system is part of this performance-based specification, excluding the site utility line extension work defined under other sections of the Contract Documents (i.e. fiber optic network systems outlined in Section M-400 *Non-Airfield Site Electrical*). The basis of design for the snow melter system equipment uses the Trecon Combustion Model 300-SG system equipment consisting of 5 individual burner units (Trecon Model 60-SG), but any equal system shall be reviewed and potentially approved by the RPR and Owner for use at this location.

MATERIALS

300-2.0 General.

a. All material and equipment covered by the following referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specifications when requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to

provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not materially 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 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 pertinent products or models applicable wire to this project. Indicate all optional equipment and delete non-pertinent data. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in 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 electronically submitted in PDF format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures, which, in the RPR's opinion, does not meet the system design and the standards and codes, specified herein.

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.

300-2.1 Snow Melter Equipment Package. As noted, the equipment will be procured under a performance-based specification and the overall system shall be able to perform the minimum requirements:

Equipment Snow Melting Rating:	300 tons/hour
Equivalents:	750 Cubic Yards/Hour @ 30 lbs/cubic foot
	1500 Cubic Yards/Hour @ 15 lbs/cubic foot

Typical Area Serviced by System:	27 to 33 acres
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Water Outflow (Average):	1200 US gallons/minute @ 38°F
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Water Outflow (Maximum):	1800 US gallons/minute @ 38°F
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Natural Gas Supply Requirements:		
(to each unit with basis of design of 5 units)	Pressure Range	5.25 psig (min) ^{*a}
		6.5 psig (max) ^{*a}

Fuel Flow	67,500 SCFH
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^{*} Natural gas supply piping must be designed such that the supply pressure does not drop below 5.0 psig at 13,500 SCFH. Additionally, the gas supply must be protected against risign above 6.5 psig at any time.

^a Additional manufacturer supplied equipment should be available to accommodate a natural gas supply pressure outside of the 5.25 to 6.5 psig range. It is identified that the equipment will affect the design and price of the Snow Melter system. Coordination with natural gas supply company (Liberty Utilities) shall be performed to determine if the natural gas supply is outside the standard range.

Burner Rating (to each unit)	13.5 mm BTU/hour
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Combustion Air Fan Motor (Soft Start Not Required)	50 HP @ 3600 RPM
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Gas Compressor with VFD (each) (Quantity = 2 for Full Redundancy)	Not included in basis of design, but include as required if there are natural gas supplier restrictions
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Maximum Electrical Load (Complete System – 5 Units)	Approximately 440 kVA
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Power Supply (to the Complete System)	480 V/3 PH/60 Hz 600 Amp (fused)
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NOTE: Additional Building Loads or Optional Equipment not included

300-2.1.1 Burner/Weir/Downcomer Assembly. Each of the units shall be in conformance with the following specifications:

Immersion Heater (Shipped Installed)	6 kW Prevents water in melting pit from freezing between operations
Safety Components	High Temp Switch Prevents snowmelter from operating when water temperature is above set point
	Water Probe Level Prevents snowmelter/immersion heater from operating when water level is low
Weight	Approximately 2600 pounds
Weir	Integral Part
Downcomer Shell	Shipped Installed
Downcomer Insert	Shipped Installed
Burner	Shipped Installed

300-2.1.2 Burner (Part of Burner/Weir/Downcomer Assembly). Each of the burner units shall be in conformance with the following specifications:

Capacity:	13,500 SCFH Submerged-combustion direct contact high heat release Ignition is by spark-ignited pilot Automatic shutoff in case of electrical failure
Materials & Finish:	Carbon steel, painted black Refractory lined
Components Installed on Burner:	Flame scanner Sight glass Pilot

300-2.1.3 Equipment Skid. Each of the unit's equipment skids be in conformance with the following specifications:

Base Dimensions:	5' Wide x 7' Length
Weight:	Approximately 3,000 pounds
Components Installed on Skid:	Centrifugal blower with TEFC motor Air control valve and actuator Gas Train Control Panel Power Panel

300-2.1.4 Gantry Spars for Attachment to Steel Equipment Enclosure. Each of the unit's gantry spars be in conformance with the following specifications:

Materials & Finish:	Carbon steel, painted yellow
Components Installed on Gantry Spar:	Safety chain – secures cover in the open position in the event of hoist failure Burner On Light – indicates when burner is operating (2) High CO lights and (2) CO detectors (Over Burner 2 & 4) – indicates high CO concentration
Components Shipped Loose for Install:	Melting pit cover hoist – Chain hoist that opens and closes melting pit cover. Actuated from hoist control panel.

300-2.1.5 Melting Pit Cover Embedded Frame and Melting Pit Cover. Each of the unit's melting pits shall have the following components for field installation and shall be in conformance with the following specifications:

Embedded Frame Materials & Finish:	Galvanized carbon steel
Melting Pit Cover Materials & Finish:	Cover Top – Aluminum tread plate or approved equal Cover Frame - Carbon steel, galvanized
Optional Melting Pit Cover Equipment:	Protective pipe bollard – bollard mounted on melting pit cover that helps prevent vehicles from driving onto cover

300-2.1.6 Equipment Enclosure. The snow melter equipment manufacturer will supply a steel container type enclosure for the five (5) equipment skids. The enclosure will have all the equipment skids installed, including all internal piping and wiring by the snow melter equipment manufacturer prior to shipment. The enclosure has air inlet louvers and connections for external piping and wiring. At one end there is the Master Control Panel and Power Distribution Panel.

Weight: Approximately 55,000 pounds

300-2.1.7 Overflow Shields. The snow melter equipment manufacturer will supply six (6) overflow shields which shall be in conformance with the following specifications:

Features:	Hinged cover to assist cleanout
Materials & Finish:	Carbon steel, painted black

300-2.1.8 If required due to Natural Gas Supply Constraints, Optional Natural Gas Compressor Skids. If determined during the Design/Build process by the Contractor in coordination with the Equipment vendor and the Natural Gas Supplier to be necessary, the snow melter equipment manufacturer will supply two (2) Natural Gas compressor skids. Each gas compressor is rated at 100% capacity of the full snow melter configuration (i.e. all 5 units), thus providing full redundancy. Each gas compressor will be supplied with a Variable Frequency Drive (VFD) in order to maintain sufficient flow based on the number of burners operating. The installation of this equipment, if required due to any natural gas system constraints, shall also include any additional piping, valving, filtering, and all other incidentals to provide the compressor skids.

300-2.1.9 Miscellaneous Materials and Equipment to be supplied and installed by the Contractor. The Contractor will verify with snow melter equipment manufacturer that the Contractor will be supplying the following miscellaneous materials:

- 1.) Cast-In-Place Reinforced Concrete Materials for System Pit, Pads, and Overflow Box. These materials shall include all materials necessary for the complete installation of any concrete structure, including the sealant materials required for the concrete surfaces.
- 2.) Anchoring Bolts and Other Hardware per Equipment vendor requirements.
- 3.) Vent Piping from the equipment unit vent pipes to connection points as required by local codes.
- 4.) 2" Water Supply Piping for Units including valving, heat tracing, insulation, and auto dumping

- per Equipment vendor requirements.
- 5.) 8" Overflow Drain Materials per Equipment vendor requirements.
 - 6.) Natural Gas supply piping and venting to units per Equipment vendor requirements
 - 7.) Conduits not provided by the Equipment vendor for power supply and units, as well as for all building electrical requirements.
 - 8.) Electrical Field wiring materials for the snow melter equipment as required for a complete installation to pre-wired unit snow melter equipment connection locations provided by the Equipment vendor, including but not limited to: Burner junction box, melting pit cover hoist, etc.
 - 9.) Electrical Field wiring and other associated materials to the snow melter equipment and building electrical services for the power feeds using the Basis of Design Assumptions for the system include: Equipment: 600 A - 480V/3 PH/60 Hz and Building: 100 A - 120/240V/1 PH/60 Hz. These assumptions need to be verified as per the Design/Build Final Design by the Contractor for the Electrical Layout.
 - 10.) Electrical Field wiring materials for the building as required for a complete installation per the Design/Build Electrical Layout.
 - 11.) All other incidental items, not provided by the Snow Melter Equipment Manufacturer, but required for a complete, installed and functioning snow melter system.

300-2.1.9 Optional Snow Melter Equipment and Materials. Several pieces of optional equipment were mentioned throughout this Materials Section to be provided by the snow melter equipment manufacturer. This section collects all of the optional equipment in one place and includes several other pieces of optional equipment and material finishes available. The Owner may decide if any of these pieces of additional optional equipment should be included.

Optional Equipment and Materials TO BE INCLUDED as part of the Snow Melter Equipment Package Base Bid:

Melting Pit Immersion Heater (above in 300-2.1.1)

CO Monitoring System (above in 300-2.1.4)

Surface Snow/Ice Melt System in Pit Loading Area to minimize slips/falls – Options Include:

In-ground electrical heating cables or Overhead Snow Clear Lamps mounted on a pipe gantry spanning length of the pit.

Optional Equipment and Materials to be supplied as part of the Snow Melter Equipment Package Base Bid, if determined by the Contractor during bidding process to be necessary to provide a complete and operating system:

Gas Compressor(s) for supply pressure below standard range

Available Optional Equipment and Materials, but NOT TO BE INCLUDED as part of the Snow Melter Equipment Package Base Bid, but the Contractor may provide an optional price for the Owners consideration:

Stainless Steel – Substitute for embedded frame material

Protective Pipe Bollard for Melting Pit Cover

Remote Operator Interface Tablet

Extended Warranty beyond the Standard Warranty

Spring and Fall Maintenance Packages by the Equipment Manufacturer

300-2.2 Snow Melter System Final Design and Installation Requirements – Design Not Performed by the Snow Melter Equipment Manufacturer but required by the Contractor for a complete system installation. The submittal package(s) for the final design calculations and drawings shall be stamped by

a Professional Engineer licensed in the State of New Hampshire. These final design and installation requirements shall include, but may not be limited to the following, based on the Contractor's Design/Build of the Final Layout and performance-based installation of the work:

- 1.) Final Structural Design and Calculations of the Snow Melter System Concrete Pad, Pit and Overflow Box Layouts based on the Basis of Design Layout or as modified by the Equipment vendor. Approximate inside plan dimensions of the pit are 42'-6" long by 10' wide and are to be verified by the Equipment vendor as part of the final design coordination.
- 2.) Final Design and calculations of Snow Melter System Site Electrical Layout based on the Equipment vendor and building requirements. The final design shall also include a short circuit study as part of the submission.
- 3.) Final Design and calculations of Snow Melter System Site Plumbing Layout for the equipment based on the Equipment vendor requirements.
- 4.) Final Design and calculations of Snow Melter System Site Natural Gas Supply and Equipment Distribution Layout for the equipment based on the Equipment vendor requirements.
- 5.) Final Overall Layout Coordinated Design Plan with trade coordination and all other incidental items for a completed installation.

300-2.3 Snow Melter Building. This Specification shall provide requirements for the Pre-Engineered Precast Concrete Snow Melter Building. The Item shall consist of furnishing and constructing a Pre-Engineered Precast Concrete Building in accordance with these specifications, and in accordance with the design, dimensions, and at the location shown in the plans. All work shall meet applicable State of New Hampshire and the local building codes. The following is intended as a performance-based specification and does not necessary cover every aspect of the materials and requirements of the Pre-Engineered Precast Concrete Snow Melter building.

The Contractor shall provide a complete submittal package on the Precast Concrete Snow Melter Building which will also accommodate the Owner's fiber optic network materials as described under Section M-400 *Non-Airfield Site Electrical*. The submittal shall include a summary of all applicable code requirements and design loads with calculations and drawings used for the building design. All HVAC and electrical system submittals shall indicate the performance rating of the unit provided versus the design loads required of the building, as well as the operational needs for the Snow Melter equipment and other equipment. The building submittal package(s) for the shall be stamped by a Professional Engineer licensed in the State of New Hampshire.

300-2.3.1 Snow Melter Building Basis of Design. The basis for design for the Pre-Engineered Precast Concrete Building is Easi-Set Precast Concrete Building System Model 1012 or an approved equal. The building may be either Pre-Assembled (plant assembled transportable building delivered and placed at the site) or Field Assembled (transportable plant precast concrete components and delivered to the site for placing and assembly by the Building Manufacturer or other approved Building subcontracted representative). Building shall be provided by manufacturer with all necessary openings as specified by Contractor's Design/Build requirements and in conformance with manufacturer's structural requirements.

Codes and Standards. The building shall meet current applicable State of New Hampshire and local building code requirements and the following codes listed below. In areas of conflict between codes, the more stringent shall apply:

- 1.) ACI-318-11 "Building Code Requirements for Structural Concrete."
- 2.) ASCE/SEI-7-10 "Minimum Design Loads in Buildings and Other Structures"
- 3.) IBC 2012: International Building Code
- 4.) PCI Design Handbook, 7th Edition
- 5.) Concrete Reinforcing Institute, "Manual for Standard Practice"
- 6.) Bullet Resistant: Meets and/or exceeds UL 752 Level 5 Standards
- 7.) Fire Resistant: Walls or panels shall have a 2-Hour Fire Rating

- 8.) Producer shall be certified by the Prestressed Concrete Institute (PCI) Plant Certification Program. Manufacturer shall be certified at the time of bidding.

Dimensions and Design Loads.

- 1.) Building Dimension: Exterior: 12' x 10' x 8'-8"
- 2.) Standard Live Roof Load: 60 psf (Snow) minimum
- 3.) Standard Live Wind Load*: 115 MPH minimum
- 4.) Standard Floor Load: 150 psf minimum
- 5.) Walls: 4" min. thick
- 6.) Monolithic Construction: Roof, floor, and wall panels must each be produced as single component monolithic panels. No roof, floor, or vertical wall joints will be allowed, except at corners and along perimeter. Wall panels shall be set on top of floor panel.
- 7.) Roof: Roof panel shall have a tapered slope $\frac{1}{2}$ " from front to back in 10-foot direction. The roof shall extend a minimum of 2 $\frac{1}{2}$ " beyond the wall panel on each side and have a turndown design which extends $\frac{1}{2}$ " below the top edge of the wall panels to prevent water migration into the building along top of wall panels.
- 8.) Floor: Floor panel must have $\frac{1}{2}$ " step-down around the entire perimeter to prevent water migration into the building along the bottom of wall panels.

*Note: Design loads relate to precast components only, not accessories (i.e. doors, vents, etc.)

Building Materials.

- 1.) Concrete: 5000 psi minimum compressive strength
- 2.) Reinforcement: Rebar shall meet ASTM A615, grade 60 and Welded Wire Fabric shall meet ASTM 185.
- 3.) Post-tensioning Strand: 41K Polystrand CP50, $\frac{1}{2}$ " 270 ksi Seven-Wire strand, enclosed within a greased plastic sheath (ASTM A416). Roof and floor each shall be post-tensioned by a proprietary, second-generation design using a single, continuous tendon. Said tendon is placed in the concrete slab to form a perimeter loop starting from one corner of the slab to a point where the cable entered the slab. The tendon then turns 90 degrees and follows the cable member(s) in the periphery to a point midway along the "X" axis of the concrete building panel and then turns 90 degrees along the "Y" axis of the concrete building panel. This bisects the concrete building panel and crosses the opposite parallel portion of the cable member and exits from an adjacent side of the concrete building panel. This creates a cable pattern with no less than 2.5 parallel cables in any direction. To ensure a watertight design, no alternate methods shall be substituted for the post-tensioning.
- 4.) Sealant: All joints between panels shall be caulked on the exterior and interior surface of the joints. Caulking shall be DOW CORNING 790 silicone sealant or equal. Exterior caulk reveal to be $\frac{3}{8}$ "x $\frac{3}{4}$ " deep so that sides of the joint are parallel for proper caulk adhesion. Back of the joint to be taped with bond breaking tape to ensure adhesion of caulk to parallel sides of joint and not the back.
- 5.) Vents: Two screened aluminum vents to be cast in rear wall. Vents shall be SUNVENT INDUSTRIES Model FL-164 or equal.
- 6.) Panel Connections: All panels shall be securely fastened together with $\frac{3}{8}$ " thick steel brackets. Steel is to be of structural quality, hot-rolled carbon complying with ASTM A36 and hot dipped galvanized after fabrication. All fasteners to be $\frac{1}{2}$ " diameter bolts complying with ASTM A325 for carbon steel bolts. Cast-in anchors used for panel connections to be Dayton-Superior F-63 coil inserts, or equal. All inserts for corner

connections must be secured directly to form before casting panels. No floating-in of connection inserts shall be allowed.

Finishes

- 1.) Interior of Building: Smooth form finish on all interior panel surfaces, unless exterior finish is produced using a form liner, then smooth hand-troweled finish.
- 2.) Standard Exterior of Building: Architectural precast concrete brick finish: Finish must be imprinted in top face of panel while in form using an open grid impression tool similar to typical brick size shall be 2 3/8" x 7 5/8" with vertical steel float or light broom finish. Joints between each brick must be 3/8" wide x 3/8" deep. Back of joint shall be concave to simulate a hand-tooled joint. Each brick face shall be coated with the following water-based acrylic, water repellent penetrating concrete stain: A) Canyon Tone stain by United Coatings, B) Sherwin Williams (H&C concrete stain) or equal. Stain shall be applied per manufacturer's recommendation. Joints shall be kept substantially free of stain to maintain a gray concrete color. Stain color shall be selected by the RPR/Owner during the submittal review, unless specified otherwise herein.
- 3.) Floor surface shall be finished concrete.

Door and Hardware Materials.

Doors and Frames: Shall comply with Steel Door Institute (SDI) "Recommended Specifications for Standard Steel Doors and Frames" (SDI-100) and as herein specified. All door and frame galvanizing shall be in accordance with ASTM A924 and A653, A60 minimum coating thickness.

- 1.) The buildings shall be equipped with double 3'-0" x 6'-8" x 1-3/4" thick insulated, 18-gauge, metal doors with 16-gauge frames (to meet wall thickness). Doors to have flush top cap. 12-gauge flat astragals shall be applied to the active leaf to protect against the elements or forced opening.
- 2.) Doors and frames shall meet SDI standard Level 2, 1 3/4" heavy duty.
Approved manufacturers: Republic, Steelcraft, Ceco, Black Mountain, Pioneer, Curries, Mesker, MPI, Door components or equal. Approved distributor: Integrated Entry System.
- 3.) Door & Frame Coating System: Doors and frames shall be factory bonderized and painted with one coat of rust inhibitive primer and one finish coat of enamel paint; color to be selected by the RPR/Owner during the submittal review, unless specified otherwise herein. Coating system shall be Sherwin Williams Industrial Enamel, Color as Selected by Owner or approved equal.

Door Hardware:

- 1.) Pull Handle: Shall meet requirements of ANSI A156.2. Shall be thru bolt attached and constructed of a minimum 3/4" diameter stainless pull handle sized 8" center to center with a stainless backer plate, minimum 0.053" on both sides.
Approved manufacturers: Design Hardware, Don-Jo, or equal
- 2.) Hinges: Shall comply with ANSI A156.1 and be of the ball bearing, non-removable pin type (3 per door minimum). Hinges shall be 4 1/2" x 4 1/2" US26D (652) brushed chrome finish. Manufacturer shall provide a lifetime limited warranty.
Approved manufacturers: Design Hardware, or equal
- 3.) Deadbolt: Commercial Grade Deadbolt conforming to ANSI 156.5 furnished with a 2 1/4" face plate and a 1" projecting deadbolt with hardened steel pins. Dead bolts shall be UL and ADA approved. Finish shall be US26D (626) brushed chrome finish. Manufacturer

shall provide a lifetime limited warranty.

Approved manufacturers: Design Hardware, Dorma, or equal

- 4.) Surface Bolt: 8" Surface bolt UL listed. Finish US26D (626) brushed chrome finish. (2 per inactive leaf)

Approved manufacturers: Don-Jo, Design Hardware, or equal

- 5.) Threshold: Bumper Seal type threshold with a maximum 1" rise to prevent water intrusion. Thresholds shall be approved for UL 10B suitable for use with fire doors rated up to three hours.

Approved manufacturers: National Guard Products or equal

- 6.) Overhead Door Holder: Heavy duty surface mounted hold open device with hold open/stop angle of 85 to 110 degrees. Construction shall be stainless steel. Finish US32D (630) satin stainless steel finish.

Approved manufacturers: ABH, Rockwood, or equal

- 7.) Drip Cap: Aluminum drip cap with minimum projection of 2 1/2" shall be furnished.

Approved Manufacturers: Design Hardware, National Guard Products, or equal

- 8.) Door Stop: ANSI 156.16 approved wall mounted door stop with keeper constructed of a corrosion resistant cast brass material. Finish US26D (626) brushed chrome finish.

Approved manufacturers: Don-Jo, Rockwood, or equal

Foundation Materials

Crushed Stone Material shall conform to ASTM C33 Size 67 or Size 7 (i.e. approximately 3/8" diameter median stone size) stone gradation.

300-2.3.2 Snow Melter Building HVAC Systems Basis of Design. The HVAC systems shall be electric and UL listed. The HVAC systems shall include, but not be limited to:

- Heating and Cooling Systems

The HVAC systems shall be capable of heating the building to 68° F with an outside temperature of -20°F and cooling the building to 72°F with an outside temperature of 100°F. The Contractor shall provide complete and operational HVAC systems to the satisfaction of the RPR.

300-2.3.3 Snow Melter Building Lighting and Interior Electrical Basis of Design. The Contractor shall provide an electrical service design to calculate the loading requirements for this building, including but not limited to: the HVAC, lighting and outlet requirements. The final Design/Build electrical layout for the building shall be provided as part of the submittal review.

The precast concrete building shall have interior ceiling lighting capable of eliminating the entire building interior at a sufficient level for task work. The lighting control shall be operated with an internal on/off switch located adjacent to the door. The interior lighting shall be LED fixtures.

Exterior lighting shall be a wall pack type provided above the door to the precast concrete building and on the middle of each exterior wall. The light shall be UL listed for exterior use. The exterior light control shall operate using a photocell sensor and an internal override on/off switch located adjacent to the door. The light shall be LED fixtures.

The building interior shall be provided with duplex electrical service outlets (NEMA 5-20R GFCI) on the walls meeting the current National Electrical Code. The layout shall include be at least two (2) different circuits of electrical outlets rated at 20 amps per circuit. The proposed fiber optic system and other Owner equipment installed in the building shall occupy at least one (1) of the circuits. Each outlet shall be forty-eight inches (48") above finish floor and spaced no more than four feet (4') apart on each wall and

coordinated with the snow melter equipment electrical requirements and the fiber optic network layout requirements and placement.

300-2.4 Snow Melter Equipment Layout and Site Work Concrete. Refer to Section P-610 for cast-in-place concrete materials and installation specifications.

300-2.5 Cable Materials. Refer to Section L-108 for the basis of design for cable/conductor materials and installation specifications. If other cable/conductors are necessary for the snow melter equipment or building services, this cable/conductor materials and sizing shall be performed as part of the Design/Build and Electrical Layout Plan to be performed by the Contractor and shall conform to the Utility Supplier and National Electric Code requirements.

300-2.6 Conduit Materials. Refer to Section L-110 for the basis of design for conduit materials and installation specifications.

300-2.7 Underground Warning Tape. Refer to Section L-110 Paragraph 110-2.9 Detectable warning tape for the tape material specification. The tape color shall be: Blue for waterlines, Yellow for natural gas, Red for electrical, and Orange for Communications/Data.

300-2.8 Water Line and Fitting Materials. Refer to Manchester Water Works standard materials and installation specifications. All pipe and fitting materials shall be included on the Manchester Water Works approved vendor list for the various pipes and fitting manufacturers.

- 1.) **Ductile Iron Pipe:** ductile iron pipe shall be class 52 and manufactured in the United States of America and shall conform to ANSI 21.51 (AWWA C-151) for "pipe centrifugally cast in metal molds for water". Cement linings shall be double the standard thickness and shall conform to ANSI A21.4. Seal coating shall be applied inside and out. All pipe shall be *push-on* type joint, in accordance with ANSI A21.11. In addition, all pipe purchased may be subject to inspection and acceptance by the Manchester Water Works or its agent. The supplier and/or manufacturer shall be responsible for such accommodations and handling as are required to allow for proper inspection, if so requested by the Manchester Water Works.
- 2.) **Ductile Iron Fittings:** Unless otherwise specified, all mechanical joint fittings shall be complete with accessories and shall conform to AWWA C104/ANSI A21.4, C111/A21.11 or C153/A21.53. All fittings shall be pressure rated for 350 psi, ductile iron with double cement-lining thickness and seal coated inside and out, or two-part epoxy coated, and shall be manufactured in the United States of America. Fittings 4"-12" shall be *compact* pattern per AWWA C153. In addition, all fittings purchased may be subject to inspection and acceptance by the Manchester Water Works or its agent. The supplier and/or manufacturer shall be responsible for such accommodations and handling as are required to allow for proper inspection if so requested by the Manchester Water Works. Additional Requirements The fittings, in addition to meeting all of the appropriate requirements of ANSI and AWWA, shall conform to the following:
 - a. All fittings shall be free of all significant casting flaws both inside and out, including slag holes, slag inclusions, laps, lamination, mold splash, and pin holes.
 - b. All linings shall be of uniform thickness with no significant waving and/or roughness.
 - c. Mechanical joint bells and glands shall be dimensionally correct and free of all slag and rough edges at bolt holes
 - d. All fittings shall arrive with their appropriate mechanical joints accessories.

Fitting manufacturers shall be approved by Manchester Water Works and include: U.S. Pipe, Tyler Fitting and Griffin Fitting.

- 3.) **Polyethylene Service Tubing (1" to 2" diameter):** Tubing shall be constructed of ASTM D3350 polyethylene with Copper Tube Size (CTS) designed for 200 psi working pressure and shall conform to AWWA C901. Insert stiffeners shall be used on all compression joint connections.

PE tubing shall be supplied in 100 ft. coils with at least four stiffeners per coil.

300-2.9 Water Appurtenance Materials. Refer to Manchester Water Works standard materials and installation specifications. All appurtenance materials shall be included on the Manchester Water Works approved vendor list for the various manufacturers.

- 1.) **Hydrants:** All hydrants shall have the following features as a minimum:

Color: YELLOW

Flange: Break type

Head: Swivel

Opening: Hydrants shall open right (clockwise).

Inlet Connection: Mechanical joint 6"- shoe casting shall be coated with a fusion bonded epoxy coating.

Nozzle: Hose: (2) 2½"

Pump: (1) 4½"

Threads: National Standard Thread (NST)

Operating Nut: Pentagon MWW approved size

Main Valve Opening: 5¼"

Size: Hydrant sizes represent "depth of trench" measurement, that is to say, the distance from the bottom of the trench to ground line just below the break flange.

Note: All hydrant risers and break flange kits shall be original manufactured parts. Any after-market material will not be acceptable.

Hydrant manufacturers shall be approved by Manchester Water Works and include: Clow Corporation (Eddy) or U.S. Pipe, Valve & Hydrant, Inc., (Metropolitan).

- 2.) **Tapping sleeves:** Tapping sleeves 4" through 12" sizes shall be US Pipe and Foundry ductile iron T-28, dual compression.

Tapping sleeves 16" through 24" sizes shall be US Pipe and Foundry T-9 or Mueller ductile iron, mechanical joint.

- 3.) **Gate Valve – Resilient Seated Valves (4" – 12"):** Mechanical joint resilient seated gate valves shall be manufactured in the United States of America and tested in full compliance with the latest revision of AWWA standard C-509-01 or AWWA C515-01(reduced wall, resilient seated). Valves shall have a minimum design working pressure of 200 psi and a minimum test pressure of 400 psi. The pressure rating shall be cast on the outside of the valve. Valve body and bonnet shall be of cast or ductile iron coated on all exterior and interior surfaces with a two-part fusion bonded epoxy conforming to the latest revision of AWWA standard C-550, applied with a minimum thickness of eight (8) mils. The manufacturer shall certify that the coating is suitable for use in a potable water system, and the interior coating certified to be holiday-free.

The gate shall be completely covered with rubber over all ferrous surfaces. The rubber shall be securely bonded to the gate body. The "O" ring stem seal shall be replaceable with the valve under pressure in the full open position. Valves shall be full port opening, open to the right (clockwise) and be the non-rising stem type with standard accessories for buried application. **Exposed bolts and nuts shall be stainless steel.**

Gate valve manufacturers shall be approved by Manchester Water Works and include: Clow, Kennedy, U.S. Pipe, M&H, Mueller, and AFC.

- 4.) **Tapping Gate Valve – Resilient Seated Valves (4" – 12"):** Tapping valves shall have enlarged ports, open right, and end connections of mechanical joint x flange with lip, and shall be

manufactured in the USA and tested in full compliance with the latest revision of AWWA standard C-509-01 or AWWA C515-01. The valves shall meet all the requirements listed in the previous paragraph " **Gate Valve – Resilient Seat Valves 4" through 12"**.

Tapping gate valve manufacturers shall be approved by Manchester Water Works and include: Clow, Kennedy, U.S. Pipe, M&H, Mueller, and AFC

- 5.) **Retainer Glands:** Retainer glands shall be wedge action retainer glands with the following features:
- a. Glands shall be of ductile iron.
 - b. Set screws shall be of ductile iron and must be designed for 70 ft lbs. of torque.
 - c. Retainer glands shall be UL approved.
 - d. Mechanical Joint bolts and gaskets are not included.
 - e. Glands shall be free of excess bituminous coating.
 - f. Retainer glands shall be manufactured in the USA.
 - g. Retainer glands shall be EBBAA Iron Sales Inc. Megalug or Uni-Flange Series 1400.
- 6.) **Gate Valve Box:** Gate valve boxes shall be cast iron and for water use only (marked "WATER"), and shall have the following characteristics:
- a. Flange shall be located at top of top section.
 - b. Bottom section shall be bell base.
 - c. Boxes shall be two-piece with covers; thirty-six (36) inch bottoms and twenty (26) inch tops.
 - d. Boxes shall have slip-tight shaft; five and one-quarter (5-1/4) inches.
 - e. Gate box covers shall fit properly and seat flush in the gate valve box top section.
 - f. Gate box shall be made in the United States of America or Canada.
 - g. Gate box extensions shall accept standard gate box cover
 - h. Gate box extensions shall properly fit the gate valve box top section and be Buffalo #B-5181 or equal.

Special Note: A typical sample of a complete gate valve box must be available for evaluation by Manchester Water Works, if requested. All gate valve boxes shall be approved by Manchester Water Works.

- 7.) **Service and Repair Saddles:** Service and repair saddles shall have bodies of ductile iron, fusion bonded epoxy coating and the outlet shall be tapped with CC female thread per AWWA C800. Gaskets shall provide a tight seal by both mechanical and hydrostatic pressure. Saddles shall have stainless steel straps, bolts and hex nuts. Saddles shall be a single strap style for all 3/4" and 1" line services and double strap style on all 1-1/2" and 2" line services on nominal size mains 4" through 12". Nominal sizes which are required are for ductile iron pipe and cast iron pipe. The service saddles shall be Smith Blair model 317 and repair saddles shall be Smith Blair model 331.
- 8.) **Corporation Stop (No Lead Brass):** Corporation stop shall be compliant with AWWA C800 and shall be cast with No Lead Brass, with PTFE coated ball type and double O-ring design. The inlet side shall have AWWA tapered threads. The outlet side shall have CTS pack joint fittings for use with Type K copper tubing or CTS Polyethylene. The corporation shall be adaptable to the drill and tap combinations used in the Mueller A-3, B-100 and D-5 type tapping machines, or the Reed CDTM 1000.

Corporation stops shall be 300 Ball Type Corporation Valve by Mueller Company of Decatur, Illinois; Series FB1000-NL by Ford Meter Box Company Inc. of Wabash, Indiana; or equal as determined by MWW.

- 9.) **Curb Stop (No Lead Brass):** Curb stops shall be compliant with AWWA C800 and shall be cast with No Lead Brass, with PTFE coated ball, double O-ring design and CTS pack joint fittings for

use with Type K copper tubing. Upper extension shall be one inch in diameter.

Curb stops shall be 300 Ball Curb Valve by Mueller Company of Decatur, Illinois; Model 76000-22 by A.Y. McDonald Manufacturing Company of Dubuque, Iowa; Series B44-NL by Ford Meter Box Company Inc. of Wabash, Indiana; **no substitutions**.

- 10.) **Unions (3-Piece) (No Lead Brass):** 3-piece unions shall be equipped with CTS pack joint fittings: body shall be heavy cast brass and compatible with copper tubing (type K soft). Unions shall be McDonald MAC-PAK 74758-22, Ford C44 or approved equal. See additional requirements below.

NOTE: Additional Requirements (For No Lead Brass)

Casting: Curb stops and corporations shall meet the requirements set in the “Reduction of Lead in Drinking Water Act” and are to be cast from red brass having the following compositions: Cu-86-91%, Sn-4-6%, Zn-2-6%, Bi-1.7-2.7%, Pb-.09% max. **

Tests: All curb stops and corporations shall be tested for tightness, and have the ability to withstand one hundred fifty (150) pounds working pressure.

Threads: Shall be standard threads and finished in a workmanlike manner, i.e., free of excessive burrs. Nuts shall start freely in assembly.

Fittings: Compression type fittings on all copper connections unless otherwise specified.

Trademark: The manufacturer’s identifying mark shall be stamped on the brass service material.

Other: The corporations shall be adaptable to the drill and tap combinations used in the Mueller B-100 and A-3 type tapping machines, and Reed TM 1000 tapping machine.

** ASTM specifications allow 86% to 90% copper content. AWWA C-800

- 11.) **Curb Stop Box:** All curb stop boxes shall have the following features as a minimum:

Adjustment: Twelve (12) inches minimum.

Cover: Heavy duty, slotted, with counter sunk pentagon solid brass plug, coarse thread.

Length: Adjustable, 5ft. to 6ft.

Pattern: Arch type to be used with curb stop sizes three-quarter (3/4) and one (1) inch. The box bottom section foot piece shall have a heavy-duty arch pattern that will accommodate a 2” curb stop.

Rod: One-half (1/2) inch offset stainless steel rod with stainless steel yoke, thirty (30) inches in length.

Upper Extension: One (1) inch for 1-inch or less curb stops. Two and one-half (2.5) inch for 2-inch diameter curb stops.

Special Note: A typical sample of a complete gate valve box must be available for evaluation by Manchester Water Works, if requested. All curb stop boxes shall be approved by Manchester Water Works.

- 12.) **Repair Clamps:** The full circle repair clamps shall be made of a type 304 (18-8) stainless steel. They shall be a minimum of 15” in width, except clamps for 2” pipe.

The lugs shall be made of a high strength ductile iron per ASTM A536 GR 80-55-06 and have a fusion bonded epoxy coating.

The gasket shall be made of nitrile (Buna N) a special compound to resist water, oil, acids, alkalis, hydrocarbon fluids and many other chemicals.

All bolts, nuts and washers shall be 304 stainless steel. At least one 5/8" x 6-7/8" bolt with a taller nut shall be furnished to help facilitate installation of the clamps.

Repair clamps shall be Smith Blair 226.

- 13.) **Couplings:** Couplings shall be **Hymax Coupling**. The body and rings shall be carbon steel with a fusion bonded epoxy coating. The bolts and nuts shall be stainless steel with the nuts coated with an anti-seize compound. The gasket shall be made in two layers with a removable inner layer that allows for diameter range expansion. Gasket shall be rubber recommended for water and have superior resistance to set. Gasket performance shall not be affected within a temperature range of -40F to +140F. OD range for nominal pipe sizes shall be sufficient for use with cast iron and class 52 ductile iron pipe.

- 14.) **Bollards:** Refer to the details in the plans.

300-2.10 Gas Line Materials. All gas main piping, valving and appurtenances shall be supplied by the Natural Gas Supplier (Liberty Utilities).

300-2.11 Sand Bedding and Blanket. Sand bedding and blanket material required for installation of the water mains, services, and appurtenances shall meet the following material gradation requirements: 100% passing the 1/2" sieve and, of the material passing the #4 (4.75 mm) sieve, no more than 12% shall pass the #200 (0.075 mm) sieve.

300-2.12 Common Backfill Materials. It is anticipated that the existing materials will be adequate for backfill assuming the material is a granular material, consisting of hard sand and gravel so graded that, of the material passing the No. 4 (4.75 mm) sieve, not more than 35 percent shall pass the No. 200 (0.075 mm) sieve. Common backfill shall be free of organic matter, trash, roots, frost, or other deleterious material and shall contain no stone measuring greater in any dimension than two-thirds of the loose lift thickness or 6 inches (150 mm), whichever is smaller. Common backfill shall be capable of forming a firm, stable base when spread and compacted in accordance with this specification. In addition, common backfill shall be non-plastic (plasticity index zero, defined as liquid limit minus plastic limit). Common backfill may be obtained from either on-site excavations or off-site sources. Any materials excavated from the trench not conforming to this specification shall be disposed of as specified and replaced with approved material, as required, at no additional cost to the Owner.

CONSTRUCTION DETAILS

300-3.1 Snow Melter System Final Design and Equipment Installation.

300-3.1.1 Snow Melter System Final Design. The snow melter systems Final Design items identified above under paragraph 300-2.2 shall be performed under the direction of the Contractor and in coordination with the snow melter equipment requirements and their shop drawings, installation instructions and recommendations; using local codes and requirements; and as reviewed by the RPR. The snow melter equipment manufacturer will be able to provide technical assistance for the Final Design.

300-3.1.2 Snow Melter System Equipment Installation. All of the snow melter system equipment shall be installed by the Contractor in accordance with the snow melter equipment manufacturer's shop drawings, installation instructions and recommendations and the Final Design as performed by the Contractor under the Design/Build and performance-based specification. The snow melter equipment manufacturer will provide technical and oversight assistance as a separate scope of work line item for the installation process, but the equipment shall be installed by the Contractor and their subcontractors.

300-3.2 Site Preparation and Site Work Installation.

300-3.2.1 Snow Melter Site Work Installation. All of the snow melter site preparation and site installation work shall be coordinated with the snow melter equipment's installation instructions and recommendations,

the Contractor's Final Design for Layouts, and the snow melter equipment manufacturer representatives or RPRs direction.

300-3.2.1 Site Work.

- 1.) **Site Concrete Snow Melter Pad/Apron.** Install the cast-in-place reinforced concrete pad/apron around the snow melter to the dimensions shown on the plans, or as modified during the Final Design, and in conformance with the installation requirement in Section P-501, Section P-610, and the project details shown in the plans, as applicable to the installation. The Final Design and installation work shall include the Surface Snow/Ice Melt System as described herein.
- 2.) **Site Concrete Snow Melter Pits and Overflow.** Install the cast-in-place reinforced concrete snow melter pits and overflow for the snow melter system, to the dimensions determined during the Final Design process in coordination with the snow melter equipment manufacturer, and in conformance with the installation requirement in Section P-501, Section P-610, and the project details shown in the plans, as applicable to the installation.
- 3.) **Site Utility Trade Installations between Units and Site Utilities.** Install the site utility trades (i.e. gas connections from the utility supplier, electrical connections to the units, plumbing to site drainage structures, etc.) from the units to the site utilities. These utilities shall be installed in accordance with the Contractor's Final Design plans and the snow melter equipment manufacturer's shop drawings and installation requirements.
- 4.) **Miscellaneous Site Work.** Install all other miscellaneous site work required for a complete installation as outlined in the Contract Documents and as determined by the Contractor's Final Design as part of the Design/Build and performance specification for the site.

300-3.3 Snow Melter Building Installation.

300-3.3.1 General. The Contractor shall construct the Snow Melter precast concrete building at the location indicated in the plans.

The Contractor shall clear, grade, the area within the footprint and a minimum distance of 5 feet on all sides of the proposed precast concrete building and prepare the building foundation of compacted crushed stone. The slope shall be not less than 1/2-inch per foot away from the building all directions.

The precast concrete building shall provide adequate protection against weather elements, including rain, wind-driven dust, snow, ice and excessive heat. The building 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. Contractor is responsible for contacting the manufacturer of the equipment to be installed to obtain environmental limitations of the equipment to be installed.

If a crane is to be used to place the building, the Contractor shall file a FAA Form 7460 to the FAA for approved use of a crane within navigable air space. The Contractor shall submit this FAA Form 7460 at least 90 days prior to the date the crane is anticipated to be required.

300-3.3.2 Building Placement. The building shall be place in accordance with the building manufacturer's recommendations by the manufacturer or a manufacturer approved subcontractor.

- 1.) The precast concrete building floor slab shall bear fully on a crushed stone base that is at least two feet larger than the length and width of building.
- 2.) Crushed stone setting bed shall be a minimum of 6" thick upon a firm compacted non-frost susceptible subgrade. Between the crushed stone and the subgrade, a separation geotextile material (Mirafi 140N or equivalent) shall be placed. The vertical soil capacity under stone shall be compacted to have minimum bearing of 1,500 pounds per square foot. Stone shall be less than 3/4" (i.e. ASTM C33 No. 67 or No. 7) and must be screeded level within 1/4" in both directions. Stone shall be placed within a perimeter form with flat and level top edge for screeding. Forming

material shall remain around stone until after the building is set.

- 3.) The crushed stone base shall be kept within the confines of the soil or perimeter form. Do not allow the base to become unconfined so that it may wash, erode, or otherwise be undermined.

300-3.3.3 Building Systems Installation. All building systems shall be installed in the precast concrete building in the area as shown on the plans per the manufactures recommendations and code requirements. In areas of conflict in the codes, the more stringent shall apply. Electrical connections shall be per National Electric Code. The Contractor shall provide and install a complete and working system to the satisfaction of the RPR and Owner.

300-3.4 Water Works Installation.

300-3.4.1 Pipeline and Fitting Installations.

- 1.) Installation of all buried piping shall be in accordance with AWWA C 600 Standards for Installation of Ductile Iron Water Mains and their Appurtenances. Refer to the plan details and Manchester Water Works (MWW) Construction Standards and Details for additional installation requirements.
- 2.) Water service tubing shall be laid in a continuous sections unbroken section to the greatest extent possible.
- 3.) The water main tap shall be performed under pressure. The Contractor shall coordinate the tap with the MWW. If required, the Contractor shall use only a MWW approved vendor/subcontractor for tapping the main. No separate measurement for payment will be made for tapping the main rather it shall be considered incidental to the line item.
- 4.) The interior of pipe, fittings and valves shall be kept clean and free of foreign material or soils at all times during storage and installation, or the material may be rejected by the RPR.
- 5.) All pipes and appurtenances laid in open trench excavation shall be bedded and uniformly supported over their full-length on bedding of the types specified herein and shown on the drawings. All work shall be performed in a dry trench.
- 6.) Pipe and fittings shall be laid accurately to the line and grades. Care shall be taken to provide a firm bearing for the pipe along its entire length. Pipes shall not be laid in water, nor shall water be allowed to flow through them.
- 7.) Wherever it is necessary to deflect the main at joints or pipe tubing from a straight line, either in the vertical or horizontal plane, the amount of deflection allowed shall not exceed that permitted tolerance by the manufacturer and shall be subject to the approval of the Manchester Water Works and/or RPR.
- 8.) All mechanical joint fittings shall be installed with thrust blocks and restrained retainer joints glands as outlined herein and shown on the plans.
- 9.) The piping/tubing and appurtenances shall be installed with a bedding and blanket material meeting the material specified herein. If the in-situ material meets the material specifications, it may be used. The bedding and blanket material shall be placed to a minimum of 12 inches above the pipe crown. The trench shall be backfilled by placing and compacting the sand in lifts of 6 inches or less. The blanket shall be carried up evenly on both sides of the pipe, so as not to disturb the pipe. Compact the blanket material to 95% standard proctor (in accordance with ASTM D 698 and ASTM D 2922) with approved hand-operated devices.
- 10.) Backfill material from 12 inches above the pipe to the underside of the pavement select material profile, or to the underside of loam and grassed areas, shall be backfilled with common backfill described herein and as approved by the RPR. Backfill shall be placed and compacted in layers of

6 inches or less. Compact the backfill material to 95% modified proctor (in accordance with ASTM D 157 and ASTM D 2922). Compaction shall be by hand-operated compactors or other approved method. Jetting and bucket compaction are not acceptable means of compaction.

- 11.) Trench areas improperly backfilled or having excessive settlement, as determined by the RPR, shall be reopened to the required grade, backfilled using proper techniques, and repaved as necessary. The Contractor shall receive no additional compensation for repair of trenches constructed under this Contract.

300-3.4.2 Water Line Leakage Testing and Disinfection.

Prior to final acceptance of the Work, all waterlines and appurtenances shall meet specific leakage requirements. These leakage requirements must be satisfied by the basic materials alone. Every test must be witnessed by RPR and any test not so witnessed will be considered as not having been performed. Contractor shall pretest the Work and shall not request RPR to witness the final test until the Contractor is reasonably certain that the test will yield results within the acceptable limits.

Testing Apparatus

- 1.) Provide all labor, pumps, plugs, measuring equipment and other apparatus, complete, and as required to perform all testing.
- 2.) Provide clean water as required to accomplish all testing.
- 3.) Provide plugs and caps capable of withstanding the test pressures, as applicable.
- 4.) Provide all necessary gauges. Gauges shall be standard pressure type with a minimum 6" diameter dial and a pressure range not in excess of 150% of the maximum required test pressure.
- 5.) Provide a hand or motor driven pump to maintain the required test pressure constant throughout the duration of the test. If a water pump is used, install water meter on supply side of pump

Pressure Pipe Leakage Test for Waterlines

- 1.) Leakage testing shall include the main pressure pipe, service connections, and all other appurtenances on the section of pipeline being tested.
- 2.) Provide and maintain at the site, a gauge stand with an approved laboratory calibrated test gauge. Periodically check test gauges used for testing against the test gauge, and whenever requested by RPR.
- 3.) Where it is absolutely necessary for testing, tap pipes and insert approved plugs after testing is completed. Install air release valves at high points for water testing, if hydrants or blowoffs are not available.
- 4.) All concrete thrust blocks and restraints shall be in place and cured at least 7 days.
- 5.) All buried pipe shall be backfilled.
- 6.) All water main testing shall be in accordance with the requirements of AWWA Standard C600.

Pipe Hydrostatic Test

- a. Open all air release valves and fill pipe with water at a rate not to exceed venting capacity of the valves.
- b. Raise pressure to 150 percent of the highest working pressure, or 100 psig, whichever is greater, adjusted to lowest point of the test section. Maintain a minimum of 125 percent of the working pressure at the highest point of the test section. In some instances, the lengths of test sections will have to be shortened to meet the above requirements.
- c. Maintain pressure for a minimum of two (2) hours.

Nongaseous Pipe Leakage Test

- a. Perform leakage test simultaneously with hydrostatic test.
- b. Maintain pressure within a maximum variation of ± 5 psi for 2 hours minimum.
- c. Record amount of leakage from water meter or other approved method.

d. Allowable leakage is:

- i. Exposed piping: Exposed piping with flanged, threaded or welded joints, or buried pipe in conflict with potable water lines: No leakage allowed.
- ii. Other pipe by the following formula:

$$L = [(S) \times (D) \times (\text{sqrt } P)] / 133,200$$

Where: L = Maximum allowable leakage in gallons per hour.
S = Length of pipe tested, in feet.
D = Nominal internal diameter of the pipe in inches
P = Average test pressure in pounds per square inch gage.

Flushing and Bacterial Testing/Disinfection Testing.

1.) Reference Standards

NSI/AWWA B300 – Hypo-chlorites; American Water Works Association; 2004

ANSI AWWA B301 - Liquid Chlorine; American Water Works Association; 2004

ANSI/AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005

2.) Test Reports Submittals: Indicate results comparative to specified requirements.

Disinfection report:

Type and form of disinfectant used.

Date and time of disinfectant injection start and time of completion.

Test locations.

Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.

Date and time of flushing start and completion.

Disinfectant residual after flushing in ppm for each outlet tested.

Bacteriological report:

Date issued, project name, and testing laboratory name, address, and telephone number.

Time and date of water sample collection.

Name of person collecting samples.

Test locations.

Initial and 24-hour disinfectant residuals in ppm for each outlet tested.

Coliform bacteria test results for each outlet tested.

Certification that water conforms, or fails to conform, to bacterial standards of the governing authorities of the State of New Hampshire.

Quality Assurance Testing Firm:

Certify all testing work performed in accordance with AWWA C651.

Company specializing in testing potable water systems, certified by governing authorities of the State of New Hampshire.

300-3.5 Natural Gas Service Trenching Installation. The Natural Gas Supplier will be providing the labor and all materials for the installation of the gas service installation, including the tapping of the service onto the existing gas main. The Contractor shall be performing the trench excavation and backfill for the materials to be installed in conjunction with the service tap and pipe installation being performed and under the direction of the Natural Gas Supplier or their representative. The excavation shall be performed in accordance with Liberty Utility installation standards and recommendations and the following:

- 1.) The piping/tubing and appurtenances shall be installed with a bedding and blanket material meeting

the material specified herein. If the in-situ material meets the material specifications, it may be used. The bedding and blanket material shall be placed to a minimum of 12 inches above the pipe crown. The trench shall be backfilled by placing and compacting the sand in lifts of 6 inches or less. The blanket shall be carried up evenly on both sides of the pipe, so as not to disturb the pipe. Compact the blanket material to 95% standard proctor (in accordance with ASTM D 698 and ASTM D 2922) with approved hand-operated devices.

- 2.) Backfill material from 12 inches above the pipe to the underside of the pavement select material profile, or to the underside of loam and grassed areas, shall be backfilled with common backfill described herein and as approved by the RPR. Backfill shall be placed and compacted in layers of 6 inches or less. Compact the backfill material to 95% modified proctor (in accordance with ASTM D 698 and ASTM D 2922). Compaction shall be by hand-operated compactors or other approved method. Jetting and bucket compaction are not acceptable means of compaction. The warning tape shall also be placed as shown on the plans.
- 3.) Trench areas improperly backfilled or having excessive settlement, as determined by the RPR, shall be reopened to the required grade, backfilled using proper techniques, and restored to grade and repaved as necessary. The Contractor shall receive no additional compensation for repair of trenches constructed under this Contract.

METHOD OF MEASUREMENT

300-4.1 Snow Melter Equipment Package. Measurement for the Snow Melter Equipment Package will be based on the actual lump sum quote proposal from the Snow Melter Manufacturer. The exact amount of reimbursement to the Contractor will be indicated on the Snow Melter Manufacturer Company's quote proposal and will be the basis of measurement without any additional mark-up by the Contractor. There shall be no separate measurement for the Contractor's cost to procure the equipment and any coordination and administration and these items shall be considered incidental to the overall cost of the equipment package and overall completed project.

300-4.2 Snow Melter Equipment Manufacturer Installation Assistance. Measurement for the assistance of the Snow Melter Manufacturer shall be a lump sum price. The exact amount of reimbursement to the Contractor will be indicated on the Snow Melter Manufacturer Company's proposal quote to perform the installation technical assistance and oversight work. This proposal quote will be the basis of measurement without any additional mark-up by the Contractor. There shall be no separate measurement for the Contractor's cost for the coordination and administration and these items shall be considered incidental to the overall cost of the equipment package installation and completed project.

300-4.3 Contractor Snow Melter System Final Design and Equipment Installation. Measurement for the Contractor Snow Melter System Final Design and Equipment Installation shall be a lump sum price. The Contractor shall coordinate and perform the Final Design of the Layout and Materials for a completed system installation with coordination with the snow melter equipment manufacturer and as reviewed by the RPR. The Contractor shall also perform the installation work for the snow melter equipment as outlined within this Design/Build specification and as determined through the Final Design performed by the Contractor. There shall be no separate measurement for the Contractor's cost for the coordination and administration of this item and that work shall be considered incidental to the overall cost of the equipment installation and completed project.

300-4.4 Contractor Snow Melter System Site Preparation and Site Infrastructure Work. Measurement for the Contractor Snow Melter Site Preparation and Site Infrastructure Work shall be a lump sum price. The Contractor shall coordinate and perform all site preparation and site infrastructure work for a completed system installation as identified above in paragraph 300-3.2.1 with coordination with the snow melter equipment manufacturer, the Owner and the RPR. The Contractor shall also perform the

installation for the snow melter system site preparation and site infrastructure work as outlined within this Design/Build specification and as determined through the Final Design performed by the Contractor. There shall be no separate measurement for the Contractor's cost for the coordination and administration of this item and that work shall be considered incidental to the overall cost of the equipment installation and completed project.

300-4.5 Snow Melter Building and Installation. Measurement for the Snow Melter Building and Installation shall be made at the lump sum price for the Snow Melter Building and Installation as outlined on the plans, specifications, and as noted herein. Measurement will also include the performance-based design and review of the building and all items for a completed and accepted Pre-Engineered Precast Concrete Building installation.

300-4.6 Snow Melter Utility – Water Pipe and Fittings. Measurement for water pipe shall be per linear foot along the length of the installed water pipe (including fittings) computed to the nearest one tenth (0.1) of a foot. Measurements shall commence and terminate at (1) connection to existing watermain and (2) end of pipe. Do not deduct for adapters, fittings, and other pipe appurtenances.

No separate measurement for payment will be made for; excavation, dewatering, shoring, purchasing the pipe and fittings, laying the pipe and fittings, pipe bedding and blanket materials, thrust blocks, placing and compacting back fill material, inspections, testing, coordination with the water utility supplier and RPR, and all other incidental work as required to have a complete and working water pipe as required by the Manchester Water Works.

300-4.7 Snow Melter Utility – Water Line Appurtenances. Measurement for water line appurtenances shall be per each, including all associated accessories to the appurtenance.

The item or work shall include, but not be limited to: excavation, dewatering, shoring, purchasing the appurtenance and any associated accessories, installing the appurtenance and any associated accessories, bedding and blanket materials, connections to existing watermain (as applicable) with all associated fittings and appurtenances, in-line connections of fittings and appurtenances with all accessories to the new water pipe (as applicable), ductile iron pipe to connect an appurtenance assembly (as required), placing and compacting back fill material, , inspections, testing, and all other work as required to have a complete and working water line as required by the Manchester Water Works.

300-4.8 Snow Melter Utility – Natural Gas Service Supplier Coordination & Installation. Measurement for the coordination with and installation work by the Natural Gas Service Supplier (Liberty Utilities) shall be a lump sum price. The exact amount of reimbursement will be for any proposal quote from the Gas Service Supplier (Liberty Utilities) to perform the installation of the gas service materials (i.e. pipe, valves, tapping materials, etc.) and installation labor, which includes the tap to the existing gas main. This proposal quote will be the basis of measurement without any additional mark-up by the Contractor. There shall be no separate measurement for the Contractor's cost for the coordination and administration and these items shall be considered incidental to the overall cost of the installation and completed project.

300-4.9 Snow Melter Utility – Natural Gas Service Pipe Trenching. Measurement for gas main pipe installation trenching shall be per linear foot along the length of the installed gas service piping computed to the nearest one tenth (0.1) of a foot.

No separate measurement for payment will be made for; excavation, dewatering, shoring, pipe bedding and blanket materials (if necessary), placing and compacting back fill material, inspections, testing, coordination with the gas service utility supplier (Liberty Utilities) and RPR, and all other incidental work as required to have a complete and working gas service pipe as required by the Liberty Utilities.

BASIS OF PAYMENT

300-5.1 Snow Melter Equipment Package. The amount paid to the Contractor shall be the exact amount indicated on the quote proposal from the Snow Melter Manufacturer's company without mark-up. There shall be no separate payment to the Contractor for the procurement and coordinate with the scheduling of the Snow Melter Manufacturer and these costs are considered incidental to the equipment package and overall completed project.

300-5.2 Snow Melter Equipment Manufacturer Installation Assistance. The amount paid to the Contractor shall be the exact amount indicated on the proposal quote from the Snow Melter Manufacturer's company without mark-up. There shall be no separate payment to the Contractor for the administration and coordination with the scheduling of the Snow Melter Manufacturer installation work and these costs are considered incidental to the equipment installation and overall completed project.

300-5.3 Contractor Snow Melter System Final Design and Equipment Installation. Payment shall be made at the lump sum price for the Contractor Snow Melter System Final Design and Equipment Installation as outlined on the plans, specifications, and as noted herein. The price for payment shall be full compensation for the Final Design for the snow melter system as performed under the direction of the Contractor with technical assistance from the snow melter equipment manufacturer and as reviewed by the RPR. There shall be no separate payment for the Contractor's cost for the coordination and administration of this item and that work shall be considered incidental to the overall cost of the equipment installation and completed project. Payment for the installation shall also be for furnishing all labor, materials and equipment, transporting, tools, excavation, backfill, waste material removals and proper disposal, and all other items and incidentals necessary to satisfactorily complete the item to the satisfaction of the RPR.

300-5.4 Contractor Snow Melter Site Preparation and Site Infrastructure Work. Payment shall be made at the lump sum price for the Contractor Snow Melter Site Preparation and Site Infrastructure Work as outlined on the plans, specifications, and as noted herein. This price shall be full compensation for the Final Design for the snow melter system as performed under the direction of the Contractor with technical assistance from the snow melter equipment manufacturer and as reviewed by the RPR. There shall be no separate payment for the Contractor's cost for the coordination and administration of this item and that work shall be considered incidental to the overall cost of the equipment installation and completed project. Payment shall also be for furnishing all labor, materials and equipment, transporting, tools, excavation, backfill, waste material removals and proper disposal, and all other items and incidentals necessary to satisfactorily complete the item to the satisfaction of the RPR.

300-5.5 Snow Melter Building and Installation. Payment shall be made at the lump sum price for the Snow Melter Building and Installation as outlined on the plans, specifications, and as noted herein. Payment will be made at the contract lump sum price for the completed and accepted Pre-Engineered Precast Concrete Building 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 to the satisfaction of the RPR.

300-5.6 Snow Melter Utility – Water Pipe and Fittings. Payment shall be made at the linear foot price for the water pipe (including fittings) as outlined on the plans, specifications, and as noted herein or as field modified by the RPR. The payment shall constitute full compensation for all labor, materials, equipment, incidentals and expenses necessary to the satisfactory completion of the installation to the satisfaction of the RPR and Manchester Water Works.

300-5.7 Snow Melter Utility – Water Line Appurtenance. Payment shall be made at the each price for the water line appurtenance and associated accessories as outlined on the plans, details, specifications, and as noted herein. The payment shall constitute full compensation for all labor, materials, equipment, incidentals and expenses necessary to the satisfactory completion of the installation to the satisfaction of the RPR and Manchester Water Works.

300-5.8 Snow Melter Utility – Natural Gas Service Supplier Coordination & Installation. The amount paid to the Contractor shall be the exact amount indicated on the proposal quote from the natural gas supplier’s company (Liberty Utilities) without mark-up. There shall be no separate payment to the Contractor for the administration and coordination with the scheduling of the natural gas supplier’s installation work and these costs are considered incidental to the project installation and overall completed project.

300-5.9 Snow Melter Utility – Natural Gas Service Pipe Trenching. Payment shall be made at the linear foot price for the natural gas service pipe as outlined on the plans, specifications, and as noted herein or as field modified by the Natural Gas Service Supplier or RPR. The payment shall constitute full compensation for all labor, materials, equipment, incidentals and expenses necessary to the satisfactory completion of the installation to the satisfaction of the RPR and Natural Gas Supplier (Liberty Utilities).

Payment will be made under:

Project Item M-300-1	Snow Melter Equipment Package per Lump Sum
Project Item M-300-2A	Snow Melter Equipment Manufacturer Installation Assistance per Lump Sum
Project Item M-300-2B	Contractor Snow Melter System Final Design and Equipment Installation per Lump Sum
Project Item M-300-3	Contractor Snow Melter Site Preparation and Site Infrastructure Work per Lump Sum
Project Item M-300-4	Snow Melter Building and Installation per Lump Sum
Project Item M-300-5A	Snow Melter Utility – 2” Polyethylene Water Line per Liner Foot
Project Item M-300-5B	Snow Melter Utility – 8” Ductile Iron Water Line per Liner Foot
Project Item M-300-5C	Snow Melter Utility – 2” Service Tap (Saddle & Corporation) per each
Project Item M-300-5D	Snow Melter Utility – 2” Curb Stop with Curb Box per each
Project Item M-300-5E	Snow Melter Utility – 12” x 8” Tapping Sleeve and 8” Gate Valve per each
Project Item M-300-5F	Snow Melter Utility – Hydrant and 6” Gate Valve Assembly per each
Project Item M-300-6A	Snow Melter Utility – Natural Gas Service Supplier Coordination and Installation per Lump Sum
Project Item M-300-6B	Snow Melter Utility – Natural Gas Service Pipe Trenching per Linear Foot

END OF ITEM M-300

ITEM M-400
NON-AIRFIELD SITE ELECTRICAL

DESCRIPTION

400-1.1 This work shall consist of the installation, as well as the removal and disposal, of site electrical and data utilities with associated structures and appurtenances as shown on the plans or as directed by the Owner's representative (Resident Project Representative (RPR)). The site electrical utility removal shall also include the restoration of the disturbance for the removals including backfilling of resulting trenches, holes, and pits, as well as the proper disposal of the existing utility waste materials and appurtenances.

400-1.2 As part of this work, the Contractor shall coordinate with the Manchester-Boston Regional Airport (MHT) Information Technology (IT) Department through:

Department Contact: Frederick Zapp
1 Airport Road – Suite 300
Manchester, NH 03103
General Phone: (603) 624-6539

Direct Phone: (603) 656-6338
Email: fzapp@flymanchester.com

and the MHT IT fiber/security maintenance company (Security Consultant) which is:

Allied Universal Technology Services
1 Corporate Drive – Suite 3
Andover, MA 01810
General Phone: (978) 688-4444

Account Manager Contact: Kevin Finnerty
Direct Phone: (978) 253-5029
Email: kevin.finnerty@aus.com

The Security Consultant will provide support services to MHT, as well as to the Contractor, for the fiber network extension work for the project under an allowance provided by this specification. This Security Consultant is the sole integrator and maintenance provider for the airport's security system and CCTV platform. The Contractor shall coordinate with the Engineer, MHT IT Department and the Security Consultant with regard to scheduling the consultants for when they will be required to perform their duties.

The scope of the fiber network related work for the Contractor will be installation of new conduit (underground and above ground with innerduct, fittings and handholes), installation of new single mode fiber cable through new conduit and existing conduit (as shown on the Contract Drawings), mounting and connections to new and existing patch panels and security equipment, and the testing of the new fiber cable to ensure the fibers are operational. The Security Consultant will be responsible for connections of existing systems and new fiber network systems with any required switches, security equipment, power supplies and other incidental work related to the new fiber network system.

400-1.3 As part of this work, the Contractor shall perform the installation of the underground facilities for the Electric Utility Supplier Relocation and coordinate the associated new Utility Supplier Cable Installation. An Allowances for work as shown on the drawings has been included.

400-1.4 As part of this work, the Contractor shall perform the removal of existing site lighting systems and other identified site items, as well as the relocation of any identified site-related item.

MATERIALS

400-2.0 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.

400-2.1 The Contractor shall supply all materials and equipment required to perform the removal of the utilities in accordance with these specifications and all Federal, state and local regulations and the respective utility suppliers.

400-2.2 All temporary facilities, equipment, and materials to perform the utility removals must adhere to and/or meet EPA, OSHA, and NIOSH regulations, as well as all other Federal, state, and local regulations.

400-2.3 Granular Backfill Material. It is assumed supplemental backfill material will be necessary for some of the site electrical utility removals and new structures. The backfill material shall conform to the New Hampshire Department of Transportation Standard Specifications §209 Granular Backfill using Item 209.4 Granular Backfill (Gravel). Granular backfill (gravel) shall consist of a mixture of stones or rock fragments and particles with 95 to 100 percent passing the 3" sieve and 25 to 70 percent passing the No. 4 sieve.

400-2.4 Structure Bedding/Special Backfill. Bedding or special backfill shall be as shown on the plans.

400-2.5 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

400-2.6 Reinforcing steel. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

400-2.7 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.

400-2.8 Rigid Conduit. Refer to Section L-110 2.2 specifications for the RGS conduit materials.

400-2.9 PVC Conduits. Refer to Section L-110 2.3 specifications for the PVC conduit materials.

400-2.10 Conduit Spacers. Refer to Section L-110 2.5 specifications for the conduit spacer materials.

400-2.11 Detectable Warning Tape. Refer to Section L-110 2.5 specifications for the conduit spacer materials.

400-2.12 Electrical Power Cable. 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.

400-2.13 Fiber Cable Innerduct: Innerduct constructed of a white nylon-6 resin containing melamine-cyanurate polymer and designed to provide low-friction pathway advantages for in conduit environments meeting the following requirements:

1. Plenum rated flexible optical fiber/communication raceway constructed of Polyethylene Terephthalate and Nylon 6
2. Provide wire management in a building and underground conduit for fiber optic and data and communications cabling.
3. UL Listed.
4. Meets UL 2024A standards for Plenum Optical Fiber/Communications raceways.
5. Low-smoke, zero-halogen rated.
6. Color differentiated pull tapes are pre-installed 1250lb polyester flat woven pull tape in each cell.
7. Allows for simplified cable installations – short runs are installed easily by hand
8. Allows for easy removal of obsolete cables
9. Sewn-in 18 AWG TFN solid copper wire suitable for direct toning equipment and above ground handheld locators
10. Product shall be Maxcell Edge Detectable (3" – 3 cell configuration) as manufactured by MaxCell Group/TVC Communications or approved equal.

400-2.14 Fiber Optic Cable: Fiber optic cable shall meet MHT IT Department requirements summarized as follows:

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 μm (OS1/OS2) complying with TIA-492CAAA.
3. Cable Capacity: **2-strand fiber and 144 strand fiber.**
4. Cable Applications:
 - a. Plenum Applications: Indoor/Outdoor use listed NFPA 262 Type OFNP plenum cable.

5. Cable Jacket Color:
 - a. Single mode Fiber (OS1/OS2): Black, flame retardant PVC.

400-2.15 Fiber Optic Cable Connector Devices: Fiber optic cable connector devices shall meet MHT IT Department requirements summarized as follows:

1. Connector Type: SC Type Connectors, as specified by MHT IT Department, 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.
4. Housing shall be as manufactured by Corning or approved equal

400-2.16 Demarc Room/Snow Melter Hut Fiber Optic Equipment Materials: Fiber optic equipment and accessories shall meet MHT IT Department requirements summarized as follows:

- A. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant, if not already available at the mounting location.
 1. Size: As required to accommodate equipment.
 2. Do not paint over UL label.
- B. Wall Mount Bracket: EIA/ECA-310-C standard 19-inch wide component rack mount. Provide two (2) wall mount brackets at each location for the ability to have pass-through on the fiber optic cable.
 1. Vertical Mount Bracket: Steel construction. 2-post Open Frame. 4U 19-inch Steel Vertical Wall Mount Equipment Rack Bracket. Startech.com Model: RK419WALL V or approved equal.
- C. Patch Panel: EIA/ECA-310 standard 19 inch-wide component racks. Provide two (2) panels at each location for the ability to have pass-through on the fiber optic cable.
 1. Wall Rack Mounted Patch Panel: 16-gauge rolled steel construction. Panels pre-loaded with snap-in fiber adapter panels. Loaded with Single-Mode/Multimode 24 simplex ports. SC connector model. Dimensions: 1.75" H (1U) x 17" W x 11" D. Black Box Model JPM370A-R2 or approved equal. The Patch Panel must accept Coning bulkhead.
- D. Patch Panel Enclosure: Medium NEMA Type 1 Enclosure to accommodate the EIA/ECA-310 standard 19-inch wide component rack and patch panel. Provide two (2) enclosures at each location for the ability to have pass-through on the fiber optic cable.
 1. Medium NEMA Type 1 Enclosure: 12-gauge steel construction with an ANSI 61 gray polyester powder paint finish inside and out over pretreated surfaces and having the following features:
 - a. Door with butt hinges
 - b. Collar studs provided for mounting optional panel
 - c. Mounting holes on back of enclosure
 - d. Keyed Cylinder Lock Kit
 - e. Panel for Medium Type 1 Enclosure
 - f. Dimensions: 36"H x 30"W x 12"D
 - g. Hoffman Model A36N30DLP or approved equal.

400-2.17 Fiber Network Grounding and Bonding Components: The fiber network grounding and bonding shall meet the following requirements:

- A. Comply with TIA-607.

400-2.18 Fiber Network Identification Products. The fiber network identification products shall meet the following requirements:

- A. Comply with TIA-606.
- B. Markers for Conductors and Cables: Use plastic sleeve, plastic clip-on, or vinyl split sleeve type

markers suitable for the cable to be identified.

- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch (3 mm).
- G. Color: Black text on white background unless otherwise indicated.

400-2.19 Fiber Network Source Quality Control

- A. Factory test cables according to TIA-568.

400-2.20 Mast Light: High output LED Flood light with specially designed Airport Apron flood light optic.

1. (2) Flood light fixtures per pole, each with the following characteristics:
 - a. 276 LEDs
 - b. 579 watts
 - c. 88,832 lumens
 - d. 154 lumens per watt Efficacy
 - e. Airport Flood Light Optic
 - f. 4000K color temperature
 - g. 700mA drive current
 - h. IK10 rated LED module lenses
 - i. High power factor 90% min driver.
 - j. 10kV/10kA Surge protector
 - k. Expected 100,000+ hours with L70 lumen maintenance at 25degC
 - l. cULus Listed for Canada and USA, per UL1598 and UL8750
 - m. Rated for -40 to +104 degree Fahrenheit ambient temperatures
 - n. 5-year limited warranty
 - o. Provide Twin Bullhorn 180degree mounting accessory
 - p. Gardco model PFF-276L-700-NW-G2-SF-AIRP-UNV-MGY with GMD102-PFF-MGY twin bullhorn mount, or approved equal.

400-2.21 Mast Light Pole: 39 foot tall, Round Tapered Aluminum alloy mast light pole

1. 6063 alloy aluminum heat treated to produce a T6 temper.
2. A356 alloy aluminum cast anchor base (plate) treated to a T6 temper after all structural welding is completed.
3. Min 55,000 PSI yield strength anchor bolts with an L bend on one end and threaded on the opposite end. Hot dipped galvanized.
4. Electrostatically applied, thermally cured TGIC polyester powdercoat finish or liquid polyurethane finish.
5. Guardco model TRA-CB-39-H-T4-MGY, or approved equal.

400-2.22 Security Camera: Cost effective, high performance network camera

1. Pole Camera:
 - a. PTZ with HDTV 1080p and 32x optical zoom
 - b. IP66, NEMA 4X, IK10 ratings
 - c. Forensic WDR and Lightfinder 2.0
 - d. Signed firmware and secure boot
 - e. Focus recall and EIS
 - f. 1024 MB RAM, 512 MB Flash system on chip memory
 - g. H.264 baseline, main and high profiles H.265 main profile motion JPEG video

- compression
 - h. 1920x1080 HDTV 1080p to 320x180
 - i. Up to 60/50 fps frame rate in all resolutions
 - j. PoE+ midspan 1-port: 100-240 VAC, max 37 W IEEE 803.3at, Type 2, Class 4
 - k. Power consumption: 20-28 V DC, typical 10 W, max 18 W, 20-24 V AC, typical 15.5 V A, max 26 V A
 - l. RJ45 10BASE-T PoE connector
 - m. Support for SD/SDHC/SDXC card
 - n. Axis model P5655-E network camera, or approved equal.
2. Building Mounted Camera:
- a. Fixed dome
 - b. IP66, NEMA 4X, IK10 ratings
 - c. Forensic WDR and Lightfinder technology
 - d. 180° panoramic overview, up to 30 FPS in 8.3 MP resolution
 - e. 8.3 MP resolution at full frame rate
 - f. 1024 MB RAM, 512 MB Flash system on chip memory
 - g. H.264 baseline, main and high profiles motion JPEG compression
 - h. 4320x1920 to 480x270
 - i. Up to 25/30 fps frame rate without WDR, up to 12.5/15 fps with WDR
 - j. Power over ethernet IEEE 802.3af/802.3at, Type 1, Class 3, Typical 7W, Max 12.9W
 - k. RJ45 10BASE-T PoE connector
 - l. Support for SD/SDHC/SDXC card
 - m. Axis model P3807-PVE network camera, or approved equal.

400-2.23 Security Camera Hardened Switch: 4-port PoE+ Hardened Network Switch

1. Outdoor rated NEMA 4/4X, IP66-11 Rated Enclosure.
2. 115VAC input voltage.
3. Power output: (4) 10/100/1000 Mbps PoE/PoE+ (up to 30W) ports or (2) Hi-PoE (60W) ports.
4. One (1) Gigabit SFP Fiber port.
5. LED indicators.
6. 4AH/12VDC sealed lead acid or gel type back-up battery.
7. UL/cUL listed.
8. Altronix model NetWay4EWPX, or approved equal.

400-2.24 Security Camera Cable. Copper Horizontal Cat 6 cable.

1. 100ohm, balanced twisted pair cable complying with TIA-568.2 and labeled as complying with UL 444.
2. TIA-568.2 Category 6 outdoor rated 4-pair, 24 AWG U?UTP.
3. Suitable for Ethernet 1000BASE-T, 100-BASE-TX, 10BASE-T, PoE, PoE+, noisy environments.
4. Outdoor rated.
5. Shielded for use inside a light pole.

400-2.25 Mast Light Foundation. Refer to the drawing details for material requirements.

400-2.26 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 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 **H-20 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.

400-2.27 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 at least H-20 load requirements.

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 applicable word "ELECTRIC" or "DATA" 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).

CONSTRUCTION METHODS

400-3.0 General Requirements. The Contractor shall conduct all site electrical and data utility installations and removal operations in a safe, legal, and responsible manner and shall ensure that any equipment, material, or method used shall be safe for the workers and the public. All laws, rules, regulations, utility supplier requirements, and local building codes shall be followed. Local building code shall mean a code enacted or adopted by competent local officials or bodies at least as stringent in its requirements as the "New Hampshire State Fire Prevention and Building Codes" and its associated reference standards. The Contractor is responsible to secure all permits for any utility removals, coordinate with all utility supply company owners, and to properly dispose of the waste materials from the removal of pipe materials, structures and appurtenances.

400-3.0.1 Existing Utility Dig Sage. The Contractor shall protect all utility lines to remain during the installation or removal of any adjacent utilities. **At least seventy-two (72) hours (not including weekends and Holidays) in advance** of the commencement date of the utility installations or removals, the Contractor shall notify all operators who have underground or overhead facilities at or near the proposed building demolition and utility removal areas through the one-call notification system (**Dig Safe System – MA/ME/NH/RI/VT - Dial 811 or www.digsafe.com**). In addition, the Contractor shall contact all utility owners and request a Pre-Construction Conference with all operators having underground or overhead facilities at or near the proposed demolition and utility removal area, as required.

All utility installation or removals shall be as outlined within this specification, unless otherwise shown on the proposed installation or demolition plans, or directed by the Owner's representative.

400-3.1 General Duct Bank/Conduit Installation. The Contractor shall install underground duct banks and conduits AND aboveground 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 any pavements (aprons, parking areas, roadways, shoulder, etc.).

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 all items of this specification. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to all items of this specification.

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.

400-3.2 Duct Bank Installation. 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 paved areas (unless otherwise noted on the plans for Electrical Supply Provider Duct Banks/Conduits), 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.

400-3.3 Conduits without Concrete Encasement Installation. 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.

400-3.4 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.

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.

400-3.5 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 as specified under 400-2.3—*Granular Backfill Material*. 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.

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.

400-3.6 Restoration for Duct Bank/Conduit Installation. 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 pay items. 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.

400-3.7 General Cable Installation. 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 shall be installed in concrete encased duct banks. Cable shall be run without splices, from structure to structure or structure to terminus point (i.e. no splices within conduits).

Provide not less than 3 feet (1 m) of cable slack on each side of all connections and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade

connections and 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 cable passes through empty junction boxes and access structures to allow for future maintenance and connections, or as designated by the RPR.

400-3.8 Installation of Cable 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 as outlined herein. 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 pull box, 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, pull box, 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 or conduits.

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 pull box 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.

400-3.9 Cable Installation Testing. The Contractor shall furnish all necessary equipment and appliances for testing the electrical and data 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:

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

- A. All testing shall be at the sole expense of the Contractor.
- B. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.
- C. That all affected circuits (existing and new) are free from unspecified grounds.
- D. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.
- E. 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.

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.

400-3.10 Fiber Network Installation - General

- A. Comply with latest editions and addenda of TIA-568 (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and System Design as specified in Materials above.
- B. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
- C. As part of the installation work, the new fiber work will be performed adjacent to other utilities, facilities and cabling. The Contractor shall not damage any existing utilities, facilities and cabling of other parties, including but not limited to: the utility, facilities and cabling owned by: all MHT Building tenants, and all Aeroterm Cargo Building tenants. If damage does occur to any utilities, facilities or cabling, the Contractor shall cease all new installation work and immediately repair the damaged utilities, facilities or cabling. All repair work shall be performed at no additional cost to the facility owner or MHT and shall be performed to the satisfaction of the facility owner, MHT and the Engineer.

400-3.11 Installation of Fiber Network Pathways

- A. Install pathways with the following minimum clearances:
 - a. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 - b. 12 inches (300 mm) from power conduits and cables and panelboards.
 - c. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
 - d. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Conduit, in Addition to Requirements of Section L-110, for above grade installation:
 - a. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between

- pull points.
- b. Conduit Bends: Inside radius not less than 10 times conduit internal diameter, unless using and LB fitting for above grade installations.
- c. Arrange conduit to provide no more than 100 feet (30 m) between pull points.

400-3.12 Fiber Network Innerduct Installation

- A. Verify that dimensions are correct and site is in proper condition.
- B. Verify that the product is listed and is properly marked.
- C. Store products in manufacturer's unopened package until installation.
- D. Install in accordance with manufacturers instruction.

400-3.13 Installation of Fiber Network Equipment and Cabling

- A. Cabling:
 - a. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than four (4) times cable diameter.
 - b. Do not over-cinch or crush cables.
 - c. Do not exceed manufacturer's recommended cable pull tension.
 - d. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
 - e. Provide service loops shall be provided for all finished (terminated) fiber cables near patch panels. Service loop length shall be not less than three (3) feet and not greater than twelve (12) feet long.
 - f. At the Snow Melter Hut, the fiber cable shall have a terminus for a future fusion splice to an fiber cable extension. At the location, there shall be a minimum of 100 feet of coiled slack provided.
- B. Fiber Optic Cabling:
 - a. Prepare for pulling by cutting outer jacket for ten (10) inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 - b. Support vertical cable at intervals as recommended by manufacturer.
- C. Wall-Mounted Racks and Enclosures:
 - a. Install to plywood backboards only, unless otherwise indicated.
 - b. Mount so height of topmost panel does not exceed 78 inches above floor, unless otherwise authorized by the MHT IT personnel or the Engineer.
- D. Identification:
 - a. Use wire and cable markers to identify cables at each end.
 - b. Use manufacturer-furnished label inserts or identification labels to identify each jack at communications outlets with unique identifier.
 - c. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

400-3.14 Fiber Network Field Quality Control

- A. Comply with inspection and testing requirements of specified installation standards.
- B. Visual Inspection:
 - a. Inspect cable jackets for certification markings.
 - b. Inspect cable terminations for color coded labels of proper type.
 - c. Inspect patch panels for complete labels.

- d. Inspect patch cords for complete labels.
- C. Testing - Fiber Optic Cabling:
 - a. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
 - b. Single Mode Backbone: Perform tests in accordance with TIA-526-7 .
 - c. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.
- D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

400-3.15 Mast Light and Pole Installations. Install the mast light pole and lighting fixtures in accordance with the manufacturer's instructions or as directed by the RPR. The Contractor shall coordinate the installations with the Cargo Building Construction Manager/Contractor to minimize any disruptions between the projects.

400-3.16 Mast Light and Building Camera Installation. Install the mast light pole and building cameras and any associated equipment, conduits and cabling in accordance with the manufacturer's instructions or as directed by the RPR. The Contractor shall coordinate all camera and associated equipment installations with the Cargo Building Construction Manager/Contractor to minimize any disruptions between the projects.

400-3.17 Site Electrical and Data Concrete Structure Installation. 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.

400-3.18 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.

400-3.19 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.

400-3.20 Installation of structure 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.

400-3.21 Removal of structure 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.

400-3.22 Backfilling of structures. 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.

400-3.23 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.

400-3.24 Manhole elevation adjustments. The Contractor shall adjust the tops of manholes in areas designated in the Contract Documents to the new elevations shown, as required. 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 400-2.23.

400-3.25 Existing Site Lighting Facility or other Miscellaneous Removals. Site Lighting facilities (poles, cabling, foundations (as applicable), etc.) and other miscellaneous site components (i.e. handholes, etc.) shall be removed to the limits as indicated on the plans, or as directed by the RPR. The removal of any small structure or underground conduit shall be backfilled in lifts of compacted suitable material. Any of the above grade facilities (light poles, fixtures, panels, etc.), but not cabling and foundation, shall be removed and be salvaged to the MHT Maintenance, at their discretion. The Contractor shall coordinate with MHT Maintenance on the location to transport and store the salvaged materials. The foundations and cabling shall be removed and become property of the Contractor and disposed of properly. The Contractor shall be responsible for making notifications to the appropriate utility companies (Eversource) as necessary

to shut down the electric supply facilities prior to any removal work for the shutdown/decommissioning of the electric supply service.

400-3.26 Ownership of removed cable. The Contractor shall obtain ownership of removed cable and shall properly disposed of the cable materials off the Airport site.

400-3.27 Protection of Existing Facilities and Utilities to Remain. The Contractor shall be responsible for any provisions necessary to protect utilities and any site facilities during any installation operations using means acceptable to the utility owner and the RPR. If such utility lines cannot be protected in place, the Contractor shall temporarily relocate the utility lines, as necessary, in coordination with the utility owner to protect these utilities prior to undertaking any installation work that might affect these utility lines. There shall be no additional cost to the Owner for any coordination and necessary protection provisions or temporary relocation of facilities or utilities.

400-3.28 Electric Supply Facility Removal and Relocation Coordination. All existing utility-owned electrical supply wires, poles, transformers and associated supply appurtenances shall be removed by the Utility Supplier as shown on the plans, or as directed by the Utility Supplier. The relocation of any aerial electrical supply facilities shall be disconnected and relocated to the proposed modified layout by the Utility Supplier (Eversource) in accordance with their requirements.

400-3.29 Electrical Utility Relocated Cable Installation Coordination. After the new underground facilities with conduits, manholes, sector cabinet foundations and transformer pads have been installed by the Contractor, the Contractor shall coordinate the installation of the new electrical service supply conductors. The Contractor shall be responsible for making appropriate notifications to the utility supply the transfer of the new cabling to the new underground service facilities.

400-3.30 Disposal of Removed Materials. Disposal of materials shall be in accordance with all federal, state, and local laws, rules, and regulations; any provision found elsewhere in the Contract Documents; and most specifically in New Hampshire Department of Transportation Standard Specifications §202 Removal of Structures and Obstructions; New Hampshire RSA 149-M Solid Waste Management; and New Hampshire Department of Environmental Services Division of Waste Management rules and regulations and shall be subject to the approval of the RPR. If necessary, the Contractor shall provide to the RPR a disposal plan at least fifteen (15) days prior to removal of materials from the site. Disposal plan shall identify the location of disposal, license and/or permit number of the disposal facility or facilities, as required for disposal. If applicable, delivery tickets from the location of disposal indicating date, time, and weight of debris disposed at the facility shall be provided to the RPR.

400-3.31 Dust Control. Provisions shall be made on the site to control the quantity of dust resulting from site removal or installation operations by wetting the immediate work area with water, or other appropriate spraying agents, or by means acceptable to the RPR. The Contractor shall also perform sweeping operations to keep any paved surface clean from vehicle tire tracking from the work zone. There shall be no additional cost to the Owner for any dust control for the work.

400-3.32 Allowances. Under these items, the Contractor shall coordinate and directly pay the Utility Suppliers and Security Integrator vendor for the project under the allowance provided by this specification. The Contractor shall coordinate with these companies with regard to scheduling the work to be performed after the project items under the Contract have been installed.

METHOD OF MEASUREMENT

400-4.1 Cable/Wire. Cable or 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 (as necessary) ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional

quantities required for service slack. Cable service 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 service slack. No separate payment will be made for ground rods as required.

400-4.2 Camera/Fiber Equipment and Cable Interconnections. Camera/fiber system equipment and fiber cable interconnection shall be measured by each unit completed in place, ready for operation, and accepted as satisfactory

400-4.3 Structures. Manholes, handhole, transformer pad, and light foundation structures shall be measured by each unit completed in place and accepted or removed 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; and all incidental work required for a complete installation or removal.

400-4.4 Mast Light Pole and Fixtures. The accepted quantity of mast light poles and fixtures 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 erection requirements; all required connections; and all incidental work required for a complete installation.

400-4.5 Site Lighting or Other Site Item Removal. Measurement shall be made for the removal of each section of existing site lighting and identified site items to be removed as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances indicated on the plans as being removed or as required for the complete removal of the identified section of lighting, including any supplemental backfill material required to restore the foundation hole or pit, as well as any other incidental item for a complete removal of the lighting system. This item also includes salvaging the existing light poles and fixtures to MHT Maintenance, at their discretion, and transportation of the salvaged materials to the Airport Property location identified by the MHT Maintenance.

400-4.6 Relocation of Existing Wireless Internet System. Measurement shall be made for the relocation of a wireless internet system as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances indicated on the plans as being removed, salvaged, and re-installed at a relocated position as required for the complete relocation of the system. This item also includes any supplemental backfill material required to relocate the system, as well as any other incidental item for a complete relocation.

400-4.7 Allowances. Measurement for the allowances are based on the actual invoices by the Utility Supplier and Security Integrator vendor for any allowable associated costs. The exact amount of reimbursement will be indicated on the Utility Supplier's or Security Integrator'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 work and it shall be considered incidental to the overall project.

BASIS OF PAYMENT

400-5.1 Cable/Wire. Payment will be made at the contract unit price for trenching, cable and 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, as necessary to complete this item.

400-5.2 Camera/Fiber Equipment and Cable Interconnections. The accepted quantity of camera/fiber equipment and cable interconnections 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, placing of the materials, furnishing and installation of appurtenances and connections as may be required to complete

the item as shown on the plans or specified herein and for all labor, materials, equipment, tools and incidentals necessary to complete the system to the satisfaction of the RPR and Owner.

400-5.3 Mast Light Pole and Fixtures The accepted quantity of mast light poles and fixtures 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, placing of the materials, furnishing and installation of appurtenances and connections as may be required to complete the item as shown on the plans or specified herein and for all labor, materials, equipment, tools and incidentals necessary to complete the system to the satisfaction of the RPR and Owner.

400-5.4 Structures. The accepted quantity of manholes, handhole, transformer pad, and light foundation structures will be paid for at the Contract unit price per each, complete and in place or completely removed. 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/conduits 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 or remove the structure.

400-5.5 Site Lighting or Other Site Item Removal. Payment shall be made at the lump sum price for removal of each section of existing site lighting system or other identified site items as outlined on the plans and as noted herein. This price shall be full compensation for the removal of site lighting or other site items with associated equipment and appurtenances and for furnishing all labor, materials and equipment, tools, coordination with the utility supplier, excavation, removed waste materials and proper disposal, salvaging of identified items to Owner (at their discretion) and transporting the identified items to the Owner, water used for dust control, supplemental borrow material, site lighting utility modifications (as necessary), compaction, grading to the adjacent existing finished grades, and all incidentals necessary to satisfactorily complete the work.

400-5.6 Relocation of Existing Wireless Internet System. Payment shall be made at the lump sum price for the relocation of a wireless internet system as a lump sum item as outlined on the plans and as noted herein. This price shall be full compensation for the relocation of the wireless internet system with associated equipment and appurtenances and for furnishing all labor, materials and equipment, tools, coordination with the MHT IT Department, excavation, waste materials removals and proper disposal, salvaging and temporary storage of the identified items, , supplemental borrow material, system modifications (as necessary), compaction, grading to the adjacent existing finished grades, and all incidentals necessary to satisfactorily complete relocation.

400-5.7 Allowances. The amount paid to the Contractor shall be the exact amount indicated on the Contractor's invoice from the Utility Supplier or Security Integrator vendor without mark-up. There shall be no separate payment to the Contractor to coordinate and administer the scheduling of the work and these costs are considered incidental to the overall project.

Payment will be made under:

Item M-400-5.1a	No. 12 AWG, 600V Copper Wire, Installed in Duct Bank or Conduit, Including Connections/Terminations - per linear foot
Item M-400-5.1b	No. 10 AWG, 600V Copper Wire, Installed in Duct Bank or Conduit, Including Connections/Terminations - per linear foot
Item M-400-5.1c	No. 6 AWG, 600V Copper Wire, Installed in Duct Bank or Conduit, Including Connections/Terminations - per linear foot
Item M-400-5.1d	No. 10G AWG, 600V Copper Wire, Installed in Duct Bank or Conduit, Including Connections/Terminations - per linear foot

Item M-400-5.1e	No. 8G AWG, 600V Copper Wire, Installed in Duct Bank or Conduit, Including Connections/Terminations - per linear foot
Item M-400-5.2a	144 Strand Fiber Cable with Innerduct Installed in Duct Bank or Conduit, Including Connections/Terminations - per linear foot
Item M-400-5.2b	2 Strand Fiber Cable Installed in Conduit, Including Connections/Terminations - per linear foot
Item M-400-5.2c	Cat 6 Cable Installed in Conduit, Including Connections/Terminations - per linear foot
Item M-400-5.3a	Demarc Room Fiber Equipment & Fiber Cable Interconnections - per Lump Sum
Item M-400-5.3b	Snow Melter Building Fiber Equipment & Fiber Cable Interconnections - per Lump Sum
Item M-400-5.4a	Concrete Encased 5" Conduit - Type III, Sch. 40 PVC -- per linear foot
Item M-400-5.4b	Eversource Riser 5" Conduit - Rigid -- per linear foot
Item M-400-5.4c	Concrete Encased Duct Bank 2-Way x 4" - Type III, Sch. 40 PVC -- per linear foot
Item M-400-5.4d	Concrete Encased Duct Bank 2-Way x 3" Conduit - Type III, Sch. 40 PVC -- per linear foot
Item M-400-5.4e	Concrete Encased 1" Conduit - Type III, Sch. 40 PVC -- per linear foot
Item M-400-5.5	Mast Light Pole and Fixture Installation - Per Each
Item M-400-5.6a	Mast Light Camera with Installation - Per Each
Item M-400-5.6b	Building Mounted Camera with Installation - Per Each
Item M-400-5.6c	Camera 4-Port PoE Enclosure and Switches with Installation - Per Each
Item M-400-5.6d	Security Camera Integrator Installation - Allowance - \$20,000
Item M-400-5.7a	500 kVA Eversource Transformer Pad - Per Each
Item M-400-5.7b	Electrical Manhole (H-20 Rated) - Per Each
Item M-400-5.7c	Fiber/Electrical Handhole (H-20 Rated) - Per Each
Item M-400-5.7d	Existing Handhole Removal - Per Each
Item M-400-5.7e	Mast Light Pole Foundation Installation - Per Each
Item M-400-5.8a	Utility Supplier Relocation Work Allowance - \$100,000
Item M-400-5.8b	Utility Supplier Cable Installation Allowance - \$20,000
Item M-400-5.9a	Lot D (North) Site Lighting Removal - Per Lump Sum
Item M-400-5.9b	Lot D (South) Site Lighting Removal - Per Lump Sum
Item M-400-5.9c	Access Roadway Site Lighting Removal - Per Lump Sum
Item M-400-5.10	Remove, Salvage and Relocate Wireless Internet System - Per Lump Sum

REFERENCE

EIA/ECA-310	Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005.
ICEA S-83-596	Indoor Optical Fiber Cables; Insulated Cable Engineers Association; 2011.
NECA/BICSI 568	Standard for Installing Building Telecommunications Cabling; National Electrical Contractors Association; 2006.
NFPA 70	National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
TIA-455-21 - FOTP-21	Mating Durability of Fiber Optic Interconnecting Devices; 2012.
TIA-492AAAA-B	Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; Rev B, 2009.
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.
TIA-568-C.3	Optical Fiber Cabling Components Standard; Rev C, 2008 (with Addenda; 2011).
TIA-569-C	Commercial Building Standard for Telecommunications Pathways and Spaces; Rev C, 2012 (with Addenda; 2013).
TIA-598-C	Optical Fiber Cable Color Coding; Rev C, 2005.
TIA-606-B	Administration Standard for the Telecommunications Infrastructure; Rev B, 2012.
TIA-607-B	Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; Rev B, 2012 (with Addenda; 2013).
UL 444	Communications Cables; Current Edition, Including All Revisions.
UL 1651	Fiber Optic Cable; Current Edition, Including All Revisions.
UL 1863	Communications-Circuit Accessories; Current Edition, Including All Revisions.

END OF ITEM M-400

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ITEM M-500
AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS) RELOCATION

DESCRIPTION

500-1.1 This work shall consist of assisting the National Weather Service (NWS) and Federal Aviation Administration with the relocation of an existing Automated Surface Observation System (ASOS) by performing the following tasks:

1. Install new foundations, conduits and other site-related materials for the relocated ASOS equipment and site at the relocation site,
2. provide and operate construction equipment (i.e. boom truck, small crane, excavator, etc.) used for the dismantling and removal of the existing equipment from the existing foundations to Contractor-supplied trailers used for transporting the equipment to the new relocated site,
3. provide and operate construction equipment (i.e. boom truck, small crane, excavator, etc.) used for the erection and installation of the existing equipment, including the existing generator, on the new foundations at the relocated site,
4. coordinate and perform the necessary work for the removal of the existing propane underground storage tank and the installation of a new propane underground storage tank for the ASOS equipment generator, and
5. Remove and dispose of existing equipment foundation structures, associated conduits and appurtenances, and propane underground storage tank at the existing ASOS site, as shown on the plans or as directed by the Owner's representative (Resident Project Representative (RPR)).

All dismantling and re-installation work associated with the ASOS equipment, including the new cabling (except site grounding), will be performed by the National Weather Service (NWS), not the Contractor. The Contractor will assist the NWS with the transportation of the existing equipment from the existing site to the relocated site. The installation and removal work for both the relocated site and the existing site shall also include the restoration of the disturbance areas with new stabilized surfaces per the plans, including backfilling of resulting trenches and holes to the proposed finish grade. The work also includes the proper disposal of all associated waste materials.

MATERIALS

500-2.1 The Contractor shall supply all materials and equipment required to perform the installation of the new foundations and conduits and for the removal of the utilities in accordance with these specifications and all Federal, state and local regulations and the respective utility suppliers.

500-2.2 All temporary facilities, equipment, and materials to perform the work must adhere to and/or meet EPA, OSHA, and NIOSH regulations, as well as all other Federal, state, and local regulations.

500-2.3 GRANULAR BACKFILL MATERIAL. It is anticipated backfill material will be necessary for the removals for the existing foundations, conduits and other appurtenances, as well as for the installation of the new foundations and conduits. Any backfill material required shall conform to the New Hampshire Department of Transportation Standard Specifications §209 Granular Backfill using Item 209.4 Granular Backfill (Gravel). Granular backfill (gravel) shall consist of a mixture of stones or rock fragments and particles with 95 to 100 percent passing the 3" sieve and 25 to 70 percent passing the No. 4 sieve.

500-2.4 CONCRETE. Conform to P-610 concrete mix per these specifications.

500-2.5 PVC CONDUITS. Conform to L-110 PVC conduit materials per these specifications.

500-2.6 RESTORATION TO TURF GROWTH MATERIALS. Conform to the seeding, topsoil and

mulching specifications as outlined in Sections T-901, T-905, T-908, respectively.

500-2.7 BASE COURSE MATERIAL. Conform to M-700 *Miscellaneous Site Improvements*, Item 700-2.4 Base Course materials, of the specifications.

500-2.8 ASPHALT PAVEMENT. Conform to M-600 NHDOT Asphalt Pavement materials of these specifications.

500-2.9 250 GALLON UNDERGROUND STORAGE TANK. Coordinate with a local propane supply vendor to procure a new 250-gallon underground storage tank, including all materials required for a new complete installation, which meet all codes and specifications.

500-2.10 GROUNDING MATERIALS. Wire for ground grid installations for the ASOS systems shall be No. 0 AWG bare solid copper wire for grounding. 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 10 feet long and 3/4 inch in diameter. All connections, wire to wire or wire to ground rods, shall use exothermic weld materials.

CONSTRUCTION METHODS

500-3.1 GENERAL REQUIREMENTS. The Contractor shall conduct all new site work and utility removal operations in a safe, legal, and responsible manner and shall ensure that any equipment, material, or method used shall be safe for the workers and the public. All laws, rules, regulations, utility supplier requirements, and local building codes shall be followed. Local building code shall mean a code enacted or adopted by competent local officials or bodies at least as stringent in its requirements as the “New Hampshire State Fire Prevention and Building Codes” and its associated reference standards. The Contractor is responsible to secure all permits for utility removals (if required), coordinate with all utility vendors and/or owners (if required), and to properly dispose of the waste materials from the removal of conduit materials, structures and appurtenances.

500-3.2 DUST CONTROL. Provisions shall be made for the site to control the quantity of dust resulting from any installation or removal operations by wetting the immediate work area with water, or other appropriate spraying agents, or by means acceptable to the Owner’s representative. The Contractor shall also perform sweeping operations of adjacent airport operations areas, as necessary, and to keep any paved surface clean from vehicle tire tracking from the work zone. There shall be no additional cost to the Owner for any dust control for the utility removals.

500-3.3 UTILITY LOCATIONS. The Contractor shall protect all existing utility lines to remain during the removal of any adjacent structure or utilities or the installation of new site improvements. **At least seventy-two (72) hours (not including weekends and Holidays) in advance** of the commencement date of the any work to be performed in the existing site or proposed site, the Contractor shall notify all operators who have underground facilities at or near the proposed work areas through the one-call notification system (**Dig Safe System – MA/ME/NH/RI/VT - Dial 811 or www.digsafe.com**). In addition, the Contractor shall contact all utility owners and request a Pre-Work Coordination Meeting with all operators having underground facilities at or near the proposed work areas, including the FAA Technical Operations since this agency is not part of the Dig Safe System.

It will be the responsibility of the Contractor to mark out all utilities near any proposed installation or removal work. Since the work is considered to be “Airside”, many utility suppliers will not perform the mark outs. The Contractor shall be responsible for performing the mark outs using a private utility locator and in coordination with the utility owners, including the FAA Technical Operations.

500-3.4 PROTECTION OF EXISTING FACILITIES AND UTILITIES TO REMAIN. As noted above, the Contractor shall be responsible for any provisions necessary to protect utilities, in conjunction with the utility owner, for any site facilities which will remain after the proposed work relating to the site improvements or site work removal operations. The protection shall be by using means acceptable to the

utility owner and the Owner's representative. If the existing utility lines are disturbed, broken, or service is disrupted, the Contractor cease all work and repair the utility facilities to the satisfaction of the utility owner. There shall be no additional cost to the Owner for any coordination, necessary protection provisions or repairs of the facilities or utilities.

In addition, the Contractor shall assist the NWS with the transportation of the existing facilities to the relocated site by providing the transportation, as well as the loading and unloading of the facilities. All removal work will be performed by the NWS and any equipment assistance will be under the direction of the NWS.

500-3.5 EXISTING SITE ELECTRIC SUPPLY FACILITIES. All electrical supply building service wires and conduits for the existing site electrical service shall be removed to the limits as shown on the plans, or as directed by RPR. The removal of any underground electric supply conduit shall be backfilled in lifts of compacted suitable material. The removal of the existing electrical supply cabling shall, at a minimum, be disconnected and removed to the existing disconnect switch by the dumpster pad.

The Contractor shall be responsible for making appropriate notifications to MHT Building Maintenance which currently controls the temporary electric supply facilities to the existing ASOS site.

500-3.6 EXISTING SITE AND RELOCATED SITE PROPANE GAS SERVICE FACILITIES. The removal of the NWS owned existing 250 gallon underground propane gas facilities shall be coordinated with a propane gas service vendor. Available records indicate the original propane gas vendor was Ferrell Gas of Epping, NH, but the Contractor may coordinate with any propane supply vendor since the tank is owned by the NWS and there are no records for any recent fuel supplies. The existing underground storage tank be removed and salvaged at no cost to the selected propane gas supply vendor for possible re-use off the site (at the discretion of the propane gas supply vendor) or arrange to have the tank properly disposed. The gas service piping shall be removed to the limits as shown on the plans, unless otherwise directed by the RPR or the propane gas supply vendor. The removal of all underground gas facilities shall be backfilled in lifts of compacted suitable material.

All underground storage tank work shall be coordinated with the selected propane gas supply vendor. The exact limits of work relating to the removal of the existing propane gas supply facilities work, including the salvaged of the underground storage tank, and to the installation of the proposed propane gas supply facilities work, including the new underground storage tank and associated appurtenances, which is to be performed by the Contractor and limits of work performed by the propane gas supply vendor shall be coordinated directly with the propane gas supply vendor.

The Contractor shall be responsible for making appropriate notifications and coordination with the propane gas supply vendor controlling the propane gas facilities prior to any removal work to comply with the decommissioning of the existing 250-gallon underground storage tank.

500-3.7 PROPOSED RELOCATED SITE IMPROVEMENTS. All relocated ASOS site improvement work (foundations, conduits, underground storage tank, site grounding, etc.) shall be installed to the dimensions and limits as shown on the plans and in accordance with the specifications as outlined herein or in other referenced specifications. All grounding grid connections shall use exothermic welds.

500-3.8 DISPOSAL OF MATERIALS. Disposal of all materials shall be in accordance with all federal, state, and local laws, rules, and regulations; any provision found elsewhere in the Contract Documents; and most specifically in New Hampshire Department of Transportation Standard Specifications §202 Removal of Structures and Obstructions; New Hampshire RSA 149-M Solid Waste Management; and New Hampshire Department of Environmental Services Division of Waste Management rules and regulations and shall be subject to the approval of the Owner's representative. Contractor shall provide to the Owner a disposal plan at least fifteen (15) days prior to removal of demolition materials from the site. If the disposal material is regulated by either a State or Federal agency, a disposal plan shall identify the location of disposal, license and/or permit number of the disposal facility

or facilities. If applicable, all delivery tickets from the existing site to the location of disposal site, indicating date, time, and weight of debris disposed at the facility shall be provided to the Owner.

500-3.9 BACKFILL AND RESTORATION. All areas disturbed by any of the removal or installation work included in this specification shall be backfilled using the existing trench materials, as much as possible, and supplemented with clean granular material as required or directed by the RPR. The disturbed areas to be backfilled shall be compacted as noted within these specifications. The surface shall be graded to match the existing adjacent grades. The backfill for turf areas shall provide at least twelve inches (12") of clean bank run gravel material and at least two inches (2") of topsoil and associated turf restoration requirements. The backfill for paved areas shall provide at least twelve inches (12") of clean bank run gravel material and at least three inches (3") of NHDOT State Mix Pavement requirements. No additional payment will be made for different types of surface restoration. Payment for the required restoration items will be considered part of the payment for items within this specification section.

500-3.10 COMPACTION. Compaction of the in-situ material disturbed by the utility removals and any granular gravel borrow material used for restoration shall be to at least 90% Standard Proctor Density of the material under turf sections and at least 95% Standard Proctor Density of the material under pavement sections. The Contractor shall be responsible for all testing of in-situ and granular gravel borrow material for compaction requirements.

METHOD OF MEASUREMENT

500-4.1 Measurement shall be made as a complete item of work for each of the components (Removal at the Existing Location or New Installations at the Relocated Site), as outlined on the plans and herein, and to the satisfaction of the RPR. There will be no separate individual measurement for any of the work as outlined herein or as indicated on the plans, but rather a completed area of work for each component with the surfaces restored to either a turf condition for the removal areas or under new facilities, or a replacement of a paved condition under existing paved areas having new facilities. The work shall include all materials, but not limited to: the supplemental backfill material required to restore the trench or hole; new foundations and conduit materials; relocated or new propane gas storage tank for the relocated generator; surface restoration (turf or pavement), and all other incidental items to provide a complete relocation of the ASOS equipment. The work shall also include the coordination and assistance with the National Weather Service for the relocation of their facilities (including the transportation of the existing facilities), MHT Maintenance, FAA Technical Operations, propane gas supply vendor, and any other utility companies, as required.

BASIS OF PAYMENT

500-5.1 Payment shall be made at the lump sum price for each type of work as outlined herein. This price shall be full compensation for either the removals and for furnishing of new site improvements, including all labor, materials and equipment, tools, coordination with the respective utility suppliers/vendors, excavation, proper disposal of any waste materials, water used for dust control, supplemental gravel borrow material, compaction, grading to the adjacent existing finished grades, and all incidentals necessary to complete the work to the satisfaction of the RPR and NWS.

Payment will be made under:

- Item M-500-1 Existing ASOS Site Removal Work – per Lump Sum
- Item M-500-2 Coordination and Removal and Transportation Assistance of Equipment Relocation with the National Weather Service – per Lump Sum
- Item M-500-3 Relocated ASOS Site Improvement Installation Work – per Lump Sum

END OF ITEM M-500

ITEM M-600
NHDOT HOT BITUMINOUS PAVEMENT

DESCRIPTION

600-1.1 General. This work shall consist of constructing one or more courses of bituminous pavement on a prepared base as shown on the plans or as ordered. All methods will be classified as machine placed, even if there are small quantities of hand method to be installed. The bituminous pavement shall be installed and compacted to the lines and grades shown on the Contract Documents or otherwise directed by the Engineer.

MATERIALS

600-2.0 General. Material shall meet the requirements of the 2016 New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, or latest edition, using subsection 403 – Hot Bituminous Pavement and as modified within this specification.

600-2.1 Aggregates – General.

600-2.1.1 Aggregates shall be uniform quality durable pebbles or fragments of rock, with or without sand or other inert finely divided mineral aggregate. All material shall be free from clay balls, organic matter, deleterious substances, and an excess of flat or elongated pieces as specified in ASTM D 4791. Washing will not be required, except when aggregate plants do not produce clean material by the dry process method. In order to obtain uniformity of color and appearance of the pavement throughout the project, the aggregate for all the wearing courses shall be obtained from the same material source. Sufficient material shall be on hand prior to starting daily operations to ensure uninterrupted processing for the working day.

600-2.1.2 Fine aggregate shall consist of sound durable particles of sand, crushed stone, or a combination thereof. Fine aggregate shall be free from clay balls and injurious amounts of organic matter. Stone screening shall be produced from stone at least equal in quality to that specified for coarse aggregate.

600-2.1.2.1 Fine aggregate may be 100 percent manufactured aggregate.

600-2.1.3 Mineral filler shall conform to AASHTO M 17 except that 100 percent shall pass the No 16 sieve, waiving the requirement for the No. 30 sieve.

600-2.1.4 Coarse aggregate shall be crushed stone or crushed gravel and shall have a percentage of wear as determined by AASHTO T 96 of not more than 45 percent unless otherwise specified by Contract item. In each stockpile, not less than 50 percent by weight of the particles retained on the No. 4 sieve shall have at least one fractured face. Stockpiles consisting of a blend of crushed stone and crushed gravel will be permitted so long as the overall consistency of the stockpile is reasonably maintained and the lesser portion of coarse aggregate material does not exceed 10 percent of the total. This percentage shall be determined on the portion of the total sample by weight that is retained on the No. 4 laboratory sieve.

600-2.1.4.1 Coarse aggregate for High Strength HBP shall be crushed stone and shall have a percentage of wear as determined by AASHTO 96 of not more than 45 percent wear.

600-2.2 Bituminous Materials – General.

600-2.2.1 Bituminous materials used for asphalt cement binder shall meet the properties specified in AASHTO M 320. The grade of asphalt cement binder to be used will be specified in a Special Provision contained in the Proposal. Asphalt cement shall not be air blown or contain any form of used, recycled or re-refined oil.

600-2.2.1.1 The unit bid price for hot bituminous pavement containing failing asphalt binder shall be

assessed a 10% reduction for one temperature grade below the specified high temperature grade or one temperature grade above the specified low temperature grade. The penalty will be applied to all tonnage produced with the non-compliant binder. When the binder failure is non-compliant by two grades or more, as described above, the Contractor shall be required to remove and replace all noncompliant material at the Contractor's expense, or at the Engineer's discretion, may be allowed to leave the tonnage in place at a unit price reduction of 50%.

600-2.2.2 Liquid binder samples shall be obtained by plant personnel in the presence of the Inspector/Technician. Samples shall be obtained during each day's production.

600-2.2.3 Producers and suppliers of asphalt binders shall comply with the requirement of AASHTO R 26. Asphalt binder suppliers shall have a quality control plan approved by the Engineer that complies with AASHTO R 26.

600-2.2.3.1 All suppliers of PG binder shall certify that the PG binder supplied for use on NHDOT or publicly funded projects does not contain used, recycled or re-refined oil.

600-2.3 Approval of Materials - Method Requirements.

600-2.3.1 NOT APPLICABLE

600-2.4 Composition of Mixtures - General.

600-2.4.1 Hot mix asphalt shall be composed of a mixture of aggregate, filler if required, and asphalt binder. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula. The Contractor shall use the Volumetric Mix Design Method in AASHTO Standard Practice R 35 as modified herein.

600-2.4.2 The Contractor shall have the option of utilizing asphalt pavement removed under the Contract, if any, or old asphalt pavement from an existing stockpile or supplying all new materials for the production of asphalt pavement or any combination of the foregoing. If the job mix formula uses recycled materials, the mix shall meet the requirements of Reclaimed Asphalt Pavement as specified in 600-2.9.

600-2.4.3 The Department allows the use of recycled binder in mix designs, up to 1.0% Total Reused Binder (TRB) without any change in asphalt binder requirements as long as the mix design meets all volumetric mix design criteria. When a design has been completed using the maximum allowable percentage of TRB, one point verifications may be performed using decreasing percentages of TRB. If the design is not validated using a decreased amount of TRB, a new design will be required.

600-2.5 Job Mix – General.

600-2.5.1 When a new volumetric mix design is required, the Contractor shall use the Volumetric Mix Design Method in AASHTO Standard Practice R 35 to develop a mix that meets the associated design criteria. The Mix design shall follow the procedure detailed in AASHTO with the following exceptions:

Amend Table 1 Superpave Gyratory Compaction Effort to read as follows:

Design ESALs (Million)	N initial	N design	N max
0 < 5	6	50	75
≥5	7	75	115

Add the following:

Minimum Binder Content		
50 Gyration		75 Gyration
	3/8"	6.0%
5.8%	1/2"	5.5%
4.9%	3/4"	4.6%
4.6%	1"	4.3%

This required minimum asphalt content is based on the use of aggregate with a specific gravity of 2.65 to 2.70. The minimum asphalt content requirement may be adjusted when aggregate with a higher specific gravity is used, or the minimum may be adjusted at the Engineer's discretion if it is believed to be in the best interest of the NHDOT or the Owner.

Amend Table 3 in AASHTO M 323, referenced in AASHTO R 35, to read as follows:

Table 401-1 –Design Control Points*

Standard Sieves	Nominal Maximum Aggregate Size									
	1"		3/4"		1/2"		3/8"		No. 4	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Inch	Percentage by Weight Passing Criteria (Control Points)									
2										
1-1/2		100.0								
1	100.0	90.0		100.0						
3/4	90.0		100.0	90.0		100.0				
1/2			90.0		100.0	90.0		100.0		
3/8					90.0		100.0	90.0	100.0	99.0
No. 4							90.0		97.0	90.0
No. 8	45.0	19.0	42.0	32.0	52.0	42.0	56.0	46.0	75.0	65.0
No. 16									55.0	45.0
No. 30									36.0	26.0
No. 50									30.0	20.0
No. 100									13.0	8.0
No. 200	7.0	1.0	8.0	2.0	10.0	2.0	10.0	2.0	8.0	4.0

All mix designs shall be submitted to the NHDOT for verification and approval and a copy of the current NHDOT approval shall be provided to the Engineer for the project records.

* Superpave designs will be accepted through the restricted zone, pending verification and approval by the NHDOT - Bureau of Materials & Research. The Contractor shall submit compaction data from trial blends at the optimum asphalt content and at 0.5% below and above the optimum asphalt content. The data shall include the temperature at which the HMA was aged.

600-2.5.1.1 All 25 mm base course mixes shall be designed using the 50 gyration N_{design} .

600-2.5.2 The Design Information shall include:

- (a) Asphalt Binder
- (b) PG Test Data
- (c) Specific Gravity
- (d) Laboratory Mix/Compaction Temperature
- (e) Aggregate
- (f) Dry and Washed Gradation
- (g) Bulk and Apparent Specific Gravity

- (h) All appropriate consensus properties
- (i) Blends
- (j) Baghouse material from the plant shall be incorporated into the mix design. The amount of baghouse material should be based on estimated usage or experience.
- (k) Moisture susceptibility according to AASHTO T 283.

Along with the design information submitted to the NHDOT for approval, the Materials & Research (M&R) requires 2 quarts of the designated asphalt binder, 4 preblended aggregate specimens for gyratory and 2 preblended aggregate specimens, suitable for AASHTO T-209 when mixed with the appropriate asphalt, in order to verify the design. M&R will accept the mix design based on the submitted information meeting the mix requirements and on verification of the mix volumetrics of the submitted specimen. If the verification samples indicate voids between 3.0 and 5.5 percent, and the Voids in Mineral Aggregate (VMA) and Voids Filled with Asphalt (VFA) fall within the specified limits, then the design will be accepted. Once accepted, the approved mix design is the job mix formula (JMF). If the voids are outside the aforementioned range or the VMA or VFA are outside the specified limits, the design will be rejected. M&R may elect to verify the design again. **The Engineer will not require samples since NHDOT will be accepting the mix design.**

600-2.5.3 A copy of the proposed NHDOT approved mix designs and materials shall be submitted to the Engineer a minimum of **ten (10) working days** before placement for approval. It shall be the responsibility of the Contractor to ensure all approved mix designs have been entered into the plant automation system before production begins. The Contractor will also be required to post a copy of the JMF in the DOT testing laboratory.

600-2.5.4 Whenever the aggregate properties change enough to negate the project's existing design, a new design shall be submitted.

600-2.5.5 If it becomes necessary to change the asphalt binder grade or the source of aggregate, a new mix design shall be developed. Up to 14 calendar days will be required to evaluate a change. Approved changes in target values will not be applied retroactively for acceptance or payment. If it becomes necessary to change the source of asphalt binder, the Contractor must submit recent quality test results from the manufacturer for the asphalt binder including a temperature viscosity curve.

600-2.5.6 The Contractor shall perform a single point verification of an existing project mix design at the beginning of a new construction season to determine if the design remains valid. If the design is validated, the data from the single point verification shall be submitted to the Engineer. If the design cannot be validated, a new design shall be developed.

600-2.5.7 The Engineer may require the use of certain chemical additives.

600-2.5.8 The laboratory performing the design shall be approved by the NHDOT. To obtain the NHDOT's approval, a laboratory must demonstrate that it is equipped, staffed, and managed so as to be able to produce job mix formulas and test hot asphalt mix in accordance with these Specifications. Approval for each laboratory shall remain in effect for a period of one year.

600-2.6 Method Requirements.

600-2.6.1 Stockpiled coarse aggregate shall meet the requirements of Table 401-2.

Table 401-2 -- Percent Passing

Sieve Size	Base Mix 1-1/2"	Binder Mix 3/4"	Wearing Mix 1/2"	Wearing Mix 3/8"
1-1/2"	100			
1-1/4"	90.0 - 100			
1"	50.0 - 85.0	100		
3/4"	10.0 - 50.0	90.0 - 100	100	
1/2"		15.0 - 55.0	90.0 - 100	100
3/8"			20.0 - 60.0	95.0 - 100
# 4				22.0- 55.0
No. 8	0 - 5.0	0 - 5.0	0 - 10.0	0 - 10.0

600-2.6.2 After the job mix formula (JMF) is established, all mixtures furnished for the project shall conform within the following ranges of tolerances:

Passing No. 4 and larger sieves	±7.0 percent
Passing No. 8 No. 100 sieves (inclusive)	±4.0 percent
Passing No. 200 sieve	±1.0 percent
Asphalt binder	±0.4 percent
Temperature of mixture	± 20 °F (11 °C)

600-2.6.3 When Non-compliant test results, or other conditions make it necessary, it shall be the responsibility of the Contractor to make all adjustments required to ensure the mix conforms to the JMF. If two consecutive non-compliant results occur, the Engineer may stop production until satisfactory corrective action has been taken. A 5% reduction in unit price will be assessed to all tonnage represented by consecutive gradation failures and a 10% reduction will be assessed to all tonnage represented by consecutive asphalt binder content failures. At the Engineer's discretion, the Contractor may be required to remove non-compliant material (no payment will be made for this material or its removal). Contractor quality control personnel will not be required to be on site during production of non-quality control projects, but contract information shall be posted in the testing lab.

600-2.7 Performance Requirements (QC/QA).

600-2.7.1 After any new changed job mix formula is established, all mixtures furnished for the project shall conform thereto, within the gradation and asphalt binder content reject limits in Table 401-6 in 600-3.17.3.1.1. Specification limits for pay adjustments under Performance Requirements (QC/QA) provisions shall be as set forth in Table 401-5 in 600-3.17.3.1.1.

600-2.7.2 Materials specified in Section 411 not allowable for this project.

600-2.8 General - Bridge pavement base course shall be 3/8" wearing course. **Not Used.**

600-2.9 General - Non-modified asphalt binder shall contain silicone additive with the concentration being 3 parts per million plus or minus 1 part per million of silicone to asphalt binder, unless otherwise directed. Silicone additive shall be in liquid form and have a viscosity of 1,000 centipoises (1 Pas) at 77 °F. Asphalt binder containing silicone shall meet the requirements of 401.2.2

600-2.10 Allowed Recycled Materials – General.

600-2.10.1 Reclaimed asphalt pavement (RAP) may be used in the production of hot mix asphalt. The allowed dust to asphalt ratio shall be as identified in AASHTO M 323. The maximum allowable total reused "asphalt" binder (TRB) in HMA mixes shall be 1.5%. Any changes in the combination of recycled materials shall require a new mix design unless otherwise approved by the Bureau of Materials & Research.

600-2.10.2 Reclaimed Asphalt Pavement (RAP). RAP shall consist of recycled asphalt pavement and shall be processed by crushing, cold milling, or other approved sizing techniques approved by the NHDOT Bureau of Materials and Research to meet the required gradation specifications. The mixture of RAP and new aggregate shall meet the requirements specified in Table 401-1 for aggregate gradation. The RAP shall be tested every 1,000 tons for gradation and asphalt binder content as a stockpile is being built. These test results shall remain on file by the Contactor until such time as the entire RAP stockpile has been utilized.

600-2.10.2.1 The PG grade of added asphalt shall be as specified by the NHDOT Bureau of Materials and Research. The aggregate component of the RAP shall meet the requirements of 401.2.1. The bitumen component of the RAP shall be asphalt cement and shall be free of significant contents of solvents, tars, and other volatile organic compounds or foreign substances that will make the RAP unacceptable for recycling as determined by the NHDOT Bureau of Materials and Research.

600-2.10.2.2 RAP materials may be rejected if deemed unsuitable for any reason or require an increase or decrease in the mix asphalt content. The Contractor shall submit representative samples, and gradation and asphalt cement content test results of the RAP to be incorporated into the Recycled Mixture for approval by the NHDOT Bureau of Materials and Research at least 30 calendar days prior to the start of paving.

600-2.10.3 For all designs containing TRB in an amount greater than 1% of the total mix:

- (a) RAP stockpiles shall be covered by a roof.
- (b) Prior to the start of production, the composite RAP and virgin binder shall be tested by the Contractor to determine the appropriate grade of virgin binder to be added.
- (c) Only allowed in a drum mixer.
- (d) Only allowed for binder & base courses.
- (e) Test RAP for gradation & AC% every 1000 tons.
- (f) Run split samples at start of production and every 10k tons thereafter for composite binder testing.

600-2.11 Asphalt Modifiers.

General. The generic type of each asphalt binder admixture, modifier and/or additive shall be identified on the certificate of analysis, which shall be furnished by the manufacturer for each load of asphalt delivered. Modifiers shall be pre-blended with the asphalt binder.

600-2.11.1 Asphalt binder modification to produce high-strength mix shall utilize either a styrene-butadiene or styrene-butadienestyrene polymer to achieve the specified performance grade of asphalt. The Section 401 contract Special Provision specifying the asphalt binder grade shall also identify the AASHTO test method by which the binder grade shall be determined. The modified binder shall be pre-blended, storage-stable and homogeneous.

600-2.11.2 The use of Warm Mix Technologies **IS NOT** permitted in mix production. Qualified technologies are listed on the Qualified Warm Mix Asphalt (WMA) Technologies List.

600-2.12 Pavement Joint Adhesive. Pavement Joint Adhesive shall be a product that is listed on the NHDOT Qualified Products List.

600-2.12.1 Joint adhesive is **Not Used**.

CONSTRUCTION REQUIREMENTS

600-3.1 Mixing Plants. – Refer to Section 401-3.1 of the NHDOT Standard Specifications for requirements.

600-3.2 Storage of Asphalt Binder. – Refer to Section 401-3.2 of the NHDOT Standard Specifications for requirements.

600-3.3 Control of Asphalt Binder. – Refer to Section 401-3.3 of the NHDOT Standard Specifications for requirements.

600-3.4 Batching Plants. – Refer to Section 401-3.4 of the NHDOT Standard Specifications for requirements.

600-3.5 Drum Mix Plants. – Refer to Section 401-3.5 of the NHDOT Standard Specifications for requirements.

600-3.6 Mixing Temperature.

600-3.6.1 Method Requirements.

3.6.1.1 The Engineer may adjust the job mix formula temperature within the limits of 260° and 350°F according to the existing conditions. Material with a temperature at discharge outside the job mix formula tolerance may be rejected. In no case will a mixture be accepted with a discharge temperature in excess of 375°F.

3.6.1.2 During hot weather, the temperature of the mixture when discharged shall be as low as is consistent with proper mixing and placing. During cold weather, a temperature approaching the upper limit is desirable

600-3.6.2 Performance Requirements (QC/QA).

3.6.2.1 The job mix formula temperature may be adjusted within the limits of 260 °F and 350 °F according to the existing conditions. Material with a temperature at discharge outside the job mix formula tolerance may be rejected. In no case will a mixture be accepted with a discharge temperature in excess of 375 °F.

600-3.7 Hot Storage System. – Refer to Section 401-3.7 of the NHDOT Standard Specifications for requirements.

600-3.8 Weighting and Hauling. – Refer to Section 401-3.8 of the NHDOT Standard Specifications for requirements.

600-3.9 Vehicles. – Refer to Section 401-3.9 of the NHDOT Standard Specifications for requirements.

600-3.10 Placing – General.

600-3.10.1 Prior to placing of any mix, a pre-paving conference shall be held to discuss and approve the paving schedule, source of mix, type and amount of equipment to be used, sequence of paving pattern, rate of mix supply, traffic control, and general continuity of the operation. Special attention shall be made to the paving pattern sequence to minimize cold joints. The field supervisors of the above mentioned operations shall attend this meeting.

600-3.10.2 The Contractor shall notify the Engineer at least five working days in advance of paving operations to allow sufficient time to schedule required site inspection and testing. All paving and compaction equipment shall be approved and on site prior to start up each day.

600-3.10.3 Crack sealing material to be covered by a 1” or less overlay shall cure a minimum of 45 days prior to the placement of bituminous pavement.

600-3.10.4 Base course pavement lifts shall not exceed the maximum compacted thickness of 5 inches. Any course exceeding 5 compacted inches shall be placed in 2 passes.

600-3.10.5 When performing paving operations at night, in addition to the requirements of 600-3.1.4.5, the Contractor shall provide sufficient lighting at the work site to ensure the same degree of accuracy in workmanship and conditions regarding safety as would be obtained in daylight.

600-3.10.6 Performance Requirements (QC/QA). The Contractor shall provide the following equipment for testing and sampling at the project site. The equipment shall be in good condition and shall be replaced by

the Contractor if, during the duration of the project, it becomes unsuitable for testing or sampling purposes.

600-3.10.6.1 Metal plate 12" minimum each side, flat bottom scoop 3000-gram capacity minimum, and sample containers to perform NHDOT B-7 sampling.

600-3.10.7 Weather Limitations.

600-3.10.7.1 General. In special instances, when the Engineer determines that it is in the best interest of the State, the Engineer may waive the requirements of 600-3.10.7, provided that 600-3.10.7.3 shall always remain in effect.

600-3.10.7.2 Any material delivered to the spreader having a temperature lower than 260° F shall not be used unless modified by a qualified warm mix technology capable of being compacted to project requirements at the recommended delivery temperature.

600-3.10.7.3 Mixtures shall be placed only when the underlying surface is dry and frost free. The Engineer may permit, in case of sudden rain, the placing of mixture then in transit from the plant, if laid on a base free from pools of water, provided motorist visibility is not impaired and all other specifications are met. No load shall be sent out so late in the day that spreading and compaction cannot be completed during the daylight, unless the requirements of 600-3.10.5 are met. The Engineer may suspend operations for the day when the Contractor is unable to meet specifications.

600-3.10.7.4 All mix placed after October 1st and before May 1st shall be modified by a qualified warm mix technology.

600-3.10.7.4.1 Wearing course shall not be scheduled for placement after October 1st and before May 1st without written approval by the Engineer.

600-3.10.8 At the beginning and end of the project or project section, the existing pavement shall be removed to a sufficient depth to allow the placing of the new pavement and construction of a transverse joint, which shall be painted with a suitable bituminous material. The underlying course shall be clean and free from foreign materials and loose bituminous patches and must present a dry, unyielding surface.

600-3.10.9 Sweeping - General. Existing pavement or previously laid courses shall be thoroughly dry and free from all dust, dirt, and loose material. Sweeping with a power broom, supplemented by hand brooming, may be necessary.

600-3.10.10 Tack coat - General. Surfaces of any pavement course shall have a tack coat of emulsified asphalt applied in accordance with the requirements of **P-603 Emulsified Asphalt Tack Coat**.

600-3.10.10.1 Daily sampling and testing is not required. Any pavement that has been placed over tack that is found to be out of specification, but is deemed suitable to remain in place by the Engineer, will be subject to a 3% price reduction. The price reduction will be applied only to the pavement placed on the date that the tack is out of specification. This price reduction will not relieve the Contractor of responsibility for latent defects and/or gross mistakes as outlined in General Conditions of the Contract.

600-3.10.11 General - Drainage and utility structures within the limits of the final course of pavement shall be set and raised in accordance with the provisions specified in other areas of the Contract. Contact surfaces of the drainage and utility castings as ordered shall be painted with a thin coating of suitable bituminous material.

600-3.11 Pavers. – Refer to Section 401-3.11 of the NHDOT Standard Specifications for requirements.

600-3.11.1.2 Material Transfer Vehicles (MTV). – Not Required for this Project, but will be allowable at the Contractor's discretion.

600-3.12 Compaction.

600-3.12.1 General. Unless an alternate compaction package is approved at the project pre-pave

meeting, roller trains shall consist of the equipment describe herein.

600-3.12.2 Method Requirements.

600-3.12.2.1 Immediately after the hot asphalt mix has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. The initial rolling shall be done with a static or vibratory steel-drum roller. Intermediate rolling shall be done by a pneumatic-tired roller. Final rolling shall be done with a static steel-drum roller or a roller of the steel-drum three-axle type, locked. The completed course shall be free from ridges, ruts, humps, depressions, objectionable marks, visible segregation, or irregularities and in conformance with the line, grade, and cross-section shown in the Plans or as established by the Engineer. Rollers must be in good mechanical condition, free from excessive backlash, faulty steering mechanism, or worn parts. The empty weight and the ballasted weight shall be properly marked on each roller. The minimum weight of static steel-drum rollers shall be 8 tons. When a vibratory roller is being used, the vibration shall stop automatically when the roller is stopped or reversing direction of travel.

600-3.12.2.2 Pneumatic-tire rollers shall be self-propelled and shall be equipped with smooth tires of equal size and diameter. The wheels shall be so spaced that one pass of a two-axle roller accomplishes one complete coverage. The wheels shall not wobble and shall be equipped with pads that keep the tires wet. The rollers shall provide an operating weight of not less than 2,000 lb per wheel. Tires shall be maintained at a uniform pressure between 55 and 90 psi with a 5 psi tolerance between all tires. A suitable tire pressure gauge shall be readily available.

600-3.12.2.3 Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally parallel to the roadway center line, gradually progressing to the crown of the roadway. The overlap shall be one-half the roller width for wheeled rollers and 6 in for vibrating rollers. No overlap is required for pneumatic-tired rollers. When paving in echelon or abutting a previously placed lane, the longitudinal joint shall be rolled first followed by the regular rolling procedure. On superelevated curves, the rolling shall begin at the low side and progress to the high side by overlapping of longitudinal passes parallel to the centerline.

600-3.12.2.4 Rollers shall move at a slow but uniform speed with the drive roll or drive wheels nearest the paver, except on steep grades. Static and pneumatic-tired rollers shall not operate at speeds in excess of 6 mph. All courses shall be rolled until all roller marks are eliminated. Cores shall be collected by the Contractor at locations as determined and witnessed by the Engineer. One core per lane mile, but no less than two, shall be taken for each roadway segment paved. When shoulders are overlayed, cores shall be collected solely for density information at a frequency of one core for every 750 tons of mix. The Contractor will deliver the cores to the designated testing laboratory once NHDOT chain of custody measures have been applied. **The minimum compaction requirement shall be 91% of maximum theoretical density as determined in accordance with AASHTO T 209.** The following reductions in unit price shall apply for all tonnage placed that is represented by any core (excluding shoulder cores) that does not meet the minimum requirement: for results below 91% but equal to or greater than 90%, a 5% reduction will be assessed; for any results below 90%, a 10% penalty for all tonnage placed will be assessed. At the Engineer's discretion, the Contractor may be required to remove noncompliant material below 90% (no payment will be made for this material or its removal).

600-3.12.2.4.1 All cores need not be cut at the same time. The Contractor is allowed the option to collect cores through all placed lifts at once, provided cores are collected within two working days of placing the first course. Corrective action to any covered course is at the Contractor's risk.

600-3.12.2.5 Any displacement occurring as a result of reversing the direction of a roller, or from other causes, shall be corrected at once by the use of lutes and the addition of fresh mixture when required. Care shall be exercised in rolling so as not to displace the line and grade of the edges of the bituminous mixture.

600-3.12.2.6 To prevent adhesion of the mixture to the rollers, the wheels shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted. All steel rollers shall be equipped with adjustable wheel scrapers.

600-3.12.2.7 Along forms, curbs, headers, and similar structures and other places not accessible to a normal full-sized roller, sidewalk rollers weighing at least 2,000 lb (900 kg) shall be used. Where rollers are impracticable, the mixture shall be thoroughly compacted with heated or lightly oiled hand tamps or vibrating plate compactors.

600-3.12.2.8 Unless the Engineer determines that for the weight and placement conditions a lesser number will be satisfactory to obtain the desired pavement densities, the following is the list of required compaction equipment. The output of each paver placing wearing course (Table 1) materials shall be compacted by the use of one each of the following complement of rollers as a minimum: a static or vibratory steel-wheel roller, a pneumatic-tired roller and a three-axle roller or a static steel-wheeled roller. If the required density is not being obtained with the rollers supplied, the use of additional rollers of the specified type may be ordered. Paving widths in excess of 16 ft (5 m) will require additional rollers as ordered.

600-3.12.3 Performance Requirements (QC/QA).

600-3.12.3.1 Immediately after the hot asphalt mix has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted. The completed course shall be free from ridges, ruts, humps, depressions, objectionable marks, visible segregation, or irregularities and in conformance with the line, grade, and cross-section shown in the Plans or as established by the Engineer. If necessary, the mix design may be altered to achieve desired results.

600-3.12.3.2 All compaction units shall be operated at the speed, within manufacturers recommended limits, that will produce the required compaction. The use of equipment, which results in excessive crushing of the aggregate will not be permitted. Any asphalt pavement that becomes loose, broken, contaminated, shows an excess or deficiency of asphalt binder, or is in any way defective, shall be removed and replaced at no additional cost with fresh hot asphalt mix, which shall be immediately compacted to conform with the surrounding area. Hot asphalt mix shall not be permitted to adhere to the roller drums during rolling.

600-3.12.3.3 The type of rollers to be used and their relative position in the compaction sequence shall be the Contractor's option, provided specification densities are attained and with the following stipulations: a) At least one roller shall be pneumatic-tired. b) Vibratory rollers shall not be operated in the vibratory mode under the following conditions: When checking or cracking of the mat occurs, when fracturing of aggregate occurs, and on bridge decks.

600-3.13 Joints - General.

600-3.13.1 Unless otherwise shown on the plans, the longitudinal wearing course joints shall be at the edge of lane placed, where the edge line, lane line and centerline pavement markings will be applied, and joints of other courses shall be offset approximately 6".

600-3.13.2 The material being placed next to a previously paved lane shall be tightly crowded against the face of the abutting lane. The paver shall be positioned so that during spreading, the material will overlap the edge of the first lane by 1 to 2" and shall be left sufficiently high such that finish pavement of the lane being placed is approximately 1/8" higher than the previously paved lane after compaction. The overlapped material shall be rolled without luting. Longitudinal joint compaction shall be achieved by rolling from the hot side to within 6" of the previously placed mat. The next roller pass will overlap onto the previously placed paved lane by 6" Further compactive effort shall be applied to all joints during the intermediate and final rolling.

600-3.13.3 Placing of the course shall be as continuous as possible while complying with Contract Traffic Control Plans. Transverse joints will be allowed at the end of each work shift or as required to provide properly bonded longitudinal joints.

600-3.13.3.1 No longitudinal joints greater than 1-1/2" height shall be left open to traffic unless a tapered overlapping ("wedge") joint is used. Centerline joints greater than 3/4" shall be properly delineated by tubular marker and signed appropriately. Joints between traveled way and shoulder greater than 3/4" shall be delineated by barrels. Tubular markers and barrels shall meet the requirements of M-200 Maintenance and

Protection of Traffic. Tubular markers shall be secured to the pavement.

600-3.13.3.2 Unless otherwise precluded by weather conditions, longitudinal joints shall not remain open to traffic longer than 30 hours.

600-3.13.4 If a bulkhead is not used to form the transverse joint, the previously laid material shall be cut back to the designed slope and grade of the course. The joint face shall be coated with approved bituminous bonding material meeting the requirements of P-603 *Emulsified Asphalt Tack Coat* before the fresh mixture is placed against it. Extreme care shall be taken to ensure that no unevenness occurs at the joint. If unsatisfactory riding qualities are obtained at the transverse joint in the wearing course, the joint shall be corrected by an approved method.

600-3.13.4.1 Prior to opening any lane(s) to traffic, transverse joints shall be ramped by means of an asphalt fillet at a minimum of 5 ft. horizontal to 1" vertical slope.

600-3.13.4.2 When paving into a permanent transverse joint, a full head of material shall be carried into the joint.

600-3.13.5 When specified, a bituminous pavement joint adhesive, (Not Used for this project), shall be applied to the longitudinal joint. If joint adhesive has not been specified, an approved bituminous bonding material meeting the requirements of P-603 *Emulsified Asphalt Tack Coat* shall be applied to completely cover all joint contact surfaces.

600-3.13.5.1 Joint adhesive shall be applied to the longitudinal joints so that the entire joint surface is covered with a minimum 1/8" thick layer of material. If a wedge joint is used the upper 4" of joint surface shall be covered with joint adhesive. In lieu of using joint adhesive, the Contractor may elect, with the approval of the Engineer, to use multiple pavers in echelon to eliminate the longitudinal joint. Echelon paving shall be performed as stated in 600-3.13.8.

600-3.13.5.2 The joint face on which the joint adhesive is to be applied shall be dry, free from loose material, dust, or other debris that could interfere with adhesion. If dust or debris adheres to the joint adhesive, it shall be cleaned or recoated as directed by the Engineer.

600-3.13.5.3 Trucks or traffic shall not drive across the joint adhesive until it has cooled sufficiently to prevent damage from tracking.

600-3.13.5.4 Joint adhesive shall be melted in a melting kettle that meets the requirements of 413.2.2(b). The joint adhesive shall be applied at the temperature specified by the manufacturer and shall not be heated above the safe heating temperature specified by the manufacturer.

600-3.13.5.5 Joint adhesive shall be applied using a pressure feed wand applicator system equipped with an applicator shoe as recommended by the manufacturer. A pour-pot applicator will be allowed on wedge joints only.

600-3.13.5.6 Joint adhesive (Bridge Base) shall be applied to curbs, concrete armoring, and pavement matches so that the entire joint is covered with a minimum 1/8" thick layer of material.

600-3.13.6 A tapered overlapping ("wedge") joint may be used on all longitudinal joints provided that the adjacent lane can be placed when the existing surface temperature is above 50° F.

600-3.13.6.1 An inclined face (3:1) on the joint shall be formed in the first bituminous mat placed. The inclined face may be for the entire height or an inclined face with a 1/2" maximum vertical face at the top of the mat.

600-3.13.6.2 After the initial mat is placed, the mat shall be rolled to the edge of the unconfined face.

600-3.13.6.3 When the adjoining mat is placed the initial longitudinal wedge shall be treated as in 600-3.13.5.

600-3.13.6.4 The joint matching and compaction shall be performed in accordance with 600-3.13.

600-3.13.7 The Contractor shall furnish and have available a 10 ft, light-weight metal straightedge with a rectangular crosssection of 2 by 4" at the paver at all times during paving operations. All courses shall be tested with the straightedge laid across the transverse joint parallel to the centerline and any variations from a true profile exceeding 3/16" shall be satisfactorily eliminated. The finished surface of the pavement shall be uniform in appearance, shall be free from irregularities in contour, and shall present a smooth-riding surface.

600-3.13.8 Echelon Paving. Echelon paving, when specified or approved, shall be defined as multiple pavers paving simultaneously and adjacent to one another such that all rolling of both mats is performed concurrently. Not required for this project, but will be allowable at the Contractor's discretion.

600-3.14 Variations in Profile and Cross Slope – Method (See 600-3.17.3.4.1).

600-3.15 Replacement – General. If unsatisfactory areas are found in any course, the Contractor shall remove the unsatisfactory material and replace it with satisfactory material.

600-3.16 Finished Appearance – General. Any bituminous material remaining on exposed surfaces of curbs, sidewalks, or other structures shall be removed.

600-3.17 Additional Performance Requirements (QC/QA).

600-3.17.1 Quality Control.

600-3.17.1.1 The Contractor shall operate in accordance with a Quality Control Plan, hereinafter referred to as the "Plan", sufficient to assure a product meeting the Contract requirements. The plan shall meet the requirements of C-100 *Contractor Quality Control Plan* and these special provisions.

600-3.17.1.2 The Plan shall address all elements which affect the quality of the Plant Mix Pavement including, but not limited to, the following:

- (a) Job mix formula(s).
- (b) Hot asphalt mix plant details.
- (c) Stockpile Management.
- (d) Make & type of paver(s).
- (e) Make & type of rollers including weight, weight per inch (centimeter) of steel wheels, and average ground contact pressure for pneumatic tired rollers.
- (f) Name of Plan Administrator.
- (g) Name of Process Control Technician(s).
- (h) Name of Quality Control Technician(s).
- (i) Mixing & Transportation.
- (j) Process Control Testing.
- (k) Placing sequence and placing procedure for ride quality.
- (l) Paving and Weather Limitations.
- (m) Sequence for paving around catch basins, under guard rail, around curb, at bridges, and intersections, drives and minor approaches, to ensure a proper finish and drainage.
- (n) Procedure for fine grading the top of the surface to be paved.

600-3.17.1.3 The Plan shall include the following personnel performing the described functions and meeting the following minimum requirements and qualifications as outlined in Section C-100 *Contractor Quality Control Plan*.

600-3.17.1.4 The Plan shall detail the coordination of the activities as outlined in Section C-100 *Contractor Quality Control Plan*. The Plan shall also detail who has the responsibility to reject material, halt production or stop placement.

600-3.17.1.4.1 All issues agreed to at the Pre-Paving meeting shall be considered to be part of the Plan.

600-3.17.1.5 Asphalt pavement shall be sampled, tested, evaluated and recorded by the Contractor in accordance with the minimum process control guidelines in Table 401-3.

600-3.17.1.5.1 Cross slope shall be measured on every pavement lift using the method described in 600-3.17.3.5.1 prior to placement of subsequent lifts. Particular emphasis on the first pavement lift shall be required when correcting existing substandard cross slopes. Cross slope measurements exceeding 0.5% from the specified cross slope for that location shall require an adjustment in ongoing or subsequent paving operations to correct the deficiency. If two or more consecutive measured sublots are greater than 0.5% from the specified cross slope, paving operations shall cease until the Contractor submits a corrective action satisfactory to the Engineer.

Table 401-3 - Minimum Process Control Guidelines

Properties	Test Frequency	Test Method
Temperature of Mix	6 per day at paver hopper and plant	
Surface Temperature	As needed	
Temperature of Mat	4 per day	
Density	1 per 500 tons (500 metric tons) or minimum 2 per day	AASHTO T 343 or ASTM D 2950
Maximum Theoretical Specific Gravity	1 per day of operation	AASHTO T-209
Fractured Faces	1 per 2000 tons (1800 metric tons) for Gravel Sources only	AASHTO T 11 & AASHTO T 27
Aggregate Gradation & Asphalt Binder content	1 per 750 tons (700 metric tons) recommended	AASHTO T 130 & 164
Asphalt Binder Thickness	As needed Contractor Defined	AASHTO M 226 M 320 Contractor Defined
Cross Slope	1 per 5 full stations	Per 3.17.3.5.1

600-3.17.1.6 Rejection by Contractor. The Contractor may, prior to sampling, elect to remove any defective material and replace it with new material at no expense to the Department.

600-3.17.1.6.1 No wearing course pavement shall be removed or repaired without prior approval of the Engineer.

600-3.17.1.7 The Contractor may utilize innovative equipment or techniques not addressed by the specifications or these provisions to produce or monitor the production of the mix, subject to approval by the Engineer.

600-3.17.2 Quality Assurance.

600-3.17.2.1 Asphalt pavement designated for acceptance under Quality Assurance (QA) provisions will be sampled once per subplot on a statistically random basis, tested, and evaluated by the Engineer in accordance with applicable testing requirements and the acceptance testing schedule in Table 401-4. Testing shall not take place until the material has been placed and deemed acceptable by the Contractor.

Table 401-4 - Acceptance Testing Schedule

PROPERTIES	POINT OF SAMPLING	LOT SIZE	SUBLOT SIZE	TEST METHOD
Gradation	Behind paver & before rolling ⁽⁴⁾	401.3.17.2.2	750 tons	AASHTO T 30 NHDOT B-1
Asphalt Binder content	Behind paver & before rolling ⁽⁴⁾	401.3.17.2.2	750 tons	AASHTO T 164 NHDOT B-2 NHDOT B-6
Maximum theoretical specific gravity	Compacted Roadway ⁽¹⁾ Core		750 tons	NHDOT B-8 AASHTO T 209
In Place Air Voids in total mix ^(5,6,7)	Compacted roadway ⁽¹⁾ core	401.3.17.2.2	750 tons	NHDOT B-8 AASHTO T 269
Ride Smoothness ⁽⁷⁾	Completion of wearing surface	Total project	0.1 lane mile	401.3.17.3.4
Cross Slope ⁽⁷⁾	Completion of wearing surface	Total project	1 per 5 full stations	401.3.17.3.5
Thickness ⁽²⁾⁽⁵⁾⁽⁷⁾	Compacted roadway ⁽¹⁾ core	Total project	750 tons	NHDOT B-8 ASTM D 3549

^{1.} Excluding bridge pavements.

^{2.} Measurements taken from full depth cores obtained for in place air voids determination.

^{3.} For leveling course, samples to be taken at the plant.

^{4.} Sampling and testing will not be done for leveling course.

^{5.} Not Including leveling course.

^{6.} When the Contractor is supplying mix to more than one paver simultaneously, Contractor's personnel shall keep a running total of tonnage supplied to each paver on each paver.

^{7.} Tier 1 Item only.

600-3.17.2.2 Lot Size. For purposes of evaluating all acceptance test properties a lot shall consist of the total quantity represented by each item listed under the lot size heading in the table above, up to 15,000 tons. For Items with quantities in excess of 15,000 tons, lot sizes will be determined at the pre-placement meeting. Each lot will be broken down into at least 3 sublots. The Contractor may request a change in the job mix formula. If the request is approved, all of the material produced prior to the change will be evaluated on the basis of available tests and a new lot will begin. Three sublots must be sampled and tested before a new lot may begin.

600-3.17.2.2.1 A lot for Gradation, Asphalt Content and In Place Air Voids shall be the total quantity represented by the job mix formula with the following exception; the shoulders will be evaluated as a separate lot for in place air voids.

600-3.17.2.3 Sublot Size. The quantity represented by each sample will constitute a sublot. The size of each sublot shall be as listed under the sublot size heading in Table 401-4. If there is insufficient quantity in a lot to make up at least three sublots of the designated size in Table 401-4, then the lot quantity will be divided into three equal sublots. If there is less than one half of a sublot remaining at the end, then it shall be combined with the previous sublot. If there is more than one half sublot remaining at the end, then it shall constitute the last sublot and shall be represented by test results.

600-3.17.2.4 Test Results. The Engineer may calculate pay factors and pay adjustments at any time while a lot is being produced. This may be necessary for a partial estimate or to see if quality is falling to a point where immediate attention is required. Pay factors will be determined from all available acceptance tests for the lot being evaluated.

600-3.17.3 Acceptance Testing

600-3.17.3.1 Gradation and Asphalt Binder Content. Samples for gradation and asphalt binder content shall be obtained from behind the paver in conformance with NHDOT procedure B-7 (see appendix A) and

taken from each pavement layer by the Contractor in the presence of the Engineer. The sample locations will be established by selecting a random location within each subplot in accordance with Section 106. Sample locations (center of sample) will not be within 1 foot from an edge of pavement or within 4 feet from any structure. Sample locations falling within 4 feet from any structure will be relocated 4 feet from the structure along station at the same offset. Where samples have been taken, new material shall be placed and compacted to conform to the surrounding area immediately after the samples are taken. Samples shall be accompanied by a sample tag containing the following information:

- a) Project name and number.
- b) Lot and subplot number.
- c) Material type.
- d) Date placed.
- e) Location in station and offset, tonnage
- f) Contract Administrator
- g) Sampler
- h) Item number

When the project exceeds 30 minutes travel time from the testing laboratory location, material samples will be taken and identified by NHDOT project personnel and shall be transported before cooling by the Contractor and delivered to NHDOT testing technicians at the testing laboratory location. Samples lost in transit will incur a penalty of 5% of the bid price for the entire subplot represented by that sample. Sublots with no test results due to a lost sample will not be evaluated and the total quantity represented by that subplot shall not be included in any positive pay factor.

3.17.3.1.1 Testing. Target values shall be as specified in the job mix formula. All sieve sizes specified in the job mix formula will be evaluated for gradation. The specification limits in Table 401-5 will be used for calculating pay factors for gradation and asphalt binder content.

Table 401-5 - Gradation and Asphalt Binder Specification Limits

Property	Maximum Aggregate Size			
	1"	3/4"	1/2"	3/8"
	USL and LSL (Target +/- %)			
1 1/2"	0			
1-1/4"	8.0			
1"	8.0	0		
3/4"	7.0	5.0	0	
1/2"	7.0	5.0	4.0	0
3/8"	7.0	5.0	4.0	4.0
No. 4	4.0	4.0	3.0	4.0
No. 8	4.0	4.0	3.0	3.0
No. 16	2.0	2.0	2.0	2.0
No. 30	2.0	2.0	2.0	2.0
No. 50	2.0	2.0	2.0	2.0
No. 100	2.0	2.0	2.0	2.0
No. 200	0.8	0.8	0.8	0.8
Asphalt Binder	0.4	0.4	0.4	0.4

Any subplot with a gradation or asphalt binder content falling outside the ranges of the reject limits in Table 401-6 will be either removed and replaced at the expense of the Contractor or require corrective action to the satisfaction of the Engineer. After replacement or correction, new samples will be taken and the old test results from that subplot will be discarded.

Table 401-6 - Gradation and Asphalt Binder Content Reject Limits (Deviation from Target)

SIEVE SIZE	1"	3/4"	1/2"	3/8"
	Percent Passing By Weight – Combined Aggregate			
1-1/4"				
1"				
3/4"	±12	(1)		
1/2"	(1)	±10	(1)	
3/8"	(1)	(1)	±10	(1)
No. 4	±9	±9	±9	±9
No. 8	±7	±7	±7	±7
No. 16	±6	±6	±6	±6
No. 30	(1)	(1)	(1)	(1)
No. 50	(1)	(1)	(1)	(1)
No. 100	(1)	(1)	(1)	(1)
No. 200	±3	±3	±3	±3
Asphalt Binder: % of Mix	±1.0	±1.0	±0.8	±0.8

(1) Reject limits will be waived for these sieves.

The Contractor shall have the option of requesting a change in job mix formula (aim change) values used for calculating quality level to reflect actual production values after the placement of two sublots as long as no change in plant production values are made. A new lot is not needed for this change.

600-3.17.3.2 In Place Air Voids. In place air voids shall be determined in accordance with AASHTO T 269 using 6" diameter cores taken from each pavement layer by the Contractor in the presence of the Engineer. Core sampling shall be in conformance with ASTM D 5361 and NHDOT B-8 (see Appendix A). Full depth cores containing all new pavement layers shall be required. Core locations (center of core) will be established by selecting a random location within each subplot in accordance with ASTM. When shoulders are overlaid, cores shall be collected solely for density information at a frequency of one core for every 750 tons of mix. Cores will not be located in the following areas:

- (a) Within 1 foot from an edge of pavement.
- (b) Within 4 feet from any structure. Core locations falling within this area will be relocated 4 feet from the structure along station at the same offset.
- (c) Within shoulders 4 feet or less in width.
- (d) Within 1 foot from any break in slope across the mat surface.

Cores shall be taken before opening pavement to traffic, except when location of core is within the last hour of that day's placement. Cores shall be taken within 24 hours after placement. Where cores have been taken, new material shall be placed and compacted to conform to the surrounding area the same day the samples are taken. Core samples shall be accompanied by a sample tag containing the following information:

- (a) Project name & number.
- (b) Lot and subplot number.
- (c) Material Type.
- (d) Date placed.
- (e) Date sampled.
- (f) Location in station and offset, and/or tonnage.
- (g) Plan thickness.
- (h) Contract Administrator
- (i) Sampler
- (j) Item number

The complete sample(s) (unseparated) shall be protected against damage, transported and delivered by the Contractor within one working day to the QA testing technicians at the testing lab location. Sublots where the core becomes lost or damaged will be resampled at the direction of the Engineer at the Contractor's expense. The specification limits in Table 401-7 will be used for calculating pay factors for in place air voids for each lot:

Table 401-7 - In Place Air Voids Acceptance Limits		
TARGET (%)	LSL	USL
Average of Samples	- 2.0% ¹	+2.0% ²

¹ But not less than 2.5%

² But not more than 9%

When a core is less than 80% of the nominal thickness, a new core will be taken in the same subplot at a random location for the determination of in place air voids. A subplot with a test result less than 2.0% for in place air voids will be rejected and subject to removal and replacement.

600-3.17.3.2.1 Maximum Theoretical Density (MTD). MTD shall be determined in conformance with AASHTO T 209 once per subplot from the core obtained for determining in place air voids.

600-3.17.3.2.2 Disputed Cores. If a Contractor believes that a core result is invalid for whatever reason, the Contractor shall notify the Engineer of this in writing within 24 hrs. of being informed of the test result. After being informed of the disputed core result, the Engineer will select three (3) random core locations, one in each three sections of the disputed subplot at the same offset as the disputed core. The Contractor shall cut the cores at the selected locations in the presence of the Engineer who shall place them in secured containers for delivery and testing at the QA Testing Laboratory. If there are 10 or more cores already tested to date, the pay factor for voids in the lot will be calculated (without using the result of the disputed core). If less than ten cores have been tested in the disputed lot, the three cores shall be held until ten cores have been tested or the lot is complete, whichever comes first, at which time the pay factor will be calculated.

If the pay factor for the lot that contains the disputed result is 0.95 or greater, and the disputed test result is outside three standard deviations from the mean value of the lot (calculated without using the result of the disputed core), the three cores shall be tested and the average value of the three will be calculated.

If any of these three cores falls outside three standard deviations from the mean value for the lot (calculated without using the result of the disputed core), the original core test value will stand. If the three cores fall within three standard deviations of the mean value the average of the three cores will be used as the core result for the disputed subplot.

If the three cores are not used, the Contractor shall pay for the cost of testing.

600-3.17.3.3 Pavement Thickness. The thickness requirements contained herein shall apply only when each pavement layer is specified to be a uniform thickness greater than 3/4" The thickness of each layer of hot asphalt mix will be measured in conformance to ASTM D 3549 to determine compliance with the acceptance tolerance. Measurements shall be obtained from cores taken for determining in place air voids of each pavement layer. A leveling course, or the first layer over a gravel or stone base, a milled surface or an existing surface, shall be excluded from thickness measurement.

3.17.3.3.1 Once each thickness measurement has been taken, a thickness index will be calculated. The thickness index is the actual deviation from target divided by the allowable tolerance. This will allow statistical comparisons to be made among measurements based on varying specified thickness. Thickness indexes will be established for the sole purpose of calculating pay factors. Thickness index shall be calculated under the following equation using the specification limits in Table 401-8.

$$TI = (M - ST)/T$$

where: TI = Thickness Index
 ST = Specified Thickness
 M = Measured Layer Thickness From Core
 T = 15% x ST, but no less than 1/4"

Table 401-8 -Thickness Index Acceptance Limits

	TARGET	LSL	USL
Thickness Index	0.00	-1.00	+1.00

600-3.17.3.3.2 Disputed Thickness If a Contractor believes that a thickness result is invalid for whatever reason, the Contractor shall notify the Engineer of this in writing within 24 hrs of being informed of the test result. After being informed of the disputed result, the Engineer will select three random core locations in the disputed subplot and the Contractor shall cut the cores at the selected locations in the presence of the Engineer who shall place them in secured containers for delivery and testing at the QA Testing laboratory and deliver them to the testing technician. If there are 10 or more cores already tested to date, the pay factor for thickness in the lot will be calculated (without using the result of the disputed core). If less than ten cores have been tested in the disputed lot, the three cores shall be held until ten cores have been tested or the lot is complete, whichever comes first, at which time the pay factor will be calculated.

If the pay factor for the lot that contains the disputed result is 0.95 or greater, and the disputed test result is outside three standard deviations from the mean value of the lot (calculated without using the result of the disputed thickness), the three cores shall be measured and the average value of the three will be calculated. If any of these three cores falls outside three standard deviations from the mean value for the lot (calculated without using the result of the disputed core), the original thickness test value will stand.

If the three cores fall within three standard deviations of the mean value the average of the three measurements will be used as the thickness for the disputed subplot.

If the three cores are not used, the Contractor shall pay for the cost of testing.

600-3.17.3.4 Ride Smoothness. Not Used.

600-3. 17.3.5 Cross Slope.

600-3.17.3.5.1 Cross slope will be measured once per subplot (see Table 401-4) behind the paver after final rolling of the wearing surface has taken place. Cross slope will only be evaluated when specific slopes and superelevations are shown on the plans for the entire project. Only travel lanes will be evaluated for cross slope. Measurements will be taken only in areas of normal tangent or full bank curves on even stations. Measurement shall take place utilizing one of the following methods, and shall be agreed upon by both parties: "digital read" level and 10 to 12 foot straightedge; "bubble" level, ruler, and 10 to 12 foot straightedge; transit; or electronic positioning equipment as approved by both Contractor and Department. If a straightedge is employed, perpendicularity shall be assured with the use of a right angle prism or other method acceptable to both parties. If a "bubble" or "digital read" level is employed, a second reading 180 degrees to the first shall be made and recorded, and the two shall be averaged for the test result. Measurement data shall be shared between parties within 24 hours of measurement.

600-3.17.3.5.2 Once a cross slope percentage has been measured, a cross slope index (CSI) will be calculated. The target cross slope shall be defined as the cross slope shown on the plans or as ordered to the nearest tenth of a percent. The CSI is the actual deviation from the target divided by **0.40** percent, which is the tolerance used for pay factor calculation only. This will allow statistical comparisons to be made among measurements based on varying specified cross slopes. The CSI will be established for the sole purpose of calculating pay factors. The CSI shall be calculated under the following equation using the specification limits in Table 401-10.

$$CSI = \frac{(M - SCS)}{T}$$

where: CSI = Cross Slope Index
 SCS = Specified Cross Slope in percent
 M = Measured Cross Slope in percent
 T = 0.40

Table 401-10 - Acceptable Quality Level Limits

	TARGET	LSL	USL
Cross Slope Index	0.00	-1.00	+1.00

600-3.17.3.5.3 If three or more consecutive cross slope subplot measurements on the pavement lift used to calculate the pay factor deviate more than 0.5 (in percent) from the specified cross slope value at those locations, those sublots will be considered to exceed the engineering limit of 0.5%. The Contractor shall submit a corrective action plan for approval by the Engineer for cross slope sublots that exceed this limit.

600-3.17.3.5.4 After the approved corrective action plan is implemented, the sublots will be measured to ensure compliance, but will not be re-measured for the purpose of re-calculating pay factor. Alternatively, the Contractor may submit a written request for acceptance of the material at a negotiated price. The Engineer will determine whether the material may remain in place at the negotiated price.

600-3.17.3.6 Rejection of Material.

600-3.17.3.6.1 An individual subplot. For any sublots with any test results exceeding the specified reject limits, the Engineer will:

- (a) Require complete removal and replacement with hot asphalt mix meeting the Contract requirements at no additional expense to the department, or
- (b) Require corrective action to the satisfaction of the Engineer at no additional expense to the Owner.

600-3.17.3.6.2 A lot in progress. The Engineer will shut down paving operations whenever:

- (a) The pay factor for any property drops below .90 and the Contractor is taking no corrective action, or
- (b) Three consecutive tests show that less than 50 percent by weight of the particles retained on the No. 4 sieve have at least one fractured face.

Paving operations shall not resume until the Engineer determines that material meeting the Contract requirements can be produced. Corrective action will be considered acceptable by the Engineer if the pay factor for the failing property increases. If it is determined that the resumption of production involves a significant change to the production process, the current lot will be terminated and a new lot will begin.

600-3.17.3.6.3 Remeasure and Retest. All requests to the Engineer to remeasure and retest a subplot shall be in writing.

METHOD OF MEASUREMENT

600-4.1 Asphalt pavement mixture will be measured by the ton to the nearest 0.1 ton. Batch weights will be permitted as a method of measurement only when the provisions of 600-3.8.3 are met, in which case, payment will be based on the cumulative weight of all the batches. The quantity will be the weight used in the accepted pavement, and no deduction will be made for the weight of asphalt binder or additives in the mixture.

600-4.1.1 Hot bituminous pavement, machine or hand method or night paving, will be measured in the

same manner as 600-4.1. No separate measurement will be made for lighting necessary or overtime required due to night operations at the plant or at the site. No separate measurement will be made for hand method.

600-4.1.2 Due to possible variations in the specific gravity of the aggregates, and to possible field changes in areas to be paved, the quantity used may vary from the proposal quantities, and no adjustment in Contract unit price will be made because of such variations.

600-4.2 Asphalt pavement, removed because of faulty workmanship or contamination by foreign materials, will not be included in the pay quantity.

600-4.3 Blank.

600-4.4 Joint adhesive - Not Used

600-4.5 Echelon paving, when specified or approved, will be not be measured separately and will be paid as part of the unit price per 600-4.1 above.

BASIS OF PAYMENT

600-5.1 All work performed and measured as prescribed above will be paid for at the Contract unit price as provided in the respective sections for each type specified.

600-5.2 Tack coat material ordered under 600-3.10.10 will be measured and paid separately under Section 603 – *Emulsified Asphalt Tack Coat*.

600-5.3 Blank.

600-5.4 Plant or project site lighting for hot bituminous pavement, machine or hand method (night), or overtime required due to night operations will be subsidiary to the paving items.

600-5.5 Asphalt cement additives will be subsidiary to the paving items.

600-5.6 Implementation of the Quality Control Plan and costs associated with obtaining core samples for acceptance testing shall be subsidiary. There will be no additional payment adjustments under the Quality Assurance provisions.

600-5.6.1 Gradation composite pay factor (CPF). Not Used for this project.

600-5.6.2 Pay Adjustment. Not Used for this project. The maximum payment shall be 100% of the amount earned with no bonus payments. The only pay adjustments will be deducts for work having deficiencies as outlined above in the Performance Requirements and other sections herein.

600-5.6.3 Pay Adjustment, Hot Bituminous Pavement QC/QA Items. Not Used for this project. The maximum payment shall be 100% of the amount earned with no bonus payments.

600-5.7 Joint adhesives - Not Used.

600-5.8 Material Transfer Vehicle (MTV) – Not Required. If the Contractor determines to use this equipment for their convenience, it will not receive additional payment.

600-5.9 Echelon Paving – Not Required. If the Contractor determines to use this method of placement for their convenience, it will not receive additional payment.

Payment will be made under:

Item M-600-1	NHDOT Hot Bituminous Pavement – 1/2” Wearing Course -- per ton
Item M-600-2	NHDOT Hot Bituminous Pavement – 3/4” Binder Course -- per ton

END OF SECTION M-600

ITEM M-700
MISCELLANEOUS SITE IMPROVEMENTS

DESCRIPTION

700-1.1 This work shall consist of the installation of, as well as the relocation and removal and disposal of identified items or groups of items, relating to site improvements with associated structures and appurtenances as shown on the plans or as directed by the Owner's representative (Resident Project Representative (RPR)). The site improvements shall also include the restoration of the disturbance areas including backfilling of resulting trenches, holes, and pits, as well as the proper disposal of the existing waste materials and appurtenances for the identified items.

MATERIALS

700-2.0 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.

700-2.1 The Contractor shall supply all materials and equipment required to perform the identified work and be in accordance with these specifications and all Federal, state and local regulations. Material not identified herein, or conforming to other sections of these specifications, shall meet the requirements of the 2016 New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, or latest edition, or as modified within this specification.

700-2.2 All temporary facilities, equipment, and materials to perform the utility removals must adhere to and/or meet EPA, OSHA, and NIOSH regulations, as well as all other Federal, state, and local regulations.

700-2.3 Granular Backfill Material. It is assumed supplemental backfill material will be necessary for some of the site electrical utility removals and new structures. The backfill material shall conform to the New Hampshire Department of Transportation Standard Specifications §209 Granular Backfill using Item 209.4 Granular Backfill (Gravel). Granular backfill (gravel) shall consist of a mixture of stones or rock fragments and particles with 95 to 100 percent passing the 3” sieve and 25 to 70 percent passing the No. 4 sieve.

700-2.4 Base Course Material. The base course material necessary for the base course for any new or modified access road/drive shall use the materials and installation requirements of the New Hampshire Department of Transportation (NHDOT) Standard Specifications Standard Specifications. The base course material shall conform to the requirements of the NHDOT Standard Specifications §304 Base Course Materials, using either **304.3 Crushed Gravel** or **304.4 Crushed Stone (fine) at Contractor discretion**, from Table 304-1 – *Base Course Materials Required Gradation*, which reads as follows:

Table 304-1 - Base Course Materials Required Gradation

Item No.	304.1	304.2	304.3	304.32	304.33	304.4	304.5	304.6
Item	Sand	Gravel	Crushed Gravel	Crushed Gravel for Shoulder Leveling	Crushed Aggregate for Shoulders	Crushed Stone (Fine)	Crushed Stone (Coarse)	Crushed Stone (Very Coarse)
Sieve Size	Percent Passing By Weight							
6”	100	100	---	---	---	---	---	100
5”	---	---	---	---	---	---	---	---
4”	---	---	---	---	---	---	---	---
3 1/2”	---	---	---	---	---	---	100	---
3”	---	---	100	---	---	---	85 – 100	60-90
2 1/2”	---	---	---	---	---	---	---	---
2”	---	---	95 – 100	---	---	100	---	---
1 1/2”	---	---	---	100	100	85 – 100	60 – 90	45-75
1”	---	---	55 – 85	90-100	90 – 100	---	---	---
3/4”	---	---	---	---	---	45 – 75	40 – 70	35-65
1/2”				65-90				
#4	70 – 100	25 – 70	27 – 52	30-55	30 – 65	10 – 45	15 – 40	15-40
# 200 (In Sand Portion)*	0 – 12	0 – 12	0 – 12	---	---	---	---	---
# 200 (In Total Sample)	---	---	---	0-10	0 – 10	0 – 5	0 – 5	0-5

* Fraction passing the # 4 sieve

700-2.5 Granite Curb. Curb shall be new granite or salvaged granite, as indicated in the plans and specifications. Granite shall be hard, durable, reasonably uniform in appearance, and free from weak seams. Solid quartz or feldspar veins will not be cause for rejection.

700-2.5.1 Surfaces of each stone shall be finished in accordance with the requirements of Table 609-1 as presented below. All comparable curbs on the project shall have similar finishes.

700-2.5.2 When the slope curb item description does not indicate a specific height, the size of the stone shall be as shown on the standard entitled “Granite Slope Curb”. The setting reveal (the vertical height of the exposed face when set) shall be 4” or as shown on the plans.

700-2.5.3 Salvaged granite curbing shall be dressed to obtain joints of the same width as specified for new curb.

**Table 609-1
Finished Surfaces and Tolerances for Granite Curbing**

Type	Area	Finished Surface	Tolerance, Inches ^a	
Straight or Curved	Top	5" wide or as otherwise shown, sawn true plane.	+1/8	-1/8
		Front and back arris lines pitched straight and parallel.	+1/8	-1/8
	Front face	Right angle to top, approximately true plane. No drill holes showing in top 10".	+1	-1/2
	Back face:			
	Exposed	Plane parallel with front face. Straight split to 1-1/2" below exposed surface. No larger than 1/4" segment of drill holes showing in arris lines.	+1	-1
	Concealed	Below 1-1/2" from exposed surface.	+1-1/2	-1-1/2
	Bottom	Approximately parallel to top. Minimum width: 3"	See plans.	
	Ends:			
	Exposed	Square with planes of top and face.		
	Joints:			
	Exposed	Optimum width: 1"		
	Concealed	To break back no more than 4"	+3/4	-3/4
	Lengths of stones	3 to 10 ft. with 50 percent of sections to be 5 ft. or greater, or as indicated.		
Slope and End Stone	Arris lines	Straight and true on top, front and ends. Drill holes not deeper than 1/4" allowed in arris lines.	+1/4	-1/4
	Faces:			
	Exposed	Planes; no drill holes in faces longer than 8" or deeper than 1/4"	+1	-1
	Concealed	Drill holes not objectionable.		
	Ends	Square with face except as indicated.		
	Joints	On tangent, maximum width: 1" On curves over 15 ft. radius, widen top or bottom from 1" as necessary.	+1/2	-1/2
		On curves with 15ft. radius and under, use radial joints or curved curb as indicated. Optimum width: inch	+1/2	-1/2
	Length of stones	Min. and max. specified lengths.	See plans.	

^a + Projection in stone; -Depression in stone

700-2.5.4 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.

700-2.6 Miscellaneous Concrete. Miscellaneous Concrete shall be proportioned, placed, and cured per NHDOT Standard Specification Section 520 in accordance with the modified Table 520-1A – Classes of

Concrete as identified on the plans and as follows:

Table 520-1A - Classes of Concrete

Concrete Class	Minimum Expected 28 Day Compressive Strength ¹	Maximum Water/Cement Ratio ²	Entrained Air Percent	Permeability Target Value ⁶
	PSI			kΩ-cm
AA	4,000	0.444	5 to 9	20
A	3,000	0.464	4 to 7	10

700-2.7 Reinforcing steel. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

700-2.8 Traffic Sign. Traffic Signs shall be NHDOT Type C. The signs shall be flat sheet aluminum signs with retroreflective sheeting background with retroreflectorized cut-out copy or overlay film. Type C shall include aluminum tube mounts or steel “U” post mounts or as shown on the plans.

700-2.8.1 Sheet Signs. Flat aluminum sheets for sheet signs shall be one piece and conform to ASTM B 209, Alloy 6061-T6 or Alloy 5052- H38. The minimum thickness of the sheets up to 36” wide shall be 0.080” Signs greater than 36” shall be a minimum of 0.100”.

700-2.8.2 Vertical Supports.

- a. Steel posts shall conform to ASTM A 36 or ASTM A 572 and unless otherwise shown on the plans, shall be galvanized in accordance with AASHTO M 111 (ASTM A 123). The total maximum weight of steel posts below the hinges of a breakaway support system shall not exceed 45 pounds per foot when 2 posts are to be placed within 7 ft. of each other.
- b. Aluminum posts for non-breakaway supports shall be of a standard shape aluminum tubing conforming to ASTM B 221, Alloy 6061-T6 or 6063-T6, as shown on the plans. The wall thickness shall be a minimum of 1/8” and a maximum of 3/16”. 2.5.2.1 Aluminum posts for use with breakaway support systems shall conform to ASTM B 429, Alloy 6061-T6 or 6063- T6, Schedule 40, as shown on the plans.
- c. Steel “U” posts shall be rail steel conforming to the requirements of ASTM A 499, Grade 60 or ASTM A 576, Grade 1070-1080, minimum yield strength of 60,000 psi. Posts shall be galvanized in accordance with AASHTO M 111. The weight per foot shall be a minimum of 2-1/2 lb. and a maximum of 3 lb. The posts shall have 3/8” holes drilled or punched, before painting, along the center line of the web. The holes shall begin 1” from the top of post and continue at 1” centers for the entire length of the post.

700-2.8.3 Hardware.

- a. Hardware for signs shall conform to the NHDOT Standard Plans.
- b. The bolt assembly for the post clamp shall be stainless steel cap screw Alloy 304 ASTM A193 Grade B8, stainless steel locknut Alloy 304 ASTM A194 Grade 8 with nylon filler and stainless steel M10 flat washer Alloy 302 ASTM-A276. The finish on the clamps shall be Electro-Galvanized clamp. Hardware shall be Unistrut P1120 EG or approved equal. The channel bracket shall be pregalvanized conforming to ASTM D653 G90, and steel conforming to ASTM A653 GR 33 without perforations. Hardware shall be Unistrut P4100 PG or approved equal.
- c. U-channel post assembly shall be stainless steel hex bolt Alloy 304 ASTM A193 Grade B8, stainless steel M10 fender washer and flat washer Alloy 302 ASTM-A276, a nylon washer, and stainless steel locknut Alloy 304 ASTM A194 Grade 8 with nylon filler.

700-2.8.4 Supports and Bases.

- a. Concrete for bases shall be 700-2.6 NHDOT 520 Class A.
- b. Anchors for aluminum posts shall conform to the materials shown in the NHDOT Standard Plans.

700-2.8.5 Copy (Text and Borders).

- a. The design, arrangement, color, and spacing of copy shall be as shown on the plans, in the MUTCD and the Standard Highway Signs book.
- b. There shall be no gaps in the borders of the signs.
- c. Demountable sign copy shall conform to ASTM B 209, Alloy 3003-H14. The minimum thickness of flat sheet aluminum shall be 0.032”.
- d. The letters, numerals, symbols, shields, and borders of retroreflective sheeting shall be cut-out adhesive coated retroreflective sheeting conforming to NHDOT Standard Specifications §718 Retroreflective Sheeting.

700-2.8.6 Background.

- a. All background sheeting shall be retroreflective sheeting conforming to NHDOT Standard Specifications §718 Retroreflective Sheeting. Visual inspections to assure that sheeting meets the specified requirements may be made by the RPR at any time prior to acceptance.
- b. Certificates of Compliance for all sheeting materials shall be furnished.

700-2.9 Wayfinding Sign. Wayfinding Signs shall be NHDOT Type C signs. The signs shall be flat sheet aluminum signs with retroreflective sheeting background and non-embossed copy unless otherwise shown on plans. Type C signs shall include aluminum tube mounts or steel “U” post mounts or as shown on the plans. Exact Wayfinding Sign language/layout to be determined as part of the submittal process, but the **Wayfinding Sign dimensions will be up to 4 square feet for each sign.**

700-2.9.1 Sheet Signs. Flat aluminum sheets for sheet signs shall be one piece and conform to ASTM B 209, Alloy 6061-T6 or Alloy 5052- H38. The minimum thickness of the sheets up to 36” wide shall be 0.080” Signs greater than 36” shall be a minimum of 0.100”.

700-2.9.2 Vertical Supports.

- a. Steel posts shall conform to ASTM A 36 or ASTM A 572 and unless otherwise shown on the plans, shall be galvanized in accordance with AASHTO M 111 (ASTM A 123). The total maximum weight of steel posts below the hinges of a breakaway support system shall not exceed 45 pounds per foot when 2 posts are to be placed within 7 ft. of each other.
- b. Aluminum posts for non-breakaway supports shall be of a standard shape aluminum tubing conforming to ASTM B 221, Alloy 6061-T6 or 6063-T6, as shown on the plans. The wall thickness shall be a minimum of 1/8” and a maximum of 3/16”. 2.5.2.1 Aluminum posts for use with breakaway support systems shall conform to ASTM B 429, Alloy 6061-T6 or 6063- T6, Schedule 40, as shown on the plans.
- c. Steel “U” posts shall be rail steel conforming to the requirements of ASTM A 499, Grade 60 or ASTM A 576, Grade 1070-1080, minimum yield strength of 60,000 psi. Posts shall be galvanized in accordance with AASHTO M 111. The weight per foot shall be a minimum of 2-1/2 lb. and a maximum of 3 lb. The posts shall have 3/8” holes drilled or punched, before painting, along the center line of the web. The holes shall begin 1” from the top of post and continue at 1” centers for the entire length of the post.

700-2.9.3 Hardware.

- a. Hardware for signs shall conform to the NHDOT Standard Plans.
- b. The bolt assembly for the post clamp shall be stainless steel cap screw Alloy 304 ASTM A193 Grade B8, stainless steel locknut Alloy 304 ASTM A194 Grade 8 with nylon filler and stainless steel M10 flat washer Alloy 302 ASTM-A276. The finish on the clamps shall be Electro-Galvanized clamp. Hardware shall be Unistrut P1120 EG or approved equal. The channel bracket shall be pre-galvanized conforming to ASTM D653 G90, and steel conforming to ASTM A653 GR 33 without perforations. Hardware shall be Unistrut P4100 PG or approved equal.
- c. U-channel post assembly shall be stainless steel hex bolt Alloy 304 ASTM A193 Grade B8, stainless steel M10 fender washer and flat washer Alloy 302 ASTM-A276, a nylon washer, and stainless steel locknut Alloy 304 ASTM A194 Grade 8 with nylon filler.

700-2.9.4 Supports and Bases.

- a. Concrete for bases shall be 700-2.6 NHDOT 520 Class A.
- b. Anchors for aluminum posts shall conform to the materials shown in the NHDOT Standard Plans.

700-2.9.5 Copy (Text and Borders).

- a. The design, arrangement, color, and spacing of copy shall be as shown on the plans, in the MUTCD and the Standard Highway Signs book.
- b. There shall be no gaps in the borders of the signs.
- c. Demountable sign copy shall conform to ASTM B 209, Alloy 3003-H14. The minimum thickness of flat sheet aluminum shall be 0.032”.
- d. Copy for Type C signs shall be cut-out or silk screened. Cut-out copy or ink for the silk screened shall be approved by background retroreflective sheeting manufacturer for use on its sheeting.

700-2.9.6 Background.

- a. All background sheeting shall be retroreflective sheeting conforming to NHDOT Standard Specifications §718 Retroreflective Sheeting. Visual inspections to assure that sheeting meets the specified requirements may be made by the RPR at any time prior to acceptance.
- b. Certificates of Compliance for all sheeting materials shall be furnished.

700-2.10 NHDOT Hot Bituminous Pavement. Refer to Section M-600 specifications for the NHDOT hot bituminous pavement materials.

700-2.11 ADA Detectable Warning Device. Detectable warning devices shall be gray cast iron conforming to AASHTO M105 and AASHTO M306. Cast iron panels shall have no surface coating and shall be allowed to transition to their natural patina.

700-2.11.1 ADA Detectable Warning Panel Truncated Dome Geometry.

- a. Detectable warning devices shall be in full compliance with ADA Accessibility Guidelines (ADAAG) (Title 49 CFR Transportation, Part 37.9 Standard for Accessible Transportation Facilities, Appendix A, Section 4.29.2 – Detectable Warning on Walking Surfaces).
- b. Size and spacing for truncated domes shall be as follows: base diameter of nominal 0.9”, top diameter of nominal 0.4”, height of nominal 0.2”, with a center to center spacing of nominal 2.35”.
- c. The truncated domes shall be arranged in a grid pattern and shall align properly from panel to panel.

700-2.12 Loop Detector System Materials. Loop detector leads shall be an approved insulated #14 AWG loop detection wire as recommended by the loop detection system manufacturer. The sealant used to seal the wire into the pavement material shall conform to the Section P-606 specifications.

700-2.13 Rigid Conduit. Refer to Section L-110 2.2 specifications for the RGS conduit materials.

700-2.14 PVC Conduits. Refer to Section L-110 2.3 specifications for the PVC conduit materials.

700-2.15 Topsoil. Refer to Section T-905 specifications for the topsoil and amendment materials.

700-2.16 Seeding. Refer to Section T-901 specifications for the seeding and associated materials.

700-2.17 Mulching. Refer to Section T-908 specifications for the mulching materials

700-2.18 Ductile Iron Pipe and Fittings. Ductile Iron Pipe: Ductile iron pipe materials shall conform to ANSI/AWWA A21.51/C151 having a thickness class rating of Class 52 with double thickness cement lining and interior/exterior seal coating conforming to ANSI A.21.4. All pipe shall be push-on joint in accordance with ANSI A21.11. Pipe shall be cast and manufactured in the USA.

Ductile Iron Fittings: Ductile iron fittings materials shall be compact fittings with double thickness cement lining and interior/exterior seal coating conform to ANSI/AWWA A21.4/C104, ANSI/AWWA A21.11/C111, or ANSI/AWWA A21.53/C1453 having a minimum Class 350 rating, unless otherwise noted on the plans. The fittings shall be complete with accessories – tee bolts may be ductile iron or corten. All mechanical joints shall have retainer glands shall conform to EBAA Iron's Mega-Lug mechanical joint restraint or approved equal. Fittings and associated accessories shall be cast and manufactured in the USA.

CONSTRUCTION METHODS

700-3.0 General Requirements. The Contractor shall conduct all site improvement installations and removal operations in a safe, legal, and responsible manner and shall ensure that any equipment, material, or method used shall be safe for the workers and the public. All laws, rules, regulations, utility supplier requirements, and local building codes shall be followed. The Contractor is responsible to secure all permits for any work as necessary, coordinate with all utility supply company owners, and to properly dispose of the waste materials from the removal of waste materials, structures and appurtenances.

700-3.0.1 Existing Utility Dig Sage. The Contractor shall protect all utility lines to remain during the installation or removal of any adjacent utilities. **At least seventy-two (72) hours (not including weekends and Holidays) in advance** of the commencement date of the utility installations or removals, the Contractor shall notify all operators who have underground or overhead facilities at or near the proposed building demolition and utility removal areas through the one-call notification system (**Dig Safe System – MA/ME/NH/RI/VT - Dial 811 or www.digsafe.com**). In addition, the Contractor shall contact all utility owners and request a Pre-Construction Conference with all operators having underground or overhead facilities at or near the proposed demolition and utility removal area, as required.

All installation or removal work shall be as outlined within this specification, unless otherwise shown on the proposed installation or demolition plans, or directed by the RPR.

700-3.1 Base Course Installation.

700-3.1.1 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.

700-3.1.2 Production and Placement. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 700-3.1.3, the approved material may be transported directly to

the placement. Base course material shall be dumped on the course being placed and spread at once onto the previously placed layer. If the hauling equipment causes ruts in the subgrade, or previously placed base course, the equipment shall be operated only on the course being placed, behind the spreading equipment.

The compacted depth of any layer of base course material placed shall not exceed 8". Care shall be taken to avoid segregation during placement. Base course material shall be dumped on the course being placed and spread at once onto the previously placed layer. If spreading equipment is not available, dumping will not be permitted. Any segregation that occurs shall be remedied or the materials removed and replaced at no additional cost to the Owner.

The Contractor's method of operation shall be such that oversized stones will not be delivered to the project.

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.

700-3.1.3 Base Course 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 **ninety-five percent (95%)** 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 D698**. The moisture content of the material during placing operations shall be within ± 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. Water shall be uniformly applied over the base course materials during compaction in the amount necessary for proper consolidation.

Rolling and shaping shall continue until the required density is attained. Rolling and shaping shall continue until each layer conforms to the required grade and cross-section and the surface is smooth and uniform.

700-3.1.4 Base Course 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.

700-3.2 Granite Curb Installation.

700-3.2.1 Excavation for curb shall be made to the required depth, and the base upon which the curb is to be set shall be compacted to a firm even surface.

700-3.2.2 Installation of curbing shall be so that the front top arris line conforms to the line and grade required. All spaces under the curbing shall be filled with material conforming to the requirements for base course material, unless the detail shows alternative materials. This material shall be thoroughly tamped.

700-3.2.3 Joints shall be of the width indicated in 700-2.5 - Table 609-1 – *Finished Surfaces and Tolerances for Granite Curbing*. The joints shall be pointed with mortar and the exposed portions finished with a jointer.

700-3.2.4 Backfilling shall be accomplished immediately after the curb is set and jointed. Backfill shall be of approved material, placed and thoroughly tamped.

700-3.2.4.1 Concrete conforming to Class A (3000 psi) (as specified in 700-2.6 - Table 520-1A *Classes of*

Concrete) may be substituted for aggregate base course and hot bituminous base courses in the curb patch on the roadway side of granite curb. Concrete thickness shall be not less than that of the adjacent pavement.

700-3.2.5 Reset Granite Curb Installation. Curbing to be reset shall be carefully removed and stored. The Contractor shall replace any curbing damaged or lost because of his negligence. All exposed portions of reset curbing shall be cleaned by sand blasting as required by the RPR.

700-3.3 Traffic and Wayfinding Sign Installation.

700-3.3.1 General. Traffic sign details not shown on the plans shall conform to the MUTCD and Standard Highway Signs book. Traffic sign supports and framing members shall be in accordance with the AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals”.

700-3.3.2 The top edges of all signs shall be horizontal. Any chipping or bending of sign panels shall be cause for replacement at the Contractor’s expense.

700-3.3.3 Ground-mounted signs in most cases should be erected to face 2 degrees away from the direction of approaching traffic. Ground mounted signs on curves or steep grades may need to be adjusted to maximize retroreflectivity.

700-3.3.4 The minimum sign height for a conventional road in a rural district shall be 6 feet. All other sign heights shall be in accordance with the MUTCD or NHDOT Standard Plans.

700-3.3.5 When two (2) or more signs are installed on the same supports, the signs shall be butted together unless otherwise specified on the plans or MUTCD. There shall be no gaps between the signs.

700-3.3.6 Aluminum posts shall be set in holes excavated to the proper depth. The anchors shall be constructed as shown on the plans. After inserting posts, the holes shall be backfilled with granular material placed in thoroughly compacted layers not exceeding 6” in depth, care being taken to preserve the alignment of the posts. When more than one post per sign is required, the posts shall be parallel and plumb. Posts bent or otherwise damaged shall be removed and replaced.

700-3.3.7 Steel “U” posts may be set as specified in 700-3.3.5 or driven.

700-3.3.8 When posts are driven, a suitable driving cap shall be used. Battered heads will not be accepted. Posts shall not be driven with the assembly or sign attached.

700-3.3.9 When rock is encountered in erecting posts, the depth to be drilled into the rock and any required grouting shall be as directed and subsidiary to the item.

700-3.3.10 When Type C signs are ordered by the Plans or RPR to be removed, the sign and posts shall become the property of the Contractor, unless otherwise shown on the plans. Any existing concrete foundation shall be removed down to 1 ft. below final grade elevation.

700-3.3.11 When Type C signs are ordered by the Plans or RPR to be relocated, new posts and all necessary mounting hardware, including breakaway bases if required, shall be provided.

700-3.4 ADA Detectable Warning Device Installation.

700-3.4.1 The Contractor shall provide a submittal of the manufacturer’s descriptive literature for materials specified.

700-3.4.2 Transport, storage, and handling of products shall be in accordance with manufacturer’s instructions.

700-3.4.3 Install detectable warning devices and any anchoring hardware in accordance with manufacturer’s instructions. Panels shall be set into a bed of 4” wet unreinforced NHDOT Class AA concrete per 700-2.6 – *Table 520-1A Classes of Concrete*.

700-3.4.4 Use a combination of available panel widths as manufactured to cover the full sidewalk ramp

width to the extent practicable. Field cutting of panels is not permitted.

700-3.4.5 Care shall be taken to ensure the safety of pedestrians when sidewalks must remain in service during construction.

700-3.5 Loop Detection Wire Replacement Installation.

700-3.5.1 The Contractor shall provide a submittal of the manufacturer's descriptive literature for materials specified.

700-3.5.2 The Contractor shall install the loop detection system replacement wire as follows:

- 1.) The existing pavement shall be milled an approximate 2" depth as shown on the plans. The new loop detection wire shall be installed in the remaining base lift of pavement after milling the surface. The base lift of pavement shall be sawcut to the dimensions of approximately 6' x 6' square at a ¼" width having a depth of 1", including a slot cut lead to the controller. All 90° corners shall be sawcut at 45° to overlap both sides of the loop to allow for a better installation of the wire.
- 2.) The loop leads shall have a minimum 6 twists per foot using the approved detector loop wire. Wrap the loop wire in a continuous length with a minimum of 3 loops in the slot cut. So not splice the loop wire. When inserting the wire into the slot cut, do not use a sharp tool and take care in order to not cut the wire. Connect the leads to the loop detection equipment. After installation of the wire in the slot cut, the wire shall be sealed into the slot cut with the P-606 sealant material or other material as recommended by the loop system manufacturer.
- 3.) Do not install the loop wire in broken pavement since this may cause the wire to fracture and stop the loop from working properly. All loop and loop leads shall be at least 18" from any electrical power service. Also, do not run loop leads in conduit with any data/communications cabling.

700-3.5 Water Works Installation.

700-3.5.1 Pipeline and Fitting Installations.

- a. Installation of all buried piping shall be in accordance with AWWA C 600 Standards for Installation of Ductile Iron Water Mains and their Appurtenances. Refer to the plan details and Manchester Water Works (MWW) Construction Standards and Details for additional installation requirements.
- b. Water service tubing, as applicable, shall be laid in a continuous sections unbroken section to the greatest extent possible.
- c. The water main tap shall be performed under pressure. The Contractor shall coordinate the tap with the MWW. If required, the Contractor shall use only a MWW approved vendor/subcontractor for tapping the main. No separate measurement for payment will be made for tapping the main rather it shall be considered incidental to the line item.
- d. The interior of pipe, fittings and valves shall be kept clean and free of foreign material or soils at all times during storage and installation, or the material may be rejected by the RPR.
- e. All pipes and appurtenances laid in open trench excavation shall be bedded and uniformly supported over their full-length on bedding of the types specified herein and shown on the drawings. All work shall be performed in a dry trench.
- f. Pipe and fittings shall be laid accurately to the line and grades. Care shall be taken to provide a firm bearing for the pipe along its entire length. Pipes shall not be laid in water, nor shall water be allowed to flow through them.
- g. Wherever it is necessary to deflect the main at joints or pipe tubing from a straight line, either in the vertical or horizontal plane, the amount of deflection allowed shall not exceed that permitted tolerance by the manufacturer and shall be subject to the approval of the Manchester Water Works and/or RPR.

- h. All mechanical joint fittings shall be installed with thrust blocks and restrained retainer joints glands as outlined herein and shown on the plans.
- i. The piping/tubing and appurtenances shall be installed with a bedding and blanket material meeting the material specified herein. If the in-situ material meets the material specifications, it may be used. The bedding and blanket material shall be placed to a minimum of 12 inches (300 mm) above the pipe crown. The trench shall be backfilled by placing and compacting the sand in lifts of 6 inches (150 mm) or less. The blanket shall be carried up evenly on both sides of the pipe, so as not to disturb the pipe. Compact the blanket material to 95% standard proctor (in accordance with ASTM D 698 and ASTM D 2922) with approved hand-operated devices.
- j. Backfill material from 12 inches (300 mm) above the pipe to the underside of the pavement select material profile, or to the underside of loam and grassed areas, shall be backfilled with common backfill described herein and as approved by the RPR. Backfill shall be placed and compacted in layers of 6 inches (150 mm) or less. Compact the backfill material to 95% modified proctor (in accordance with ASTM D 157 and ASTM D 2922). Compaction shall be by hand-operated compactors or other approved method. Jetting and bucket compaction are not acceptable means of compaction.
- k. Trench areas improperly backfilled or having excessive settlement, as determined by the RPR, shall be reopened to the required grade, backfilled using proper techniques, and repaved as necessary. The Contractor shall receive no additional compensation for repair of trenches constructed under this Contract.

700-3.6 Walkway Modification. The modification of the existing walkway area at the southern end of the reconfiguration of the access roadway to the Terminal Loading Dock shall include, but not limited to, the following items:

- a. Reconfiguration of the existing walkway layout with connections to the new cargo facility walkway and the existing walkway crossing and adjacent areas with the associated site work of:
 - 1. Any unclassified excavation of existing materials (including pavement and boulders) and backfill with appropriate “in-kind” materials per the details
 - 2. Sawcutting of existing pavements and walkways incidental to the work
 - 3. Replace existing gate loops at the Gate House gate arms on the access road within the milled surface, including the sawcutting, all loop materials (wire, sealant, etc.) and the loop installation
 - 4. Installation of new base course materials
 - 5. Installation of ADA detectable warning devices set in concrete
 - 6. Installation of new NHDOT ½” Wearing Course Pavement (min. thickness 2”)
 - 7. Installation of 1-1/2” crushed stone slope restoration along access road by walkway
 - 8. Restoration of all disturbed areas, including turf growth
 - 9. All other incidental items completed to the satisfaction of the RPR for acceptance

700-3.7 Old Access Gate and Island Area Items Removal. The removal of the Old Access Gate and Island Area Items shall include, but not limited to, the following items:

- a. Coordination with the Utility Supplier to remove the electrical service and meter for the Old Access Gate and Island Area electrical panel. Removal of the electrical panel with associated conduits and cabling.
- b. Removal and disposal of the two (2) existing Access Gate Booths and one (1) Bus Shelter with all associated appurtenances. The existing concrete islands and foundations shall also be removed and properly disposed, except for the island as shown to remain on the plans, unless otherwise directed by the RPR.
- c. Removal and salvage (at the Owners discretion) the existing access gates, control boxes, electrical

panels, bollards, handholes, and all other incidentals. The conduits and cabling shall be removed and properly disposed of off the Airport site.

- d. Removal, salvage and relocation of existing signage with new hardware and all other incidentals related to the relocation of the signage. Protect existing signage to remain.
- e. Removal and reconfiguration of the existing Access Gate and Island Area items has the associated site work of:
 - 1. Layout of any geometry modifications
 - 2. Any unclassified excavation of existing materials (including pavement) and backfill with appropriate “in-kind” materials per the details. The final grading shall be finalized for the “grade to drain” and match into the existing topography.
 - 3. Sawcutting of existing pavements and walkways are to incidental to the work.
 - 4. Miscellaneous fencing and post removals and disposal.
 - 5. Resetting of any impacted site utility covers and other utility boxes to remain, as required.
 - 6. Restoration of all disturbed areas, including turf growth.
 - 7. All other incidental items completed to the satisfaction of the RPR for acceptance.
- f. Items included within this scope of work area, but measured separately include:
 - 1. Remove, store and reset granite curb and/or install new granite curb, as necessary
 - 2. Pavement reclamation for new base course materials.
 - 3. Installation of new base course materials (as may be required).
 - 4. Installation of new NHDOT ½” Wearing Course Pavement (min. thickness 4”).

700-3.9 Lot C Entrance Canopy Removal and Access Gate Relocation. The removal of the Lot C Entrance Canopy and Access Gate Relocation shall include, but not limited to, the following items:

- a. Removal and disposal of the Lot C Entrance Canopy superstructure with all associated appurtenances. The existing canopy foundations shall also be removed and properly disposed.
- b. Removal, salvage and relocation of existing access gates, control boxes, bollards, handholes, and all other incidentals related to the relocation of the access gate to the same configuration as the existing layout. The existing conduits and cabling shall be removed and properly disposed of off the Airport site. New conduits and cabling (in-kind sizing) shall be installed for the reconfigured layout.
- c. Removal, salvage and relocation of existing signage with new hardware and all other incidentals related to the relocation of the signage.
- d. Reconfiguration of the existing access driveway with the associated site work of:
 - 1. Layout of any geometry modifications
 - 2. Any unclassified excavation of existing materials (including pavement) and backfill with appropriate “in-kind” materials per the details.
 - 3. Removal and disposal of the existing access gate concrete island and installation of new concrete island for the access gate concrete island.
 - 4. Resetting of site electrical and data handhole covers and other utility boxes, as required.
 - 5. Sawcutting of existing pavements and walkways are to incidental to the work.
 - 6. Restoration of all disturbed areas, including turf growth.
 - 7. All other incidental items completed to the satisfaction of the RPR for acceptance.
- e. Items included within this scope of work area, but measured separately include:
 - 1. Remove, store and reset granite curb and/or install new granite curb, as necessary
 - 2. Installation of new base course materials.
 - 3. Installation of new NHDOT ½” Wearing Course Pavement (min. thickness 4”).

700-3.10 Lot C Egress Gate Relocation. The relocation of the Lot C Egress Gate shall include, but not limited to, the following items:

- a. Removal, salvage and temporary storage of existing access gate arm, control boxes, bollards, and all other incidentals related to the relocation of the access gate. The existing cabling shall be

- removed and properly disposed of off the Airport site.
- b. Provide new H-20 rated handhole and conduits for the extension of the power and communication feeds to the relocated gate arm and control box location. Re-install the existing access gate arm, control boxes, bollards, cabling, and all other incidentals related to the relocation of the access gate.
 - c. Removal, salvage and disposal of existing signage with all other related incidentals.
 - d. Reconfiguration of the existing access drive egress with the associated site work of:
 - 1. Layout of the new gate location.
 - 2. Any unclassified excavation of existing materials (including pavement) and backfill with appropriate "in-kind" materials per the details.
 - 3. Removal and disposal of the existing access gate concrete island.
 - 4. Sawcutting of existing pavements and walkways are to incidental to the work.
 - 5. Modification of existing fencing to allow for the relocated gate access location.
 - 6. Restoration of all disturbed areas, including turf growth.
 - 7. All other incidental items completed to the satisfaction of the RPR for acceptance.
 - e. Items included within this scope of work area, but measured separately, include:
 - 1. Installation of new base course materials.
 - 2. Installation of new NHDOT ½" Wearing Course Pavement (min. thickness 4").

700-3.11 Cul-de-Sac Area Items Removal. The removal of the Cul-de-Sac Area Items shall include, but not limited to, the following items:

- a. Coordination with the Utility Supplier to remove the electrical service for the existing Access Gate Booths electrical panel. Removal of the electrical panel with associated conduits and cabling.
- b. Removal and disposal of the two (2) existing Access Gate Booths with all associated appurtenances. The existing concrete islands and foundations shall also be removed and properly disposed, except for the island as shown to remain on the plans, unless otherwise directed by the RPR.
- c. Removal and salvage (at the Owners discretion) the existing access gates, control boxes, electrical panels, bollards, handholes, and all other incidentals. The conduits and cabling shall be removed and properly disposed of off the Airport site.
- d. Reconfiguration of the existing access drive egress with the associated site work of:
 - 1. Layout of the new cul-de-sac location
 - 2. Any unclassified excavation of existing materials (including pavement) and backfill with appropriate "in-kind" materials per the details.
 - 3. Removal and disposal of the existing access gate concrete island.
 - 4. Sawcutting of existing pavements and walkways are to incidental to the work.
 - 5. All other incidental items completed to the satisfaction of the RPR for acceptance.
- e. Items included within this scope of work area, but measured separately, include:
 - 1. Pavement reclamation for new base course materials.
 - 2. Installation of new NHDOT ½" Wearing Course Pavement (min. thickness 4").

700-3.12 Water Work Facilities Removal and Relocations. The Contractor shall coordinate all removals and relocation work with the Manchester Water Works and in compliance with the details, or as directed by the RPR or Manchester Water Work representative. The removals and relocations of the existing water work facilities shall include, but not limited to, the following items:

- a. **1" Copper Service Removal and Decommissioning** shall include the following associated site work (the approximate length is up to approximately 50 feet):
 - 1. Any unclassified excavation of existing materials (including pavement) and backfill with appropriate "in-kind" materials per the details.
 - 2. Removal of the existing copper tubing, curb stop, and curb stop box and salvage to the Owner, as applicable. The limit of the removal shall be to the corporation on the existing main and include "closing" the existing corporation.
 - 3. Restoration of all disturbed areas, including turf growth.

4. All other incidental items completed to the satisfaction of the Manchester Water Works and RPR for acceptance.
- b. **8" Cast Iron Service Removal and Decommissioning** shall include the following associated site work (the approximate length is up to approximately 50 feet):
 1. Coordination and notification of a "night-time" shutdown of the existing water main which services facilities on Green Drive and the MHT Terminal Building with Manchester Water Works and all affected properties.
 2. Any unclassified excavation of existing materials (including pavement) and backfill with appropriate "in-kind" materials per the details.
 3. Removal of the existing cast iron pipe, fittings, tapping sleeve, valve, and valve box and salvage any materials to the Owner, as applicable. The limit of the removal shall include the remaining service pipe with fittings and appurtenances (estimated to be up to 30 feet) to the existing 12" water main.
 4. Installation of "spool" piece of 12" main, including a solid sleeve with retainer glands, section of ductile iron pipe, and rigid cast coupling as required to restore the existing 12" cast iron main.
 5. Restoration of all disturbed areas, as required.
 6. All other incidental items completed to the satisfaction of the Manchester Water Works and RPR for acceptance.
- c. **Hydrant Relocation** shall include the following associated site work (limits as shown on the plans):
 1. Any unclassified excavation of existing materials (including pavement) and backfill with appropriate "in-kind" materials per the details.
 2. Sawcutting of existing pavements and walkways incidental to the work
 3. Removal of the existing pipe, fittings, and hydrant with salvage for re-installation. The limit of the removal shall include the hydrant, hydrant service pipe with fittings, and appurtenances to the limits as shown on the plans. It is the intent to re-use the existing gate valve and valve box and extend the line to a new hydrant location.
 4. Relocation and installation of new hydrant service extension pipe, fittings with retainer glands, and relocated hydrant to the new location.
 5. Restoration of all disturbed areas, as required.
 6. All other incidental items completed to the satisfaction of the Manchester Water Works and RPR for acceptance.

700-3.13 Ownership of removed cable. The Contractor shall obtain ownership of any removed cable and shall properly disposed of the cable materials off the Airport site.

700-3.14 Protection of Existing Facilities and Utilities to Remain. The Contractor shall be responsible for any provisions necessary to protect utilities and any site facilities during any installation operations using means acceptable to the facility or utility owner and the RPR. If such facilities or utility lines cannot be protected in place, the Contractor shall temporarily relocate the facilities or utility lines, as necessary, in coordination with the facility or utility owner to protect these utilities prior to undertaking any installation work that might affect these facilities or utility lines. There shall be no additional cost to the Owner for any coordination and necessary protection provisions or temporary relocation of facilities or utilities.

700-3.15 Disposal of Removed Materials. Disposal of materials shall be in accordance with all federal, state, and local laws, rules, and regulations; any provision found elsewhere in the Contract Documents; and most specifically in New Hampshire Department of Transportation Standard Specifications §202 Removal of Structures and Obstructions; New Hampshire RSA 149-M Solid Waste Management; and New Hampshire Department of Environmental Services Division of Waste Management rules and regulations and shall be subject to the approval of the RPR. If necessary, the Contractor shall provide to the RPR a

disposal plan at least fifteen (15) days prior to removal of materials from the site. Disposal plan shall identify the location of disposal, license and/or permit number of the disposal facility or facilities, as required for disposal. If applicable, delivery tickets from the location of disposal indicating date, time, and weight of debris disposed at the facility shall be provided to the RPR.

700-3.16 Dust Control. Provisions shall be made on the site to control the quantity of dust resulting from site removal or installation operations by wetting the immediate work area with water, or other appropriate spraying agents, or by means acceptable to the Owner's representative. The Contractor shall also perform sweeping operations to keep any paved surface clean from vehicle tire tracking from the work zone. There shall be no additional cost to the Owner for any dust control for the work.

METHOD OF MEASUREMENT

700-4.1 Base Course Material. Base course materials will be determined by measurement of the number of cubic yards of compacted material actually constructed in place and accepted by the RPR as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

700-4.2 Curbs. Curb will be measured by the linear foot to the nearest 0.1 of a foot from end to end along the lower edge of the exposed face of the curbing. Only curbing actually cut to a radius will be considered as curved curb. Slope curb shown or ordered to be cut on radial joints, (not square with face) will be measured separately. No separate measurement will be made for storage, as necessary, or sandblasting of reset curb. In the process of setting the curb, excavation and backfill of the material that has been placed by the Contractor will be considered as incidental to the item, including any cutting of the curb and providing the backfill material (as shown on the detail).

700-4.3 Sign Installations. NHDOT Type C signs will not be measured by each unit (regardless of sign size), as shown on the plans, including all necessary posts, footings, bases, and mounting hardware.

700-4.4 Sign Removals. Removing NHDOT Type C will be measured as a each unit. A unit will include all footings to a minimum of 1 ft. below finished grade, posts, hardware, and all signs on the same post.

700-4.5 Walkway Modification. Measurement shall be made for the Walkway Modification as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances indicated on the plans as being removed, salvaged, and re-installed at a relocated position as required for the complete relocation of the system. This item also includes any supplemental backfill material required to relocate the system, as well as any other incidental item for a complete relocation to the satisfaction of the RPR. This item also includes a replacement of loop detection wires for the existing Gate House gates at the Terminal access location.

700-4.6 Old Access Gate and Island Area Removal. Measurement shall be made for the Old Access Gate and Island Area Removal as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances, and other items indicated on the plans as being removed, salvaged, and disposed as required for the complete removal and reconfiguration of the identified area. This item also includes any supplemental backfill material required to final grade the area, as well as any other incidental item for a complete removal to the satisfaction of the RPR. Refer to the list of items above that will be measured separately. All other items not listed that are necessary for a completed removal and reconfiguration shall be considered incidental to the lump sum item.

700-4.7 Lot C Entrance Canopy Removal and Access Gate Relocation. Measurement shall be made for the Lot C Entrance Canopy Removal and Access Gate Relocation as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances indicated on the plans as being removed, salvaged, and re-installed at a relocated position as required for the complete relocation of the system. This item also includes any supplemental backfill material required to relocate the system, as well as any other incidental item for a complete relocation to the satisfaction of

the RPR. Refer to the list of items above that will be measured separately. All other items not listed that are necessary for a completed removal and relocation shall be considered incidental to the lump sum item.

700-4.8 Lot C Egress Gate Relocation. Measurement shall be made for the Lot C Egress Gate Relocation as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances indicated on the plans as being removed and salvaged or disposed of properly. The existing gate arm and controllers shall be salvaged and re-installed at a relocated position as shown on the plans and shall include all items as required for the complete fence gate relocation installation, including the extension of the power and data feeds as required. This item also includes any other incidental item for a complete removal of the existing access gate area materials and re-installation of the existing gate components to the satisfaction of the RPR. Refer to the list of items above that will be measured separately. All other items not listed that are necessary for a completed removal and relocation shall be considered incidental to the lump sum item.

700-4.9 Cul-de-Sac Area Removals. Measurement shall be made for the Cul-de-Sac Area Removals as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances, and other items indicated on the plans as being removed, salvaged, and disposed as required for the complete removal and reconfiguration of the identified area. This item also includes any supplemental backfill material required to final grade the area, as well as any other incidental item for a complete removal to the satisfaction of the RPR. Refer to the list of items above that will be measured separately. All other items not listed that are necessary for a completed removal shall be considered incidental to the lump sum item.

400-4.10 Water Works Removal or Relocation. Measurement shall be made for the removal or relocation of each identified water works site items to be removed or relocated as a lump sum item. There will be no separate measurement for any associated structures, equipment and/or miscellaneous appurtenances indicated on the plans as being removed or relocated. The work shall include all effort as required for the complete removal or relocation of the identified water works site item, including any supplemental backfill material required and any other incidental item for a complete removal or relocation. This item also includes salvaging the existing materials to MHT Maintenance, at their discretion, and the transportation of the salvaged materials to the Airport Property location identified by the MHT Maintenance.

BASIS OF PAYMENT

700-5.1 Base Course Material. Payment shall be made at the contract unit price per cubic yard for base course material. 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.

700-5.2 Curbs. The accepted quantities of curb will be paid for at the unit price per linear foot for each type of curbing specified, complete in place to the satisfaction of the RPR.

700-5.3 Sign Installations. The accepted quantities of installed NHDOT Type C signs will be paid for at the Contract unit price per each unit complete in place to the satisfaction of the RPR.

700-5.4 Sign Removals. The accepted quantities of removing NHDOT Type C traffic sign will be paid for at the Contract unit price per each unit to the satisfaction of the RPR.

700-5.5 Walkway Modifications. Payment shall be made at the lump sum item price for the Walkway Modifications as outlined on the plans and as noted herein. This price shall be full compensation for the removal and disposal of existing materials; layout reconfiguration work with associated materials, equipment and appurtenances; and for furnishing all labor, materials, equipment, tools, excavation, waste materials removals and proper disposal, new and supplemental materials, system replacements and/or modifications (as necessary), compaction, grading to the adjacent existing finished grades, pavements, and all incidentals necessary to satisfactorily complete the item.

700-5.6 Old Access Gate and Island Area Removal. Payment shall be made at the lump sum item price for the Old Access Gate and Island Area Removal as outlined on the plans and as noted herein. This price shall be full compensation for the removal of the existing structures, access gates with associated equipment and appurtenances, power supply for the access gate buildings, and other identified items; final layout reconfiguration work, and for furnishing all labor, materials and equipment, tools, shutdown coordination with the Utility Supply Company, excavation, waste materials removals and proper disposal, salvaging (at the Owners discretion) of identified items and associated transportation to storage, supplemental materials, system modifications (as necessary), compaction, grading to match the adjacent existing finished grades, restoration of turf growth, and all incidentals necessary to satisfactorily complete the item.

700-5.7 Lot C Entrance Canopy Removal and Access Gate Relocation. Payment shall be made at the lump sum item price for the Lot C Entrance Canopy Removal and Access Gate Relocation as outlined on the plans and as noted herein. This price shall be full compensation for the removal of the existing canopy, layout reconfiguration work, and relocation of the access gate with associated equipment and appurtenances and for furnishing all labor, materials and equipment, tools, coordination with the MHT IT Department (as necessary), excavation, waste materials removals and proper disposal, salvaging and temporary storage, and resetting of the identified items, supplemental materials, system modifications (as necessary), compaction, grading to the adjacent existing finished grades, pavements, restoration of turf growth, and all incidentals necessary to satisfactorily complete the item to the satisfaction of the RPR.

700-5.8 Lot C Egress Gate Relocation. Payment shall be made at the lump sum item price for the Lot C Egress Gate Relocation as outlined on the plans and as noted herein. This price shall be full compensation for the removal of the existing access gate with associated equipment and appurtenances and installation of a new chain link fence gate. Payment shall also be for furnishing all labor, materials and equipment, tools, excavation, waste materials removals and proper disposal, salvaging (at the Owners discretion) and transporting gate materials to storage, and installation of the new identified gate items, supplemental materials, compaction, grading to the adjacent existing finished grades, restoration of turf growth, and all other minor incidentals necessary to satisfactorily complete the item to the satisfaction of the RPR.

700-5.9 Cul-de-Sac Removals. Payment shall be made at the lump sum item price for the Cul-de-Sac Area Removals as outlined on the plans and as noted herein. This price shall be full compensation for the removal of the existing structures, access gates with associated equipment and appurtenances, and other identified items; and final layout reconfiguration work. Payment shall also be for furnishing all labor, materials and equipment, tools, shutoff coordination with the Utility Supply Company (as necessary), excavation, waste materials removals and proper disposal, salvaging (at the Owners discretion) and temporary storage, and resetting of the identified items, supplemental materials, system modifications (as necessary), compaction, grading to match the adjacent existing finished grades, restoration of turf growth, and all incidentals necessary to satisfactorily complete the item.

700-5.10 Water Works Removal or Relocations. Payment shall be made at the lump sum price for removal or relocation of each of the identified water works site items as outlined on the plans and as noted herein. This price shall be full compensation for the removal, installation and relocation of water works site items with associated equipment and appurtenances and for furnishing all labor, materials and equipment, tools, coordination with Manchester Water Works, excavation, removed waste materials and proper disposal, salvaging of identified items to Owner (at their discretion), water used for dust control, supplemental borrow backfill material, water work relocation modifications, compaction, grading to the adjacent existing finished grades, and all incidentals necessary to satisfactorily complete the work.

Payment will be made under:

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|-----------------|--|
| Item M-700-5.1a | Base Course Material - per cubic yard |
| Item M-700-5.2a | Granite Curb (Straight) - per linear foot |
| Item M-700-5.2b | Granite Slope Curb (Straight and Radial) - per linear foot |

Item M-700-5.2c	Remove, Salvage and Reset Granite Curb (Straight) - per linear foot
Item M-700-5.2d	Remove, Salvage and Reset Granite Slope Curb (Straight and Radial) - per linear foot
Item M-700-5.3a	Traffic Sign – NHDOT Type C - per square foot
Item M-700-5.3b	Wayfinding Sign – NHDOT Type C - per square foot
Item M-700-5.3c	Removal of Traffic Sign - per unit
Item M-700-5.4	Walkway Modification – per Lump Sum
Item M-700-5.5	Old Access Gate and Island Area Removal - Per Lump Sum
Item M-700-5.6	Lot C Entrance Canopy Removal & Access Gate Relocation – per Lump Sum
Item M-700-5.7	Lot C Egress Gate Relocation – per Lump Sum
Item M-700-5.8	Cul-de-Sac Area Removal – per Lump Sum
Item M-700-5.9a	1” Copper Water Service Removal & Decommissioning – per Lump Sum
Item M-700-5.9b	8” Cast Iron Water Service Removal & Decommissioning – per Lump Sum
Item M-700-5.9c	Remove, Salvage and Relocate Hydrant – per Lump Sum

REFERENCE

NHDOT	2016 New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, or latest edition
MWW	Manchester Water Works Standard Details

END OF ITEM M-700

ITEM M-750
STORMWATER TREATMENT SYSTEM

DESCRIPTION

750-1.1 This work shall consist of the furnishing and installation of the stormwater treatment (infiltration) system, as well as the associated structure and appurtenance items relating to stormwater infiltration improvements as shown on the plans, required by the system manufacturer, or as directed by the Owner's representative (Resident Project Representative (RPR)). The stormwater treatment system shown on the plans is an infiltration chamber system to control stormwater runoff. The chamber system retains and allows for effective infiltration into the soil.

MATERIALS

750-2.0 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.

750-2.1 The Contractor shall supply all materials and equipment required to perform the identified work and be in accordance with these specifications and all Federal, state and local regulations. Material not identified herein, or conforming to other sections of these specifications, shall meet the requirements of the 2016 New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, or latest edition, or as modified within this specification.

750-2.2 All temporary facilities, equipment, and materials to perform the utility removals must adhere to and/or meet EPA, OSHA, and NIOSH regulations, as well as all other Federal, state, and local regulations.

750-2.1 General Stormwater Treatment Infiltration System. The stormwater treatment system shall be capable of treating contaminants from stormwater runoff. The stormwater treatment system shall include inlet diversion manhole(s), stormwater isolation chamber rows, stormwater treatment chamber rows, manifolds between stormwater treatment rows, crushed stone aggregate, inspection ports to observe the treatment, geotextiles materials (separation and erosion), and all other incidental materials required for complete installation.

750-2.1.1 The stormwater treatment system shall be of a hydraulic design that includes flow controls designed and certified by a professional engineer using accepted principles of fluid mechanics to a pre-determined level in order to prevent surcharging the structures on the site.

750-2.1.2 The stormwater treatment system supplier shall also submit data on field-testing of a stormwater treatment system similar to the system specified herein which demonstrates at least 80% net annual TSS removal.

750-2.2 Stormwater Treatment Infiltration Design Criteria. Stormwater Treatment System shall be sized to meet the design criteria stipulated above and provided on the plans.

750-2.2.1 The system shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.

750-2.2.2 The stormwater treatment system shall have a method of pre-treatment to remove sediment (i.e. isolation chamber row). The stormwater treatment system shall provide direct access to the isolation chamber rows and manholes without the excavation of components for all maintenance operations.

750-2.2.3 The stormwater treatment system inverts shall be as indicated on the plans for the drainage system components.

750-2.2.4 The stormwater treatment system shall be of a type that has been installed and used successfully for a minimum of five (5) years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff. The stormwater treatment system shall be a StormTech Systems as manufactured by StormTech LLC, 20 Beaver Road, Suite 104, Wethersfield, Connecticut (Contact Information: Tel. (860) 529-8188 Fax: (866) 328-8401 Toll-Free: (888) 892-2694 Email: techinfo@stormtech.com, Website: www.stormtech.com) or an approved equal.

750-2.2.5 Stormwater Treatment Infiltration Final Design Submittal: A final design of the stormwater treatment system shall be submitted by the Contractor. The Contractor shall submit a digital PDF sets of detailed design calculations and construction drawings for approval at least two (2) weeks prior to the beginning of infiltration system construction. All calculations and Shop Drawings shall be prepared and sealed by a professional Civil Engineer experienced in stormwater treatment system design and licensed in the State of New Hampshire. The Engineer shall approve the design submittal prior to any installation work.

750-2.3 Stormwater Treatment Infiltration System Chambers. Stormwater Treatment System Chambers shall be constructed of injection molded polypropylene resin inherently resistant to environmental stress cracking with adequate stiffness high temperatures experienced during installation and service conforming to ASTM F2418-16a *Standard Specification for Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers* and ASTM F2787 *Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers*. The chambers shall be required to meet AASHTO HS-20 design loading. The chambers shall be 30" tall, 51" wide and 90.7" long with an open bottom (StormTech Model SC-740 or equivalent).

750-2.3.1 To maintain the width of the chambers during shipping and handling, chambers shall have an integral, interlocking stacking lug.

750-2.3.2 To ensure a secure joint during installation and backfill, the height of the chamber joint shall not be less than two inches (2”).

750-2.3.3 To ensure the integrity of the arch during installation:

- a. The arch stiffness constant as defined by in section 6.2.8 of ASTM2418 shall be greater than or equal to 550 lbs/inch/inch, and
- b. To resist chamber deformation during installation at elevated temperatures (above 73°F), chambers shall be produced from reflective gold or yellow colors.

750-2.4 Stormwater Treatment Infiltration System Media (Foundation and Embedment). The infiltration system media for both the foundation and embedment shall be the same material. This material shall be a clean, crushed, angular stone aggregate providing 40% voids and be washed stone with the majority of the particles between 3/4” to 2” dimension. This crushed stone shall be a minimum of 6” over the chambers, between the chambers, and a minimum 6” below the chambers.

750-2.5 Stormwater Treatment Infiltration System Geotextile. The infiltration system separation geotextile material shall be non-woven geotextile meeting AASHTO M288 Class 2 Separation requirements to provide a separation layer to prevent soil intrusion between the stone and the subgrade soils, excavation sidewalls, and the fill materials. The soil erosion geotextile material shall be woven geotextile meeting AASHTO M288 Class 1 to provide scour protection over the bedding stone at all chamber inlet rows. The geotextile shall meet Geosynthetics Model 601T Non-Woven or an equivalent.

750-2.6 Granular Backfill Material. It is assumed supplemental backfill material may be necessary for the backfill of the infiltration system between the infiltration media and the roadway cross section. This backfill material shall conform to the New Hampshire Department of Transportation Standard Specifications §209 Granular Backfill using Item 209.4 Granular Backfill (Gravel). Granular backfill (gravel) shall consist of a mixture of stones or rock fragments and particles with 95 to 100 percent passing the 3” sieve and 25 to 70 percent passing the No. 4 sieve.

750-2.7 Precast Concrete Structures. Refer to Section D-751 *Manholes, Catch Basins, Inlets and Inspection Holes* for the material specifications.

750-2.8 Miscellaneous Concrete. Miscellaneous Concrete shall be proportioned, placed, and cured per NHDOT Standard Specification Section 520 in accordance with the modified Table 520-1A – Classes of Concrete as identified on the plans and as follows:

Table 520-1A - Classes of Concrete

Concrete Class	Minimum Expected 28 Day Compressive Strength ¹	Maximum Water/Cement Ratio ²	Entrained Air Percent	Permeability Target Value ⁶
	PSI			kΩ-cm
AA	4,000	0.444	5 to 9	20
A	3,000	0.464	4 to 7	10

CONSTRUCTION METHODS

750-3.0 General Requirements. The Contractor shall conduct the site improvement installations and removal operations in a safe, legal, and responsible manner and shall ensure that any equipment, material, or method used shall be safe for the workers and the public. All laws, rules, regulations, utility supplier requirements, and local building codes shall be followed. The Contractor is responsible to secure all permits for any work as necessary, coordinate with all utility supply company owners, and to properly dispose of the waste materials from the removal of waste materials, structures and appurtenances.

750-3.0.1 Existing Utility Dig Sage. The Contractor shall protect all utility lines to remain during the installation or removal of any adjacent utilities. **At least seventy-two (72) hours (not including weekends and Holidays) in advance** of the commencement date of the utility installations or removals, the Contractor shall notify all operators who have underground or overhead facilities at or near the proposed building demolition and utility removal areas through the one-call notification system (**Dig Safe System – MA/ME/NH/RI/VT - Dial 811 or www.digsafe.com**). In addition, the Contractor shall contact all utility owners and request a Pre-Construction Conference with all operators having underground or overhead facilities at or near the proposed demolition and utility removal area, as required.

All installation work shall be as outlined within this specification, unless otherwise shown in the manufacturer's installation recommendations or project plans, or directed by the RPR.

750-3.1 Stormwater Treatment Infiltration System. Prior to delivery, the Contractor shall provide shop drawings showing details of construction, by-pass manholes, miscellaneous appurtenances, materials to be used, all applicable standards for materials and design assumptions prepared, stamped and signed by a licensed Professional Engineer as noted to be part of the final design submittal in paragraph 750-2.2.5.

750-3.2 Stormwater Treatment Infiltration System Installation. The Stormwater Treatment System shall be installed at the location as shown on the plans, in accordance with the details as shown on the plans, and in accordance with the manufacturer's material specifications and installation method recommendations.

750-3.2.1 The stormwater treatment chambers shall be placed on a level subgrade. The foundation stone surface shall also be level and have this stone placed to the depth as shown on the details and to approximately one foot (1') above the chamber invert. This stone shall be placed in six-inch (6") maximum lifts using two (2) full coverages with a vibratory compactor. The embedment stone (i.e. fill material surrounding the chambers from foundation stone to the granular backfill) as shown the details and may be placed without compaction to a flat, level surface to required depth above the chambers. Where infiltration surfaces may be compromised by compaction, for the standard load conditions, the flat, level surface may be achieved by raking or dragging without compaction equipment.

750-3.2.2 The perimeter infiltration media stone must be extended horizontally to the excavation wall for both vertical and sloped excavation walls and the entire infiltration media stone shall be wrapped with the geotextile material as shown on the details.

750-3.2.3 The granular backfill material shall be installed to the depth as shown in the details for the section above the infiltration media and the pavement section materials. Install the pavement section over the stormwater treatment infiltration system as shown on the details.

750-3.2.4 Install all precast concrete structures, inspection ports, weir diversion plates, and other appurtenances as shown on the plans to interconnect to the existing drainage systems.

750-3.2.5 The Stormwater Treatment System shall be tested in accordance with the manufacturer's recommendations.

750-3.3 Protection of Existing Facilities and Utilities to Remain. The Contractor shall be responsible for any provisions necessary to protect utilities and any site facilities during any installation operations using means acceptable to the facility or utility owner and the RPR. If such facilities or utility lines cannot be protected in place, the Contractor shall temporarily relocate the facilities or utility lines, as necessary, in coordination with the facility or utility owner to protect these utilities prior to undertaking any installation work that might affect these facilities or utility lines. There shall be no additional cost to the Owner for any coordination and necessary protection provisions or temporary relocation of facilities or utilities.

750-3.4 Disposal of Removed Materials. Disposal of materials shall be in accordance with all federal, state, and local laws, rules, and regulations; any provision found elsewhere in the Contract Documents; and most specifically in New Hampshire Department of Transportation Standard Specifications §202 Removal

of Structures and Obstructions; New Hampshire RSA 149-M Solid Waste Management; and New Hampshire Department of Environmental Services Division of Waste Management rules and regulations and shall be subject to the approval of the RPR. If necessary, the Contractor shall provide to the RPR a disposal plan at least fifteen (15) days prior to removal of materials from the site. Disposal plan shall identify the location of disposal, license and/or permit number of the disposal facility or facilities, as required for disposal. If applicable, delivery tickets from the location of disposal indicating date, time, and weight of debris disposed at the facility shall be provided to the RPR.

750-3.5 Dust Control. Provisions shall be made on the site to control the quantity of dust resulting from site removal or installation operations by wetting the immediate work area with water, or other appropriate spraying agents, or by means acceptable to the Owner's representative. The Contractor shall also perform sweeping operations to keep any paved surface clean from vehicle tire tracking from the work zone. There shall be no additional cost to the Owner for any dust control for the work.

METHOD OF MEASUREMENT

750-4.1 Stormwater Treatment Infiltration System. Measurement shall be made for the Stormwater Treatment Infiltration System as a lump sum item as approved by the RPR. There will be no separate measurement for any associated structures, materials, equipment and/or miscellaneous appurtenances indicated on the plans as required for the complete installation of the system. This item also includes all backfill material required for the system, as well as any other incidental item for a complete stormwater treatment infiltration system to the satisfaction of the RPR. This item also includes any Final Design by the manufacturer as part of the submittal process.

The diversion weir plate in the existing precast structure, inlet/outlet pipes to the stormwater treatment infiltration system, and pavement box section (i.e. base course and bituminous materials) shall be measured separately and will not be considered to be part of the lump sum item.

BASIS OF PAYMENT

750-5.1 Stormwater Treatment Infiltration System. Payment shall be made at the lump sum item price for the Stormwater Treatment Infiltration System as outlined on the plans and as noted herein. This price shall be full compensation for the excavation: removal and disposal of existing materials; installation of materials (including manholes, integral risers, inspection ports, all appurtenances, etc.), backfilling; and for furnishing all labor, materials, equipment, tools, excavation, waste material removals and proper disposal, new and supplemental backfill materials, compaction, grading to the adjacent existing finished grades, and all incidentals necessary to satisfactorily complete the system in place to the satisfaction of the RPR.

Separate payment shall be made for the diversion weir plate in the existing precast structure, inlet/outlet pipes to the stormwater treatment infiltration system, and pavement box section (i.e. base course and bituminous materials) and will not be considered to be part of the lump sum item. Otherwise all items necessary for the complete installation shall be considered for payment as part of the lump sum.

Payment will be made under:

Item M-750-1	Stormwater Treatment Infiltration System - per Lump Sum
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REFERENCE

ASTM F2418-16a	Standard Specification for Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers or latest edition
ASTM F2787	Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers
NHDOT	2016 New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, or latest edition

END OF ITEM M-750

ITEM M-800
MODIFIED RECLAIMED BASE COURSE

DESCRIPTION

800-1.1 GENERAL. The work shall consist of producing a stabilized base course through the recycling of the existing pavement structure with a depth of acceptable existing base/sub-base material. This combination of pavement and base/sub-base material is to be uniformly crushed, pulverized and blended with additional supplemental crushed aggregate material, as necessary, to meet the specified gradation. The material shall be processed and blended in place with additional supplemental material as necessary to make the reclaimed base material to be in accordance with the required gradation. After the proper gradation has been achieved and approved, the reclaimed base material shall be graded and compacted to the lines and grades shown on the Contract Documents or otherwise directed by the Engineer.

MATERIALS

800-2.1 GENERAL. Material shall meet the requirements of the 2016 New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction, or latest edition, using subsection 306 Reclaimed Stabilized Base Course and as modified within this specification.

The reclaimed base material shall consist of the existing pavement blended with the underlying “in situ” base and possibly subbase gravel and/or additional supplemental aggregate stone as required. The material shall be free of loam, clay, and deleterious materials such as brick, reinforcing steel, wood, paper, plaster, lathing, and building rubble, etcetera.

Reclaimed pavement material shall be processed by mechanical means and blended to form a homogeneous material. The equipment for producing the crushed material shall be of adequate size and have sufficient adjustments to produce the desired materials. Any blended materials that are stockpiled for more than 3 months shall be reworked to a uniform material and retested prior to use. However, the Engineer may require additional testing any time the materials appear excessively hard, wet and/or segregated. The processed materials shall be stockpiled in such a manner as to minimize segregation of particle sizes. Any reclaimed pavement borrow material shall come from approved sources and stockpiles. The amount of combined asphalt pavement shall not exceed 50% by volume as determined by visual inspection, and/or by laboratory tests required by the Engineer.

a. Gradation Requirements. The gradation of the final mixture shall fall within the range indicated in Table 1, when tested in accordance with ASTM C 117 and C 136. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.

**TABLE 1. REQUIREMENTS FOR GRADATION OF RECLAIMED BASE COURSE MATERIAL
(AS MODIFIED TO USE AS BASE COURSE MATERIAL)**

<u>Sieve Size</u>	<u>Allowable Range</u>
	<u>Percentage Passing by Weight</u>
3 inch	100
1-1/2 inch	80 – 100
3/4 inch	55 – 90
No. 4	40 - 70
No. 200	0 – 10

The portion of the materials passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index of not greater than 6. The liquid limits shall be determined by AASHTO T90.

The Contractor shall verify the reclaimed material meets the proper gradation with laboratory gradations as outlined within these Specifications and receive approval from the Engineer for the use of the recycled material prior to any placement of the material. **It is unknown whether supplemental crushed aggregate material will be necessary** to meet the gradation requirements, **the Contractor shall verify based on field sampling and testing**. A quantity of supplemental aggregate has been allocated to allow for varying field conditions.

800-2.2 SUPPLEMENTAL AGGREGATE MATERIAL. Aggregate for Crushed Stone for Blending, used to correct gradation deficiencies, shall conform to the requirements of NHDOT Standard Specifications Subsection 304.2.1.1 and the requirements of Section 703, Table 703-1 – Required Grading, Grading Course Aggregates #467 for 1-1/2” stone, as applicable. The supplemental aggregate material shall be approved by the Engineer prior to use.

The supplemental aggregate materials shall consist of hard, durable particles or fragments of stone or gravel. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used for aggregate base course materials. Fine particles shall consist of natural or processed sand. The materials shall be free of harmful amounts of organic material. Unless otherwise specified, the percent wear of base course material shall not exceed 50 percent as determined by AASHTO T 96, Grading A.

The crushed stone shall be reasonably free from clay, loam or deleterious material and not more than 1.0% of satisfactory material passing a No. 200 sieve will be allowed to adhere to the crushed stone. Where crushed stone is to be used for surfacing, this requirement shall be not more than 0.5% of satisfactory material passing a No. 200 sieve.

The stone shall be uniformly blended according to the grading requirements for the respective stone sizes shown on the following Table:

**TABLE 2. (NHDOT Table 703-1) Required Grading, Graded Coarse Aggregate
(Percent Passing by Weight)**

	ASTM #467
Sieve Size	#4 to 1 ½ in
2 in	100
1 ½ in	95-100
¾ in	35-70
3/8 in	10-30
No. 4	0-5

800-2.3 SAMPLING AND PRETESTING. The Contractor will take and analyze the existing “in-situ” material data in the Contract Documents, verify the estimate the depth to be recycled as shown on the plans and provide the following information in the bid proposal for each:

1. The estimated depth of existing asphalt pavement material to be recycled.
2. The estimated aggregate gradation of the material after recycling.
3. The estimated size and quantity of additional crushed aggregate to be used.

The information supplied in the Contract Documents is intended to be an indication of the existing conditions and in no way releases the Contractor from the responsibility of fulfilling the requirements of

this specification during the project. Any gradation deficiencies in the existing materials, as indicated by the Construction Document data, or additional test pits during construction, shall be corrected by blending the aggregate material into the mixture. The Contractor shall prepare a job mix formula for the recycled material and the supplemental crushed aggregate (as required) and submit to the Engineer for approval. After the blending of the materials using the job mix formula, the Contractor shall submit gradations and receive approval prior to the placement of the recycled stabilized base material.

CONSTRUCTION METHODS

800-3.1 GENERAL. Reclaiming operations shall not be permitted when the existing pavement or sub-base contains frost, when the sub-base is excessively wet as determined by the Engineer, nor when the air or surface temperature is below 40°F. Prior to the start of reclaiming operations, the Contractor shall locate and protect existing drainage and utility structures and underground pipes, culverts, conduits and other appurtenances. The limit of each sequence of the reclamation process shall be as outlined in the phasing of the project, unless otherwise directed by the Engineer in order that the placing of pavement structure will be completed before beginning the next sequence of reclamation work.

800-3.2 EQUIPMENT. The reclaimed stabilized base shall be processed, using approved reclaimers. Equipment such as a milling machine or a rock crushing plant will not be permitted. Reclaiming equipment shall be equipped with a gauge to show depth of material being processed. The recycling equipment shall have a positive depth control to ensure a uniform depth of processing. This equipment shall have the ability to process the complete design depth specified into a homogeneous mass.

Failure to meet gradation requirements or an insufficient production rate may be considered cause for rejection of the equipment, the construction methods, or both. Failure to meet gradation requirements due to improper equipment or construction methods, shall not constitute a reason for any additional compensation for the import and blending of any aggregate to meet the deficiencies.

At least one vibratory roller shall be used on each reclaimed surface, and shall have a compacting width of not less than five feet. Each roller shall have a gross weight of not less than fifteen tons. Approved equipment shall be maintained in satisfactory working condition at all times.

800-3.2 STRUCTURE REMOVAL & ADJUSTMENTS. Any existing structures shown on the plans to be removed (i.e. catch basin frame/grate, manhole frame/cover, valve box, etc.) shall be performed prior to the reclamation process as applicable and considered to be incidental to the work. All existing drainage and other utility structures are to be located and referenced with witness stakes prior to the reclamation process. If the existing structure configuration or utility casting allows, the existing castings and structure adjustment materials (i.e. bricks) are to be removed and have a steel plate installed. The steel plate shall be placed over the structure opening to allow for a minimum depth **six inches (6") below the bottom of the proposed reclaimed base course** (i.e. or estimated to be least **eighteen inches (18")** for this project). The voids remaining after the structure casting and adjustment materials have been removed are to be filled with a suitable material as determined by the Engineer. **If determined by the Engineer to not be feasible to lower the structure casting to allow for a sufficient depth below the reclaimed base course, as noted above, due to the existing structure configuration, the Contractor shall perform the reclamation work around the existing structure.** The reclaiming operation shall not begin until: (1) all existing structures to be removed have been removed; (2) all allowable structures have been lowered as stated above; and (3) all structures not feasible to be lowered have been clearly identified and referenced for the Contractor to perform the reclamation work around the structure. It shall be the Contractor's responsibility to maintain any drainage to be properly functioning in the areas under construction, including up to the time when the final system is to be put into use. In addition, any negligence by the Contractor for not properly protecting any structure and casting remaining in place during the reclamation process, the Contractor shall repair the

structure and/or replace the casting at no additional cost to the Owner. All structures allowed to be lowered for the reclamation process and worked around will be reset to the finish grade elevation after the reclamation process. All of these costs will be considered incidental to the reclamation process.

800-3.3 ESTIMATED RECLAIM DESIGN DEPTH AND MATERIAL BLENDING. The Contractor shall review the existing site conditions, with additional sampling and testing to determine material blending, to verify the assumptions herein and make their own conclusions for the prosecution of the reclamation work. In order to obtain a good mixture, it is anticipated there shall be at least two (2) passes of the reclamation equipment for the area to be reclaimed, whether supplemental aggregate is added or not. Any supplemental crushed aggregate shall be applied after the first pass and reblended with the reclaimed material from the first pass.

It is anticipated that there will be at least TEN inches (10”) – TWELVE inches (12”) depth of available Reclaimed Base Material, prior to the additional of any potential Supplemental Crushed Aggregate Material required. However, it is the Contractor shall verify this reclamation depth estimate as part of the sampling and testing to determine the amount, if any, of the supplemental crushed aggregate material. It is anticipated the entire Reclaimed Base Material depth, with any supplemental crushed aggregate added, shall be remain in place, reshaped and compacted for use as base material for any new bituminous pavement to be installed in a future project..

800-3.4 RECLAIMING OPERATIONS. Prior to the start of reclamation operations, the existing pavement shall be swept with a power sweeper to remove all trash, sand, dirt, organic matter, and other undesirable material, to the satisfaction of the Engineer. Care shall be exercised to save all pavement for reclaiming if trenches are constructed prior to processing.

The existing pavement shall be pulverized together with the underlying base and possibly subbase course material. The pulverizing operation shall blend the existing pavement and base course into a homogeneous mass, using the bitumen contained in the pavement as a stabilizer. When supplemental crushed aggregate is necessary to meet the finished gradation, the supplemental crushed aggregate shall be applied to the reclaimed surface for a second pass and re-blended with the previously reclaimed material from the first pass.

The Contractor shall perform a sieve analysis of the reclaimed material for every 5,000 square yards of material processed, or as often as conditions may require as determined by the Engineer, to verify the final gradation has been achieved. These verification test results shall be made available to the Engineer as soon as possible to allow for the compaction of the reclaimed base material.

Excess material, unless specified otherwise, shall become the property of the Contractor.

800-3.5 COMPACTION AND DUST CONTROL. The reclaimed material shall be fine graded, rolled, and compacted to approximately the pre-existing grades as indicated on the Contract Drawings or as directed by the Engineer. The reclaimed base course shall be tested for compaction, smoothness, and accuracy of grade in accordance with the applicable provisions of these specifications.

Quality Control of the reclaimed base material placement and compaction is the responsibility of the Contractor. The required density for Quality Assurance shall be measured by a Nuclear Density Gauge supplied by an Independent Testing Company selected and retained by the Contractor with the testing witnessed by the Engineer. All Nuclear Density Gauge Testing shall be performed in conformance with ASTM D 6938 “*Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) (latest revision)*” using the Direct Transmission Method.

If any portions of the work are found to be unacceptable by the Engineer based on this Quality Assurance testing, such portions shall be reprocessed (as necessary), re-graded, and re-compacted until the required smoothness and accuracy are obtained at no additional cost to the Owner.

Water may be added during fine grading to improve workability. Additional water shall be applied prior to compaction and may require mixing to blend with reclaimed material to ensure adequate compaction

At the end of each day's progress, the Contractor shall apply water for dust control, unless otherwise directed by the Engineer. At other times when necessary, water for dust control shall be applied as directed by the Engineer. A grader, roller, and water truck/wagon shall be maintained on the project site during the reclamation process. The Contractor shall submit to the Engineer, in writing, a 24-hour availability telephone number for any emergency maintenance dictated by the weather conditions or as determined by the Engineer, for repair, compaction, and dust control.

800-3.6 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. Aggregate base course shall be accepted for density on a lot basis. A lot will consist of approximately 2,500 square yards.

Each lot shall be divided into two equal sublots. One test shall be made for each subplot. Sampling locations will be determined by the Engineer on a random basis in accordance with statistical procedures contained in ASTM D 3665.

Each lot will be accepted for density when the field density is **ninety-five percent (95%) of the maximum density** of laboratory specimens prepared from samples of the reclaimed material on the jobsite. The specimens shall be compacted and tested in accordance with **ASTM D 698/AASHTO T99, (Standard Method)**.

The in-place field density may also be determined in accordance with ASTM D 1556 (Sand Cone Method) or ASTM D 2167 (Rubber Balloon Method) at the discretion of the Contractor. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached.

800-3.7 SURFACE TOLERANCES. After the reclaimed base 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, reshaped and recompacted 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. Accuracy. The grade and crown shall be measured on a 50-foot grid and shall be within +1/2 inch and -1/2 inch of the specified grade.

800-3.8 THICKNESS CONTROL. The thickness of the base course shall be within +1/2 inch and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR. Tests shall be taken at intervals representing no more than 1000 square yards per test. Sampling locations will be determined by the RPR per ASTM D3665. Where the thickness is deficient by more than 1/2 inch, the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches, adding satisfactory base material of proper gradation, and the material shall be blended and recompacted to grade. Additional test holes may be required to identify the limits of deficient areas.

If the reclaimed stabilized base is not sufficient to complete the base course depths required by the project details, additional crushed gravel conforming to NHDOT 304.3 or 304.4, in lieu of excess reclaimed base course from other areas, may be used to make up the deficiency.

800-3.9 PROTECTION. Work on the base course shall not be accomplished during freezing temperatures, nor when the subgrade is wet. When the aggregates contain frozen materials or when the underlying course is frozen, the construction shall be stopped.

Hauling equipment may be routed over completed portions of the base course, provided no damage results and provided that such equipment is routed over the full width of the base course to avoid rutting or uneven compaction. However, the Engineer in charge shall have full and specific authority to stop all hauling over completed or partially completed base course when, in his/her opinion, such hauling is causing damage. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at his/her own expense.

800-3.10 MAINTENANCE. Following the completion of the reclaimed base course, the Contractor shall perform all maintenance work necessary to keep the base course in a condition satisfactory for priming. After priming, the surface shall be kept clean and free from foreign material. The base course shall be properly drained at all times. If cleaning is necessary, or if the prime coat becomes disturbed, any work or restitution necessary shall be performed at the expense of the Contractor.

Before preparations begin for the application of a surface treatment or for a surface course, the base course shall be allowed to partially dry until the average moisture content of the full depth of base is less than 80% of the optimum moisture of the base mixture. The drying shall not continue to the extent that the surface of the base becomes dusty with consequent loss of binder. If during the curing period the surface of the base dries too fast, it shall be kept moist by sprinkling until such time as the prime coat is applied as directed.

The Contractor shall remove all survey and grade hubs from the base courses prior to placing any bituminous surface course.

METHOD OF MEASUREMENT

800-4.1 Reclaimed Base Course shall be measured in-place by the Square Yard to the limits specified on the Contract Drawings, or as directed by the Engineer. No deductions will be made for the area of surface utility structures or as otherwise noted on the Contract Drawings. Although not anticipated, the removal of existing small structures (i.e. castings, etc.) necessary for the processing of the reclaimed base material will not be measured and will be considered incidental to this Item. Also as necessary, the lowering and the plating of existing structures or the protecting of existing structures necessary for the processing of the reclaimed base material will not be measured and will be considered incidental to this Item. In addition, the resetting of the structure frames and grates/covers to the final grade shall also be considered incidental.

800-4.2 Supplemental Aggregate Material, as noted above for providing additional volume and/or correcting gradation deficiencies, shall be measured per ton, as verified from truck receipts from calibrated weight scales at the aggregate sources. It is unknown whether supplemental aggregate material is to be used for the Reclaimed Base Material. However, the Contractor shall have the final responsibility for determining the proper amount of reclaimed material requiring blending based on the actual site conditions.

BASIS OF PAYMENT

800-5.1 The accepted quantity of **Reclaimed Base Course**, as measured above, shall be paid for at the contract unit price bid per Square Yard. The unit price bid shall include full compensation for all labor,

tools, equipment, materials, and all incidental work necessary to complete the work as specified. This unit price shall include all compensation for crushing, pulverizing, blending with supplemental aggregate, sampling and testing, removal and handling, on-site hauling, temporary stockpiling, spreading and placing, grading, compacting, any incurred costs resulting from the Contractor's decision to process off site and not in place, and any incidental costs associated preparing reclaimed base course material.

Although not anticipated, the removal of any existing small structures (i.e. castings, etc.) necessary for the processing of the reclaimed base material will be considered incidental to this Item and no additional compensation will be allowed. Also as necessary, the lowering and plating of existing structures or the protecting of existing structures necessary for the processing of the reclaimed base material will be considered incidental to this Item and no additional compensation will be allowed. In addition, the resetting of the structures to the final grade after the reclamation process shall be considered incidental to this item.

Any equipment, materials or controls relating to the grading and compacting of all of the reclaimed base material shall also be considered incidental to the work. Water for dust control and compaction shall be considered incidental to the work. Calcium chloride for dust control is not allowed.

800-5.2 The accepted quantity of **Supplemental Aggregate Material** for providing added volume and/or correcting gradation deficiencies shall be paid for at the contract unit price per ton. The unit price bid shall include full compensation for all labor, equipment, materials, and all incidental work necessary to provide the material for blending to the site. The cost for blending this supplemental aggregate material with the reclaimed material will be paid as part of the Reclaim Pavement item noted above under 800-5.1.

Payment will be made under:

- | | |
|----------------|--|
| Item M-800-5.1 | Reclaimed Base Course -- per square yard |
| Item M-800-5.2 | Supplemental Aggregate Material -- per ton |

END OF SECTION M-800

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**ITEM M-900
OIL-WATER SEPARATOR**

CONTRACT DOCUMENTS

900-0.1 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

900-1.1 The work described in this section includes installation of factory assembled cylindrical, double-wall steel tank for below grade oil-water separator, complete with all specified and required accessories.

900-1.2 The oil-water separator shall be installed in the location indicated on the drawings.

900-1.3 QUALITY ASSURANCE.

900-1.3.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

- a. American National Standards Institute (ANSI) Standard: B16.5-81 Steel Pipe Flanges and Flanged Fittings
- b. American Public Health Association (APHA) publication: Standard methods for the Examination of Water and Wastewater
- c. American Society for Testing and Materials (ASTM) Standard: A 36-812 Structural Steel
- d. United States Environmental Protection Agency (EPA) Publication: Methods for Chemical Analysis of Water and Wastes
- e. Underwriter' Laboratories, Inc. (UL) Publications: UL-58 Steel Underground Tanks for Flammable and Combustible Liquids, UL-1746 Underground corrosion control system, and UL-525-79 Flame arrestors for use on vents of storage tanks for petroleum oil and gasoline
- f. American Petroleum Institute (API) Publications: API Publication 421 Monograms on Refinery Environmental Control-Management of Water Discharges; Design and Operation of Oil-Water Separators, as applicable.
- g. National Fire Protection Agency (NFPA): NFPA STD 30 Flammable and Combustible Liquids Code and NFPA STD 70 National Electrical Code, as applicable.

SUBMITTALS

900-2.1 SUBMITTALS. The Contractor shall submit a digital PDF copy of manufacturer's brochures and shop drawings on each oil-water separator to be installed to the Engineer for review and approval and three (3) copies of IOM manuals shall be submitted prior to shipment of separator.

MATERIALS

900-3.1 OIL-WATER SEPARATOR. The Oil-Water Separator shall conform to the following requirements:

a. The oil-water separator shall be designed for the specific project requirements and shall be a factory assembled unit which is a product of a manufacturer regularly engaged in the production of such equipment with similar units operating for a minimum of five (5) years. The design life of the oil-water separator shall have a minimum 30-year life. The separators shall be designed for gravity separation of free oils (hydrocarbons and/or petroleum products) along with some settleable solids from the influent. The oil separator vessels shall be designed for the separation and storage of flammable and combustible liquids.

b. The separators shall be designed in accordance with Stokes Law and the American Petroleum Institute (API) Publication 421 for the Design and Operation of Oil/Water Separators.

c. Construction and thickness of the separator shall be in strict accordance with specifications established in Underwriters' Laboratories, Subject (UL-58 Standard for Steel Underground Tanks) meeting or exceeding requirements for specified depth of burial of a horizontal steel tank. In addition, the separator capacities, dimensions, and construction shall be in strict accordance with Underwriters Laboratories UL-58.

d. The cylindrical separator shall be sized for the gallons total volume as indicated on the drawings. In addition, there shall be a pair of minimum 24" I.D. access manways to the separation chamber to provide for easy maintenance. The access manways shall have trunk extensions to allow for the hatch access to be extended to above the finish grade.

e. The separator shall be structurally designed to withstand underground soil pressure loads as dictated by the design depth below finished grade as indicated on the drawings, and/or static and dynamic loads for above ground location and installation.

f. Separator shall bear the UL1746 label. Construction shall consist of a steel tank of all welded double-wall construction and protected by a corrosion control system in strict accordance with STI-P3 specifications of the Steel Tank Institute (STI) and shall be in accordance with the National Association of Corrosion Engineer's code and applicable local codes. The corrosion protection systems shall include:

- i. Isolation spool pieces
- ii. Dielectric isolation gaskets and bushings
- iii. External surfaces commercial sand-blasted, coated with 10 mils DFT-100% Polyurethane or 125 mils DFT fiberglass reinforced polyester.
- iv. Cathodic protection system, using zinc anodes
- v. Tank corrosion monitoring capability
- f. Internal surfaces commercial sand blasted, coated with 10 mils DFT-100% polyurethane.

By virtue of the UL listing, separator shall be warranted against external corrosion for 30 years.

g. The oil/water separators shall have the following construction features for process:

- i. A flanged influent connection at the inlet end of the separators.
- ii. A flanged effluent water outlet.
- iii. One flanged recovered oil outlet.
- iv. One flanged gas vent.
- v. A velocity head diffusion baffle and wear plate assembly at the inlet.
- vi. A sediment chamber to disperse flow inside the vessel.
- vii. A sludge baffle to retain solids and sediment which has settled out of the flow.

viii. An oil/water separation chamber containing an inclined plate coalescer with removable, corrugated protected steel plates sloped toward the sediment chamber.

ix. A sectionalized removable impingement coalescer.

x. Isolation spool pieces at all tank connections.

xi. Exterior tank lifting lugs for handling and installation.

xii. External tank nylon hold-down straps, turnbuckles and dielectric liners.

h. The separator shall be designed for intermittent, variable or continuous flows of water, oil and/or any combination of non-emulsified oil-water mixtures containing up to 200,000 mg/L hydrocarbons and 100% hydrocarbons under spill conditions. The separators shall be designed in accordance with Stokes Law and the API Publication 421 for the Design and Operation of Oil/Water Separators.

i. The separator shall process uncontrolled surges of water, oil, or oil/water mixtures ranging from zero flow up to 100% of maximum hydraulic throughput capacity and provide water effluents which meet continuous discharge requirements of 15 PPM or less of oil and grease. The separator shall otherwise meet all Federal, State, and local requirements outlined in this specification.

j. The separator shall be designed in a manner to minimize solids build-up in the oil-water separator chamber, which could reduce the oil-water separation of the unit.

k. The separator shall process oily water influent by means of continuous gravity flow and by specific gravity differential with enhancement. The separator shall be engineered and sized to handle flows as shown on the drawings.

l. The preferred separator design will contain a corrugated "plate pack" to aid the separation process. Plate pack consists of multiple corrugated plates, inclined at an angle of approximately 45° to the horizontal. Number of plates shall be as needed to meet performance requirements. Plate pack shall be able to be fully removable as a single unit.

m. The separator shall have an inlet pipe having a flanged opening with the interior inlet pipe angled to flow against a laminar flow enhancer plate, welded to interior of the separator. The series of corrugated parallel plates shall be downstream set at a minimum 45 degree angle. This series of plates shall be located as close as possible to the inlet end of the separator in order to effect coalescence of the oil particles as soon as possible.

n. Inlet, outlet and separation compartment shall be vented to the atmosphere. All vents shall terminate at elevations above grade as indicated on the drawings and shall be equipped per governing codes. The top covers of the separator manways shall be removable. Covers shall be completely gasketed. Provide all connections for pipe as shown on the drawings. All maintenance and entry access hardware shall be stainless steel. The separator shall be furnished with fittings for vent, waste oil pump out, float sensors, and spare fitting for separate oil pump-out for oil removal prior to the oil reaching the manufacturer's recommended elevation for operation. The outlet pipe shall be the diameter as shown on the drawings and be braced to the end of the separator as required. The outlet pipe shall be flanged.

o. Electrical and Instrumentation Requirements. All furnished system designs shall be the manufacturer's standard with proven operating service and shall conform to the requirements of the National Electrical Code. The components shall be UL approved when required by Code. All furnished equipment shall be in accordance with the requirements of all applicable codes.

The control panel shall include, but not limited to: main power disconnect, system wiring, switches, indicating lights, and push button controls (if required). The panel components shall be mounted in a single common NEMA 4 electrical enclosure panel for the separator. All control circuits shall be rated for 120 volts AC, single phase service. The space between the inner and outer steel walls shall be monitored for leakage with an approved leak detection system. Electrical instrumentation systems to

control, monitor and test shall include the following:

- i. Level alarms (audible and visible) for high and high-high oil levels with individual contacts for remote alarm. Level settings shall be adjustable.
- ii. Leak between the interstitial space between inner and outer tank walls with audible and visual annunciation.
- iii. Local level indicators for both separated oil and effluent water compartments.
- iv. Level alarm (audible and visible) for low water level.

The control panel shall include but not be limited to:

- I. Indicating lights and alarms for: (1) High oil level and (2) High-High oil level Tank leak detection
- II. Pushbuttons for: (1) Alarm Test and (2) Alarm Silence
- III. Contact for remote Alarm Systems to indicate activation of local alarm, as applicable.

All exterior interconnecting wiring shall be routed in conduit and shall be suitable for outdoor service and/or direct burial as shown on the drawings.

INSTALLATION

900-4.1 Care shall be taken in loading and transporting to prevent damage to the oil/water separators and accessories. The equipment will be examined upon receipt at the jobsite, and no piece will be installed which is found defective. The tank manufacturer shall immediately replace or repair the defective item. Any damage shall be repaired as acceptable to the Owner and RPR. Prior to shipping, the open ends of all items shall be closed to prevent entry of foreign material. All transportation, storage, handling and preservation for all of the equipment and materials necessary for a complete installation shall be in accordance with the manufacturer's recommendations prior to installation and during the installation.

900-4.2 Pre-Installation Assembly Facility Testing. Prior to shipping, the manufacturer shall perform a hydrostatic test and inspect all completely assembled vessels and welds for leakage. All defective or leaking welds shall be repaired and re-hydrostatic tested in the completely assembled vessel. The manufacturer shall functionally test the completely assembled unit to ensure that all components function in accordance with design requirements. Satisfactory completion of all performed functional tests shall be documented with a certified test report and submitted to the Owner.

900-4.3 Installation shall be performed as shown on the drawings and in accordance with the oil-water separator manufacturer's installation manual and recommendations.

900-4.4 Post-Installation Field Testing. Field tests will be performed by the Contractor with a manufacturer approved installer after installation and connection of all services. The objective of these tests will be to verify equipment performance in accordance with specification requirements. The manufacturer shall prepare test procedure for field tests by the Contractor's installer and submit to the Owner for review. At the manufacturer's discretion, they may witness such tests at their option.

METHOD OF MEASUREMENT

900-5.1 Payment for the oil-water separator will be made on a lump sum basis. The lump sum shall include all items for a completed and in-place system, including but not limited to: labor, materials, equipment, excavation, bedding, backfill, concrete ballast anchors and strapping, and all other incidental items required to satisfy this Specification and shall be installed to the satisfaction of the RPR.

BASIS OF PAYMENT

900-6.1 The lump sum price bid for oil-water separator shall include all equipment, materials, and labor necessary to install the oil-water separator system.

Payment will be made under:

Project Item M-900-1 Oil-Water Separator - per Lump Sum

END OF SECTION M-900

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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

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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-lew-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.

This project will also have a New Hampshire Department of Environmental Services (NHDES) Alteration of Terrain (AoT) permit. As part of the EPA CGP and the NHDES AoT conditions, it is anticipated that there will be 3rd Party monitoring as part of the SWPPP compliance monitoring requirements.

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) development and submission of the USEPA NPDES CGP Notice of Intent, with all associated stormwater compliance monitoring, will be measured as a Lump Sum and all items to satisfactorily comply with all permit conditions will be considered incidental to the lump sum item.

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

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*.

102-5.2 The Storm Water Pollution Prevention Plan (SWPPP) development and submission of the USEPA NPDES CGP Notice of Intent, as well as all of the associated stormwater compliance monitoring for the USEPA NPDES CGP and NHDES AoT and all other incidental items to satisfactorily comply with all permit conditions will be paid as a Lump Sum and paid under:

- Item C-102-5.4 Storm Water Pollution Prevention Plan and Monitoring 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.

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. Schedule A Mobilization shall be limited to **three (3) percent** of only the total **Schedule A** project cost. **Schedules C1 and C2** Mobilization shall be limited to **ten (10) percent** for each of the total Schedule C1 and Schedule C2 project cost, respectively.

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 – 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 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 _L and P _U)	Positive Values of Q (Q _L and Q _U)							
	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.

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

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 $\frac{3}{4}$ 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

152-3.0 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
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ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
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 ³ (2700 kN-m/m ³))
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
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Software

FAARFIELD	– FAA Rigid and Flexible Iterative Elastic Layered Design
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U.S. Department of Transportation

FAA RD-76-66	Design and Construction of Airport Pavements on Expansive Soils
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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 ¹ (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

¹The "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 ± 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)
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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- μm (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 ³ (600 kN-m/m ³))
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 ³ (2,700 kN-m/m ³))
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
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END OF ITEM P-154

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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

Material Test	Requirement	Standard
Coarse Aggregate		
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 ¹	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles ²	ASTM D4791
Clay lumps and friable particles	Less than or equal to 3 percent	ASTM C142
Fine Aggregate		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

¹ 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.

² 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 ¹ (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 ² (425 µm)	10-30		±5
No. 200 ² (75 µm)	0-5		±3

¹ 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.

² 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 ± 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 m²). 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)
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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 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 ³ (600 kN-m/m ³))
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 ³ (2700 kN-m/m ³))
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

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% 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
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 ¹	ASTM D5821
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 ²	ASTM D4791
Bulk density of slag ³	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

¹ 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.

² 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).

³ 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 ¹

¹ 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) ¹	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA) ^{2,3}	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

¹ Test specimens for TSR shall be compacted at 7 ± 1.0 % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

² 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

³ 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 μ m)	18-38
No. 50 (300 μ m)	11-27
No. 100 (150 μ m)	6-18
No. 200 (75 μ m)	3-6
Minimum Voids in Mineral Aggregate (VMA)¹	15.0
Asphalt Percent:	
Stone or gravel	5.0-7.5
Slag	6.5-9.5
Recommended Minimum Construction Lift Thickness	2 inch

¹ 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 ¹	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%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-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%
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 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
Air Voids Total Mix (%)	2.0	5.0
Surface Course Mat Density (%)	92.8	-
Base Course Mat Density (%)	92.0	-
Joint density (%)	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 schedule¹

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject ²

¹ 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.

² 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

Material Test	Requirement	Standard
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 ¹	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 ²	ASTM D4791
Bulk density of slag ³	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

¹ 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.

² 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).

³ 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 ¹

¹ 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 ¹	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA) ^{2,3}	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

¹ Test specimens for TSR shall be compacted at 7 ± 1.0 % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

² 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

³ 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)	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 µm)	18-38
No. 50 (300 µm)	11-27
No. 100 (150 µm)	6-18
No. 200 (75 µm)	3-6
Voids in Mineral Aggregate (VMA)¹	15.0
Asphalt Percent:	
Stone or gravel	5.0-7.5
Slag	6.5-9.5
Recommended Minimum Construction Lift Thickness	2 inch

¹ 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- μ 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-501
CEMENT CONCRETE PAVEMENT**

DESCRIPTION

501-1.1 This work shall consist of pavement composed of cement concrete without reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans. The terms cement concrete, hydraulic cement concrete, and concrete are interchangeable in this specification.

MATERIALS

501-2.1 Aggregates.

a. Reactivity. Fine and Coarse aggregates to be used in PCC on this project shall be tested and evaluated by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Tests must be representative of aggregate sources which will be providing material for production. ASTM C1260 and ASTM C1567 tests may be run concurrently.

(1) Coarse aggregate and fine aggregate shall be tested separately in accordance with ASTM C1260, however, the length of test shall be extended to 28 days (30 days from casting). Tests must have been completed within 6 months of the date of the concrete mix submittal.

(2) The combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

(3) If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662 in lieu of ASTM C1567. If lithium nitrate admixture is used, it shall be nominal 30% \pm 0.5% weight lithium nitrate in water. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine aggregate. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and the parameters identified in the fine aggregate material requirements below. Fine aggregate material requirements and deleterious limits are shown in the table below.

Fine Aggregate Material Requirements		
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
Sand Equivalent	45% minimum	ASTM D2419
Fineness Modulus (FM)	$2.50 \leq FM \leq 3.40$	ASTM C136

Limits for Deleterious Substances in Fine Aggregate for Concrete		
Clay lumps and friable particles	1.0% maximum	ASTM C142
Coal and lignite	0.5% using a medium with a density of Sp. Gr. of 2.0	ASTM C123
Total Deleterious Material	1.0% maximum	

c. Coarse aggregate. The maximum size coarse aggregate shall be **1-1/2 inches**.

Aggregates delivered to the mixer shall be clean, hard, uncoated aggregates consisting of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates shall have no known history of detrimental pavement staining. Steel blast furnace slag shall not be permitted. Coarse aggregate material requirements and deleterious limits are shown in the table below; washing may be required to meet aggregate requirements.

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% 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
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 for any size group coarser than 3/8 (9.5 mm) sieve ¹	ASTM D4791
Bulk density of slag ²	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29
D-cracking (Freeze-Thaw) ³	Durability factor \geq 95	ASTM C666

¹ 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).

² Only required if slag is specified.

³ Coarse aggregate may only be accepted from sources that have a 20-year service history for the same gradation to be supplied with no history of D-Cracking. Aggregates that do not have a 20-year record of service free from major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless the material currently being produced has a durability factor greater than or equal to 95 per ASTM C666. The Contractor shall submit a current certification and test results to verify the aggregate acceptability. Test results will only be accepted from a State Department of Transportation (DOT) materials laboratory or an accredited laboratory. Certification and test results which are not dated or which are over one (1) year old or which are for different gradations will not be accepted.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (75 μ m)	ASTM C117	1.0 ¹
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert ² (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.40)	0.1 ³

¹ The limit for material finer than 75-μm is allowed to be increased to 1.5% for crushed aggregates consisting of dust of fracture that is essentially free from clay or shale. Test results supporting acceptance of increasing limit to 1.5% with statement indicating material is dust of fracture must be submitted with Concrete mix. Acceptable techniques to characterizing these fines include methylene blue adsorption or X-ray diffraction analysis.

² Chert and aggregates with less than 2.4 specific gravity.

³ The limit for chert may be increased to 1.0 percent by mass in areas not subject to severe freeze and thaw.

d. Combined aggregate gradation. This specification is targeted for a combined aggregate gradation developed following the guidance presented in United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. Base the aggregate grading upon a combination of all the aggregates (coarse and fine) to be used for the mixture proportioning. Three aggregate sizes may be required to achieve an optimized combined gradation that will produce a workable concrete mixture for its intended use. Use aggregate gradations that produce concrete mixtures with well-graded or optimized aggregate combinations. The Contractor shall submit complete mixture information necessary to calculate the volumetric components of the mixture. The combined aggregate grading shall meet the following requirements:

(1) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in paragraph 501-2.1d(4) below, the point thus determined shall fall within the parallelogram described therein.

(2) The CF shall be determined from the following equation:

$$CF = \frac{\text{(cumulative percent retained on the 3/8 in. (9.5 mm) sieve)}(100)}{\text{(cumulative percent retained on the No. 8 (2.36 mm) sieve)}}$$

(3) The WF is defined as the percent passing the No. 8 (2.36 mm) sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds (42 kg) of cementitious material per cubic meter yard greater than 564 pounds per cubic yard (335 kg per cubic meter).

(4) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary. The point determined by the plotting of the CF and WF may be adjusted during production ± 3 WF and ± 5 CF. Adjustments to gradation may not take the point outside of the parallelogram.

e. Contractors combined aggregate gradation. The Contractor shall submit their combined aggregate gradation using the following format:

Contractor's Combined Aggregate Gradation

Sieve Size	Contractor's Concrete mix Gradation (Percent passing by weight)
2 inch (50 mm)	*
1-1/2 inch (37.5 mm)	*
1 inch (25.0 mm)	*
3/4 inch (19.0 mm)	*
1/2 inch (12.5 mm)	*
3/8 inch (9.5 mm)	*
No. 4 (4.75 mm)	*
No. 8 (2.36 mm)	*
No. 16 (1.18 mm)	*
No. 30 (600 μm)	*
No. 50 (300 μm)	*
No. 100 (150 μm)	*

501-2.2 Cement. Cement shall conform to the requirements of **ASTM C-150 Type II**.

501-2.3 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 alkali content less than 3% per ASTM C311. 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 Resident Project Representative (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.

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

d. Ultrafine fly ash and ultrafine pozzolan. UltraFine Fly Ash (UFFA) and UltraFine Pozzolan (UFP) shall conform to ASTM C618, Class F or N, and the following additional requirements:

- (1) The strength activity index at 28 days of age shall be at least 95% of the control specimens.
- (2) The average particle size shall not exceed 6 microns.

501-2.4 Joint seal. The joint seal for the joints in the concrete pavement shall meet the requirements of Item P-605 and shall be of the type specified in the plans.

501-2.5 Isolation joint filler. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1751 or ASTM D1752 and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the RPR. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the RPR.

501-2.6 Steel reinforcement. Reinforcing, if required, shall consist of Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed conforming to the requirements of ASTM A1064.

501-2.7 Dowel and tie bars. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete.

a. Dowel Bars. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

b. Tie Bars. Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 Water. Water used in mixing or curing shall be potable. If water is taken from other sources considered non-potable, it shall meet the requirements of ASTM C1602.

501-2.9 Material for curing concrete. Curing materials shall conform to one of the following

specifications:

- a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class A, or Class B.
- b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.
- c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.
- d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 Admixtures. Admixtures shall conform to the following specifications:

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-entraining 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.

c. Other admixtures. The use of set retarding and set-accelerating admixtures shall be approved by the RPR prior to developing the concrete mix. Retarding admixtures shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating admixtures shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon (1.2 kg/L), and shall have the approximate chemical form as shown below:

Lithium Admixture

Constituent	Limit (Percent by Mass)
LiNO ₃ (Lithium Nitrate)	30 ±0.5
SO ₄ (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

The lithium nitrate admixture dispensing and mixing operations shall be verified and certified by the lithium manufacturer's representative.

501-2.11 Epoxy-resin. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

- a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.
- b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.
- c. Material for use for injecting cracks shall be Type IV, Grade 1.
- d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 Bond Breaker. Not required.

CONCRETE MIX

501-3.1. General. No concrete shall be placed until an acceptable concrete mix has been submitted to the RPR for review and the RPR has taken appropriate action. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 Concrete Mix Laboratory. The laboratory used to develop the concrete mix shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix must be included in the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

501-3.3 Concrete Mix Proportions. Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures." Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-6.6 for **a flexural strength of 700 psi per ASTM C78.**

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be **517** pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall be between 0.38 – 0.45 by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. At the start of the project, the Contractor shall determine an allowable slump as determined by ASTM C143 not to exceed 2 inches (50 mm) for slip-form placement. For fixed-form placement, the slump shall not exceed 3 inches (75 mm). For hand placement, the slump shall not exceed 4 inches (100 mm).

The results of the concrete mix shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition.

If a change in source(s) is made, or admixtures added or deleted from the mix, a new concrete mix must be submitted to the RPR for approval.

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.

501-3.4 Concrete Mix submittal. The concrete mix shall be submitted to the RPR at least **30** days prior to the start of operations. The submitted concrete mix shall not be more than 180 days old and must use the materials to be used for production for the project. Production shall not begin until the concrete mix is approved in writing by the RPR.

Each of the submitted concrete mixes (i.e, slip form, side form machine finish and side form hand finish) shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items and quantities as a minimum:

- Certified material test reports for aggregate in accordance with paragraph 501-2.1. Certified reports must include all tests required; reporting each test, test method, test result, and requirement specified (criteria).
- Combined aggregate gradations and analysis; and including plots of the fine aggregate fineness modulus.
- Reactivity Test Results.

- Coarse aggregate quality test results, including deleterious materials.
- Fine aggregate quality test results, including deleterious materials.
- Mill certificates for cement and supplemental cementitious materials.
- Certified test results for all admixtures, including Lithium Nitrate if applicable.
- Specified flexural strength, slump, and air content.
- Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.
- Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.
- Correlation ratios for acceptance testing and Contractor QC testing, when applicable.
- Historical record of test results documenting production standard deviation, when applicable.

501-3.5 Cementitious materials.

a. Fly ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the concrete mix. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

d. Ultrafine fly ash (UFFA) and ultrafine pozzolan (UFP). UFFA and UFP may be used in the concrete mix with the RPR's approval. When UFFA and UFP is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 7% and 16% by weight of the total cementitious material.

501-3.6 Admixtures.

a. Air-entraining admixtures. Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be **5.5%**. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM

C494.

d. Lithium nitrate. Lithium nitrate, if used, shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

CONSTRUCTION METHODS

501-4.1 Control Strip. The control strip(s) shall be to the next planned joint after the initial 250 feet (75 m) of each type of pavement construction (slip-form pilot lane, slip-form fill-in lane, or fixed form). The Contractor shall demonstrate, in the presence of the RPR, that the materials, concrete mix, equipment, construction processes, and quality control processes meet the requirements of the specifications. The concrete mixture shall be extruded from the paver meeting the edge slump tolerance and with little or no finishing. Pilot, fill-in, and fixed-form control strips will be accepted separately. Minor adjustments to the mix design may be required to place an acceptable control strip. The production mix will be the adjusted mix design used to place the acceptable control strip. Upon acceptance of the control strip by the RPR, the Contractor must use the same equipment, materials, and construction methods for the remainder of concrete paving. Any adjustments to processes or materials must be approved in advance by the RPR. Acceptable control strips will meet edge slump tolerance and surface acceptable with little or no finishing, air content within action limits, strength equal or greater than requirements of P501-3.3. The control strip will be considered one lot for payment (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 501-8.1 using a lot pay factor equal to 100.

501-4.2 Equipment. The Contractor is responsible for the proper operation and maintenance of all equipment necessary for handling materials and performing all parts of the work to meet this specification.

a. Plant and equipment. The plant and mixing equipment shall conform to the requirements of ASTM C94 and/or ASTM C685. Each truck mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades. The truck mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch (19 mm) or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

Equipment for transferring and spreading concrete from the transporting equipment to the paving lane in front of the finishing equipment shall be provided. The equipment shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

b. Finishing equipment.

(1) Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements.

(2) Fixed-form. On projects requiring less than **10,000 cubic yards** (7650 cubic meters) of concrete pavement or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with equipment specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR. Hand screeding and float

finishing may only be used on small irregular areas as allowed by the RPR.

c. Vibrators. Vibrator shall be the internal type. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation or voids. The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309R, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the RPR.

Hand held vibrators may only be used in irregular areas and shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

d. Concrete saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

e. Fixed forms. Straight side fixed forms shall be made of steel and shall be furnished in sections not less than 10 feet (3 m) in length. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the RPR. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4 inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the RPR. The forms shall extend the full depth of the pavement section.

501-4.3 Form setting. Forms shall be set to line and grade as shown on the plans, sufficiently in advance of the concrete placement, to ensure continuous paving operation. Forms shall be set to withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the concrete placement.

501-4.4 Base surface preparation prior to placement. Any damage to the prepared base, subbase, and subgrade shall be corrected full depth by the Contractor prior to concrete placement. The underlying surface shall be entirely free of frost when concrete is placed. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete.

501-4.5 Handling, measuring, and batching material. Aggregate stockpiles shall be constructed and managed 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. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Store and maintain all aggregates at a uniform moisture content prior to use. A continuous supply of materials shall be provided to the work to ensure continuous placement.

501-4.6 Mixing concrete. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or ASTM C685.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is discharged from the truck should not exceed [30] minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. In no case shall the temperature of the concrete when placed exceed 90°F (32°C). Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified is not exceeded.

501-4.7 Weather Limitations on mixing and placing. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold weather. Unless authorized in writing by the RPR, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F (4°C) and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F (2°C).

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F (10°C) at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F (66°C). The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

Curing during cold weather shall be in accordance with paragraph 501-4.13d.

b. Hot weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F (30°C), the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F (32°C). The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The concrete placement shall be protected from exceeding an evaporation rate of 0.2 psf (0.98 kg/m² per hour) per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. If the Contractor's measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

Curing during hot weather shall be in accordance with paragraph 501-4.13e.

c. Temperature management program. Prior to the start of paving operation for each day of paving, the Contractor shall provide the RPR with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. (Federal Highway Administration HIPERPAV 3 is one example of a temperature management program.) As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 19-9, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

d. Rain. The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

501-4.8 Concrete Placement. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet (1 m). The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a flexural strength of 550 psi (3.8 MPa) based on the average of four field cured specimens per 2,000 cubic yards (1,530 cubic meters) of concrete placed. The Contractor must determine that the above minimum strengths are adequate to protect the pavement from overloads due to the construction equipment proposed for the project.

The Contractor shall have available materials for the protection of the concrete during cold, hot and/or inclement weather in accordance with paragraph 501-4.7.

a. Slip-form construction. The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well-defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches (23 cm) for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches (0.5 m).

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without, segregation, voids, or vibrator trails and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot (30 cm). The frequency of vibration or amplitude should be adjusted proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is

supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500-foot (150 m) segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch (6 mm), and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch (9 mm). (The total free edge of 500 feet (150 m) of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet (150 m) of paving lane originally constructed as a separate lane will have 1,000 feet (300 m) of free edge, 500 feet (150 m) of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches (0.5 m) from the edge.

When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump will be removed the full width of the slip form lane and replaced at the expense of the Contractor as directed by the RPR.

b. Fixed-form construction. Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars / dowel bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and coated with a release agent each time they are used and before concrete is placed against them.

Concrete shall be spread, screed, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery. The equipment must be specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR.

Concrete for the full paving width shall be effectively consolidated by internal vibrators. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation, voids, or leaving vibrator trails.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches (50 mm). Vibrators shall not be used to transport or spread the concrete. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the RPR.

If a lack of consolidation of the hardened concrete is suspected by the RPR, referee testing may be required. Referee testing of hardened concrete will be performed by the RPR by cutting cores from the finished pavement after a minimum of 24 hours curing. The RPR shall visually examine the cores for evidence of lack of consolidation. Density determinations will be made by the RPR based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards (382 m²) of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original concrete mix density, with no cores having a density of less than 96% of the original concrete mix density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 Strike-off of concrete and placement of reinforcement. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screed. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 Joints. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2-inch (12 mm) from their designated position and shall be true to line with not more than 1/4-inch (6 mm) variation in 10 feet (3 m). The surface across the joints shall be tested with a 12-foot (3 m) straightedge as the joints are finished and any irregularities in excess of 1/4 inch (6 mm) shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of

the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch (3 mm) wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint. The filler shall be fastened uniformly along the hardened joint face with no buckling or debris between the filler and the concrete interface, including a temporary filler for the sealant reservoir at the top of the slab. The edges of the joint shall be finished and tooled while the concrete is still plastic.

d. Dowels and Tie Bars for Joints

(1) Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth and within the tolerances in paragraph 501-4.10(f.). When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

(2) Dowel bars. Dowel bars shall be placed across joints in the proper horizontal and vertical alignment as shown on the plans. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the RPR. Dowel bars at longitudinal construction joints shall be bonded in drilled holes.

(3) Placing dowels and tie bars. Horizontal spacing of dowels shall be within a tolerance of $\pm 3/4$ inch (19 mm). The vertical location on the face of the slab shall be within a tolerance of $\pm 1/2$ inch (12 mm). The method used to install dowels shall ensure that the horizontal and vertical alignment will not be greater than 1/4 inch per foot (6 mm per 0.3 m), except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(a) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires.

At the Contractor's option, dowels and tie bars in contraction joints may be installed by insertion into the plastic concrete using approved equipment and procedures per the paver manufacturer's design. Approval of installation methods will be based on the results of the control strip showing that the dowels and tie bars are installed within specified tolerances as verified by cores or non-destructive rebar location devices approved by the RPR.

(b) Construction joints. Install dowels and tie bars by the cast-in-place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms.

(c) Joints in hardened concrete. Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum flexural strength of 450 psi (3.1 MPa) before drilling begins. Holes 1/8 inch (3 mm) greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. Depth of dowel hole shall be within a tolerance of $\pm 1/2$ inch (12 mm) of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole by means of a suitable metal or plastic grout retention ring fitted around the dowel.

e. Sawing of joints. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial saw-cut and maintained for the remaining cure period.

Joints shall be cut in locations as shown on the plans. The initial joint cut shall be a minimum 1/8 inch (3 mm) wide and to the depth shown on the plans. Prior to placement of joint sealant or seals, the top of the joint shall be widened by sawing as shown on the plans.

501-4.11 Finishing. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, edging of joints, and then texturing. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way. Fog (mist) sprays or other surface applied finishing aids specified to prevent plastic shrinkage cracking, approved by the RPR, may be used in accordance with the manufacturers requirements.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. Equipment, mixture, and/or procedures which produce more than 1/4 inch (6 mm) of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge.

Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the RPR's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds (3400 kg) and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical.

e. Straightedge testing and surface correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a 12-foot (3.7-m) finishing straightedge swung from handles capable of spanning at least one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8 inch (3 mm) thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

501-4.12 Surface texture. The surface of the pavement shall be finished as designated below for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. The texture shall be uniform in appearance and approximately 1/16 inch (2 mm) in depth. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the RPR.

a. Brush or broom finish. Shall be applied when the water sheen has practically disappeared. The equipment shall operate transversely across the pavement surface.

b. Burlap drag finish. Burlap, at least 15 ounces per square yard (555 grams per square meter), will typically produce acceptable texture. To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot (30 cm) from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface.

c. Artificial turf finish. Shall be applied by dragging the surface of the pavement in the direction of concrete placement with an approved full-width drag made with artificial turf. The leading transverse edge of the artificial turf drag will be securely fastened to a lightweight pole on a traveling bridge. At least 2 feet

(60 cm) of the artificial turf shall be in contact with the concrete surface during dragging operations. Approval of the artificial turf will be done only after it has been demonstrated by the Contractor to provide a satisfactory texture. One type that has provided satisfactory texture consists of 7,200 approximately 0.85-inch-long polyethylene turf blades per square foot.

501-4.13 Curing. Immediately after finishing operations are completed and bleed water is gone from the surface, all exposed surfaces of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-saw-cut method is used to construct the contraction joint, the curing compound shall be applied to the saw-cut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious membrane method. Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon (4 liters) to not more than 150 square feet (14 sq m). The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the RPR, a double application rate shall be used to ensure coverage. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface.

b. White burlap-polyethylene sheets. The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

c. Water method. The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.

d. Concrete protection for cold weather. Maintain the concrete at a temperature of at least 50°F (10°C) for a period of 72 hours after placing and at a temperature above freezing for the remainder of the 7-day curing period. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from

drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the RPR.

501-4.14 Removing forms. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured in accordance with paragraph 501-4.13.

If honeycombed areas are evident when the forms are removed, materials, placement, and consolidation methods must be reviewed and appropriate adjustments made to assure adequate consolidation at the edges of future concrete placements. Honeycombed areas that extend into the slab less than approximately 1 inch (25 mm), shall be repaired with an approved grout, as directed by the RPR. Honeycombed areas that extend into the slab greater than a depth of 1 inch (25 mm) shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-4.19.

501-4.15 Saw-cut grooving. If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.

501-4.16 Sealing joints. The joints in the pavement shall be sealed in accordance with Item P-605.

501-4.17 Protection of pavement. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the RPR. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the RPR.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days, the joints are protected, the concrete has attained a minimum field cured flexural strength of [450 psi (3100 kPa)], and the slab edge is protected.

All new and existing pavement carrying construction traffic or equipment shall be kept clean and spillage of concrete and other materials shall be cleaned up immediately.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 Opening to construction traffic. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 450 pounds per square inch (3100 kPa) when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 Repair, removal, or replacement of slabs. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in paragraph 501-6.6 shall be removed and replaced or repaired, as directed by the RPR, at the Contractor's expense. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be

full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The RPR will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be have a diameter of 2 inches (50 mm) to 4 inches (100 mm), shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. Repair of cracks as described in this section shall not be allowed if in the opinion of the RPR the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch (3 mm) of the pavement surface.

a. Shrinkage cracks. Shrinkage cracks which do not exceed one-third of the pavement depth shall be cleaned and either high molecular weight methacrylate (HMWM) applied; or epoxy resin (Type IV, Grade 1) pressure injected using procedures recommended by the manufacturer and approved by the RPR. Sandblasting of the surface may be required following the application of HMWM to restore skid resistance. Care shall be taken to ensure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the RPR. Shrinkage cracks which exceed one-third the pavement depth shall be treated as full depth cracks in accordance with paragraphs 501-4.19b and 501-19c.

b. Slabs with cracks through interior areas. Interior area is defined as that area more than 6 inches (150 mm) from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than one-third the pavement depth, that extend into the interior area.

c. Cracks close to and parallel to joints. All full-depth cracks within 6 inches (150 mm) either side of the joint and essentially parallel to the original joints, shall be treated as follows.

(1) Full depth cracks and original joint not cracked. The full-depth crack shall be treated as the new joint and the original joint filled with an epoxy resin.

i. Full-depth crack. The joint sealant reservoir for the crack shall be formed by sawing to a depth of 3/4 inches (19 mm), $\pm 1/16$ inch (2 mm), and to a width of 5/8 inch (16 mm), $\pm 1/8$ inch (3 mm). The crack shall be sawed with equipment specially designed to follow random cracks. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent raveling or spalling. The joint shall be sealed with sealant in accordance with P-605 or as directed by the RPR.

ii. Original joint. If the original joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures.

Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full depth cracks and original joint cracked. If there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced.

d. Removal and replacement of full slabs. Make a full depth cut perpendicular to the slab surface along all edges of the slab with a concrete saw cutting any dowels or tie-bars. Remove damaged slab protecting adjacent pavement from damage. Damage to adjacent slabs may result in removal of additional slabs as directed by the RPR at the Contractor's expense.

The underlying material shall be repaired, re-compacted and shaped to grade.

Dowels of the size and spacing specified for other joints in similar pavement on the project shall be installed along all four (4) edges of the new slab in accordance with paragraph 501-4.10d.

Placement of concrete shall be as specified for original construction. The joints around the new slab shall be prepared and sealed as specified for original construction.

e. Spalls along joints.

(1) Spalls less than one inch wide and less than the depth of the joint sealant reservoir, shall be filled with joint sealant material.

(2) Spalls larger than one inch and/or deeper than the joint reservoir, but less than 1/2 the slab depth, and less than 25% of the length of the adjacent joint shall be repaired as follows:

i. Make a vertical saw cut at least one inch (25 mm) outside the spalled area and to a depth of at least 2 inches (50 mm). Saw cuts shall be straight lines forming rectangular areas surrounding the spalled area.

ii. Remove unsound concrete and at least 1/2 inch (12 mm) of visually sound concrete between the saw cut and the joint or crack with a light chipping hammer.

iii. Clean cavity with high-pressure water jets supplemented with compressed air as needed to remove all loose material.

iv. Apply a prime coat of epoxy resin, Type III, Grade I, to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face.

v. Fill the cavity with low slump concrete or mortar or with epoxy resin concrete or mortar.

vi. An insert or other bond-breaking medium shall be used to prevent bond at all joint faces.

vii. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints.

(3) Spalls deeper than 1/2 of the slab depth or spalls longer than 25% of the adjacent joint require replacement of the entire slab.

f. Diamond grinding of Concrete surfaces. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding of the hardened concrete should not be performed until the concrete is at least 14 days old and has achieved full minimum strength. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The depth of diamond grinding shall not exceed 1/2 inch (13 mm) and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified.

Diamond grinding shall be performed with a machine specifically designed 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 sufficient number of flush cut blades that 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 Contractor shall determine the number and type of blades based on the hardness of the aggregate. 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. All grinding shall be at the expense of the Contractor.

CONTRACTOR QUALITY CONTROL (CQC)

501-5.1 Quality control program. The Contractor shall develop a Quality Control Program in accordance with Item C-100. No partial payment will be made for materials that are subject to specific quality control requirements without an approved quality control program.

501-5.2 Contractor Quality Control (CQC). 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.

501-5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to this specification and as set forth in the CQCP. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content. A QC Testing Plan shall be developed and approved by the RPR as part of the CQCP.

The RPR may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. 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.

a. Fine aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566.

(3) Deleterious substances. Fine aggregate as delivered to the mixer shall be tested for deleterious substances in fine aggregate for concrete as specified in paragraph 501-2.1b, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566.

(3) Deleterious substances. Coarse aggregate as delivered to the mixer shall be tested for deleterious substances in coarse aggregate for concrete as specified in paragraph 501-2.1c, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

c. Slump. One test shall be made for each subplot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air content. One test shall be made for each subplot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples

shall be taken in accordance with ASTM C172.

e. Unit weight and Yield. One test shall be made for each subplot. Unit weight and yield tests shall be in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

f. Temperatures. Temperatures shall be checked at least four times per lot at the job site in accordance with ASTM C1064.

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 profile program 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 501-4.19f 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 501-6.6.

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 will be evaluated prior to and after placement of the concrete surface.

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 within 48 hours.

Areas with humps or depression that exceed grade or smoothness 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. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with paragraph 501-4.19d. Grinding shall be in accordance with paragraph 501-4.19f. All corrections will be at the Contractors expense.

501-5.4 Control charts. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, and air content. The Contractor shall also maintain a control chart plotting the coarseness factor/workability factor from the combined gradations in accordance with paragraph 501-2.1d.

Control charts shall be posted in a location satisfactory to the RPR and shall be kept up to date at all times. 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, or Specification 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 potential problem and the Contractor is not taking satisfactory corrective action, the RPR may halt production or acceptance of the material.

a. Fine and coarse aggregate gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Superimposed on the control charts shall be the action and suspension limits. Gradation tests shall be performed by the Contractor per ASTM C136. The Contractor shall take at least [two] samples per lot to check the final gradation. Sampling shall be per ASTM D75 from the flowing aggregate stream or conveyor belt.

b. Slump and air content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

c. Combined gradation. The Contractor shall maintain a control chart plotting the coarseness factor and workability factor on a chart in accordance with paragraph 501-2.1d.

Control Chart Limits¹

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Gradation ²	* ³	* ³
Coarseness Factor (CF)	±3.5	±5
Workability Factor (WF)	±2	±3
Slump	+0.5 to -1 inch (+13 to -25 mm)	+1 to -1.5 inch (+25 to -38 mm)
Air Content	±1.5%	±2.0%

¹ Control charts shall developed and maintained for each control parameter indicated.

² Control charts shall be developed and maintained for each sieve size.

³ Action and suspension limits shall be determined by the Contractor.

501-5.5 Corrective action at Suspension Limit. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of control. The CQCP shall detail what action will be taken to

bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

- a. Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.
- b. Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, the Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.
- c. Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.
- d. Slump. The Contractor shall halt production and make appropriate adjustments whenever:
 - (1) one point falls outside the Suspension Limit line for individual measurements
 - OR
 - (2) two points in a row fall outside the Action Limit line for individual measurements.
- e. Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:
 - (1) one point falls outside the Suspension Limit line for individual measurements
 - OR
 - (2) two points in a row fall outside the Action Limit line for individual measurements.

MATERIAL ACCEPTANCE

501-6.1 Quality Assurance (QA) Acceptance sampling and testing. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the RPR. The Contractor shall provide adequate facilities for the initial curing of beams. The Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 501-6.5b(1).

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F (16° to 27°C), and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

501-6.2 Quality Assurance (QA) testing laboratory. Quality assurance testing organizations performing these acceptance tests will be accredited in accordance with ASTM C1077. The quality assurance laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods will be submitted to the RPR prior to start of construction.

501-6.3 Lot size. Concrete will be accepted for strength and thickness on a lot basis. A lot will consist of a day's production **not to exceed 1700 square yards** (1420 square meters). Each lot will be divided into approximately equal sublots with individual sublots between 375 to 475 square yards (315 to 400 square meters). Where three sublots are produced, they will constitute a lot. Where one or two sublots are produced, they will be incorporated into the previous or next lot. Where more than one plant is simultaneously producing concrete for the job, the lot sizes will apply separately for each plant.

501-6.4 Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot or for overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they will constitute a lot. Where one or two sublots have been produced, they will be incorporated into the next lot or the previous lot and the total number of sublots will be used in the acceptance criteria calculation, that is, $n=5$ or $n=6$.

501-6.5 Acceptance Sampling and Testing.

a. Strength.

(1) Sampling. One sample will be taken for each subplot from the concrete delivered to the job site. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. The concrete will be sampled in accordance with ASTM C172.

(2) Test Specimens. The RPR will be responsible for the casting, initial curing, transportation, and curing of specimens in accordance with ASTM C31. Two (2) specimens will be made from each sample and slump, air content, unit weight, and temperature tests will be conducted for each set of strength specimens. Within 24 to 48 hours, the samples will be transported from the field to the laboratory while in the molds. Samples will be cured in saturated lime water.

The strength of each specimen will be determined in accordance with ASTM C78. The strength for each subplot will be computed by averaging the results of the two test specimens representing that subplot.

(3) Acceptance. Acceptance of pavement for strength will be determined by the RPR in accordance with paragraph 501-6.6b(1). All individual strength tests within a lot will be checked for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and the remaining test values will be used to determine acceptance in accordance with paragraph 501-6.5b.

b. Pavement thickness.

(1) Sampling. One core will be taken by the Contractor for each subplot in the presence of the RPR. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, will be excluded from sample locations.

Cores shall be a minimum 4 inch (100 mm) in diameter neatly cut with a core drill. The Contractor will furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes will be filled by the Contractor with a non-shrink grout approved by the RPR within one day after sampling.

(2) Testing. The thickness of the cores will be determined by the RPR by the average caliper measurement in accordance with ASTM C174. Each core shall be photographed and the photograph included with the test report.

(3) Acceptance. Acceptance of pavement for thickness will be determined by the RPR in accordance with paragraph 501-6.6.

501-6.6 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-6.5b:

- (1) Strength**
- (2) Thickness**
- (3) Grade**
- (4) Profilograph smoothness:** Not used.
- (5) Adjustments for repairs**

Acceptance for strength, thickness, and grade, will be based on the criteria contained in accordance with paragraph 501-6.6b(1), 501-6.6b(2), and 501-6.6b(3), respectively.

Production quality must achieve 90 PWL or higher to receive full payment.

Strength and thickness will be evaluated for acceptance on a lot basis using the method of estimating PWL. Production quality must achieve 90 PWL or higher to receive full payment. The PWL will be determined in accordance with procedures specified in Item C-110.

The lower specification tolerance limit (L) for strength and thickness will be:

Lower Specification Tolerance Limit (L)

Strength	$0.93 \times \text{strength specified in paragraph 501-3.3}$
Thickness	Lot Plan Thickness in inches, - 0.50 in

b. Acceptance criteria.

(1) Strength. If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

(2) Thickness. If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

(3) Grade. The final finished surface of the pavement of the completed project 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, stamped and signed by a licensed surveyor shall be in accordance with paragraph 501-5.3h. Payment for sublots that do not meet grade for over 25% of the subplot shall reduced by 5% and not be more than 95%.

(4) Profilograph roughness for QA Acceptance. Not used.

(5) Adjustments for repair. Sublots with spall repairs, crack repairs, or partial panel replacement, will be limited to no more than 95% payment.

(6) Adjustment for grinding. For sublots with grinding over 25% of a subplot, payment will be reduced 5%.

METHOD OF MEASUREMENT

501-7.1 Concrete pavement shall be measured by the number of square yards (square meters) of plain pavement as specified in-place, completed and accepted.

BASIS OF PAYMENT

501-8.1 Payment. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-6.6. Acceptance Criteria shall be based on results of strength and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness; 501-8.1b for repairs; 501-8.1c for grinding; and 501-8.1d for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed **100** percent of the product of the contract unit price and the total number of square yards (square meters) of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both strength and thickness are less than 100%.

Price Adjustment Schedule¹

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject ²

¹ Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

² The lot shall be removed and replaced unless, after receipt of FAA concurrence, the Owner and Contractor agree in writing that the lot will remain; the lot paid at 50% of the contract unit price; and the total project payment limitation reduced by the amount withheld for that lot.

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 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%; except for rejected lots which remain in place and/or sublots with adjustments for repairs.

b. Adjusted payment for repairs. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots which contain repairs in accordance with paragraph 501-4.19 on more than 20% of the slabs within the subplot. Payment factors greater than 100 percent for the strength and thickness cannot be used to offset adjustments for repairs.

c. Adjusted payment for grinding. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots with grinding over 25% of a subplot.

d. Profilograph Roughness. Not used.

e. Payment. Payment shall be made under:

Item P-501-8.1 Concrete Pavement 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 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 A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1035	Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
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 C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C117	Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C123	Standard Test Method for Lightweight Particles in Aggregate
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
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 C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in 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 C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
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 C295	Standard Guide for Petrographic Examination of Aggregates 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 C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened 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 C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
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 C1064	Test Method for Temperature of Freshly Mixed Hydraulic-Cement 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 C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
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 D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E2133	Standard Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface
American Concrete Institute (ACI)	
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
Advisory Circulars (AC)	
AC 150/5320-6	Airport Pavement Design and Evaluation
Federal Highway Administration (FHWA)	
HIPERPAV 3, version 3.2	
Portland Concrete Association (PCA)	
PCA	Design and Control of Concrete Mixtures, 16 th Edition
U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD)	
CRD C662	Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)
United States Air Force Engineering Technical Letter (ETL)	
ETL 97-5	Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements

END ITEM P-501

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

Surface Type	Residual Rate, gal/SY (L/square meter)	Emulsion Application Bar Rate, gal/SY (L/square meter)
New asphalt	0.02-0.05 (0.09-0.23)	0.03-0.07 (0.13-0.32)
Existing asphalt	0.04-0.07 (0.18-0.32)	0.06-0.11 (0.27-0.50)
Milled Surface	0.04-0.08 (0.18-0.36)	0.06-0.12 (0.27-0.54)
Concrete	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

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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* for asphalt to asphalt pavements or asphalt to Portland Cement Concrete pavements,

ASTM D5893 *Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements* for Portland Cement Concrete to Portland Cement Concrete 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)
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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
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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 ¹	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		

¹ 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, ± 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 ± 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 μ m)	40 to 50
	No. 50 (300 μ m)	16 to 26
	No. 100 (150 μ 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, 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 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 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 (Na₂O and K₂O) 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, or ASTM A934.

610-2.11 Materials for curing concrete. Curing materials shall conform to one of the following:

Materials for Curing

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

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 of the concrete complete in place and accepted.

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
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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

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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

Paint ¹				Glass Beads ²	
Type	Color	Fed Std. 595 Number	Application Rate Maximum	Type	Application Rate Minimum
Waterborne Type II	White ³	37925	115 ft ² /gal	Type I, Gradation A	7 lb/gal
Waterborne Type II	White ⁴	37925	115 ft ² /gal	Type III	10 lb/gal
Waterborne Type II	Yellow	33538 or 33655	115 ft ² /gal	Type I, Gradation A	7 lb/gal
Waterborne Type II	Red	31136	115 ft ² /gal	Type I, Gradation A	5 lb/gal
Waterborne Type II	Black	37038	115 ft ² /gal	No Beads	No Beads
Waterborne Type II	Green	34108	115 ft ² /gal	No Beads	No Beads
Temporary Marking Waterborne Type II	ALL	See Above for Color Used	230 ft ² /gal	No beads	No beads

¹ See paragraph 620-2.2a

³ General application of White Paint

² See paragraph 620-2.2b

⁴ 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 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

Dimension and Spacing	Tolerance
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 ² /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 ¹	100	75	10

¹ 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. – 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
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ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
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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
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29 CFR Part 1910.1200 Hazard Communication	
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Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
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FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
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FED STD 595	Colors used in Government Procurement
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Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based
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Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
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AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces
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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.

162-4.3 Fence removal 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, including the length occupied by gate openings when gates are to be removed. The removal of temporary fencing and gates shall be measured as part of the installation of the temporary facility.

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.

162-5.3 Payment for the removal of fence will be made at the contract unit price per linear foot (meter).

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-162-5.1a	10-ft. Height Chain-Link Fence with Barbed Wire - per linear foot (meter)
Item F-162-5.1b	4-ft. Height Chain-Link Fence - per linear foot (meter)
Item F-162-5.1c	Temporary Chain-Link Fence on Concrete Barrier with Barbed Wire - per linear foot (meter)
Item F-162-5.2a	Temporary 25' Wide Vehicle Gate - per each
Item F-162-5.2b	Pedestrian Gates – Not Used

Item F-162-5.3 Removal of Fence - 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 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 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 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. Not Used.

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). Not used.

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

Pipe Corrugation Depth		Minimum Bedding Depth	
inch	mm	inch	mm
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	12-inch Class V Reinforced Concrete Pipe per linear foot (meter)
Item 701-5.1B	15-inch Class V Reinforced Concrete Pipe per linear foot (meter)
Item 701-5.1C	18-inch Class V Reinforced Concrete Pipe per linear foot (meter)
Item 701-5.1D	48-inch Class V Reinforced Concrete Pipe per linear foot (meter)
Item 701-5.1E	12-inch High-Density Polyethylene 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-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-751-5.1A	Drainage Manhole – Aircraft Rated - per each
Item D-751-5.1B	Drainage Diversion Manhole – Aircraft Rated - per each
Item D-751-5.2A	Catch Basin – Aircraft Rated - per each
Item D-751-5.2B	Catch Basin – H-20 Rated - per each
Item D-751-5.3	Trench Drain – per linear foot
Item D-751-5.4	Adjust Structure Rim/Grate Elevation – per each
Item D-751-5.5	Replace Frame/Cover and Adjust Structure Rim Elevation – per each
Item D-751-5.6	Install Diversion Weir in Existing Catch Basin – 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:

Seed	Minimum Seed Purity (Percent)	Minimum Germination (Percent)	Rate of Application lb./acre	Rate of Application lb./1000 SF
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%)
TOTAL			175 lbs/acre	4 lbs/1000 SF

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 901-5.1	Seeding - per 1,000 square feet (sq m)
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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
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Federal Specifications (FED SPEC)

FED SPEC	JJJ-S-181, Federal Specification, Seeds, Agricultural
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Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports
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FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel
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END OF ITEM T-901

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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 μ 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 μm (No. 200) Sieve in Mineral Aggregates by Washing
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Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports
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FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-905

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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)
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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

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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 ScotchTM Electrical Tapes –ScotchTM 88 (1-1/2 inch (38 mm) wide) and ScotchTM 130C[®] linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3MTM), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be ScotchkoteTM as manufactured by 3MTM, 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 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
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Federal Aviation Administration Standard

FAA STD-019E	Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment
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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.

110-4.2 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks removed, 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. No separate measurement shall be made for the various types and sizes or number of cables to be removed.

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-110-5.2	Not Used
Item L-110-5.3	Not Used
Item L-110-5.4	Removal of Concrete Encased or Non-Encased Electrical Conduit/Duct and Cable - per linear foot (meter)
Item L-110-5.5	Removal of Cables in Existing Electrical Conduit/Duct to Remain - 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
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National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
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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 Electrical manholes and junction structures shall be measured by each unit removed 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 disconnections; and temporary cables and connections.

115-4.3 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 The accepted quantity for removal of electrical manholes and junction structures will be paid for at the Contract unit price per each completed. This price shall be full compensation for furnishing all

materials and for all preparation, excavation, backfilling and placing of the materials, removal 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.

115-5.3 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 (Aircraft Rated) - Per Each
Item L-115-5.2	Removal of Electrical Manhole/Junction Structure - Per Each
Item L-115-5.3	Existing Electrical Manhole/Junction Structure Elevation Adjustment – 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
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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)
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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-861T	2	1	N/A		L-867	Blue	L-830	20" Ht.
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

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)	3	2	2	2	TW Direction Type – Refer to Sign Schedule for Modules
L-858L(L)	3	2	2	2	TW Location Type – Refer to Sign Schedule for Modules

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-125-5.2A	New L-858(L) Airfield Guidance Sign – 2 Module – per each
Item L-125-5.2B	New L-858(L) Airfield Guidance Sign – 3 Module – per each

Item L-125-5.3	Remove, Store and Reinstall Airfield Guidance Sign on New Foundation – per each
Item L-125-5.4	Remove, Store and Reinstall Elevated Taxiway Edge Light on Existing Base Can – per each
Item L-125-5.5	Remove, Store and Reinstall Elevated Taxiway Edge Light on New Base Can and Remove Existing Base Can – per each
Item L-125-5.6	Remove Elevated Taxiway Edge Light and Base Can – per each
Item L-125-5.7A	New L-852C(L) In-Pavement Taxiway Centerline Light – per each
Item L-125-5.7B	New L-852C(L) In-Pavement Taxiway Centerline Light on Existing Conduit – per each
Item L-125-5.7C	New L-852K(L) In-Pavement Taxiway Centerline Light – per each
Item L-125-5.7D	Remove, Store and Reinstall Taxiway Centerline Light on Existing Base 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
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END OF ITEM L-125