



# PROJECT MANUAL

## Hangar 4 Pavement and Drainage Repairs Roanoke, Virginia

Prepared for  
Roanoke Regional Airport Commission

T&L Project No. 15391  
RRAC Bid No. 20-017  
Issued for Bid October 2, 2020



THOMPSON  
& LITTON EST.  
1956



(For non-AIP Projects est. at \$50,000 and above)

**SPECIFICATIONS FOR  
ROANOKE REGIONAL AIRPORT COMMISSION  
HANGAR 4 PAVEMENT AND DRAINAGE REPAIRS**

**BID NUMBER 20-017**

**Issued for Bid October 2, 2020**

**THOMPSON & LITTON, INC.  
726 AUBURN AVE.  
RADFORD, VIRGINIA 24141**

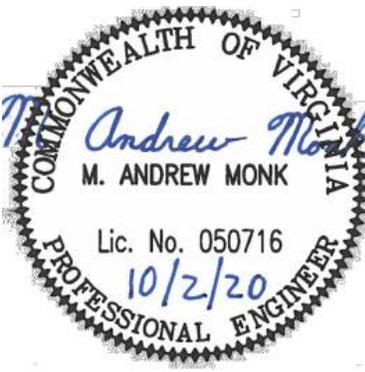
Legal Approval 021012



Hangar 4 Pavement and Drainage Repairs  
Roanoke, Virginia  
For  
Roanoke Regional Airport Commission

T&L Project No. 15391

SEALS PAGE



For Civil Engineering Only



**HANGAR 4 PAVEMENT AND DRAINAGE REPAIRS  
BID NO: 20-017**

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## INVITATION FOR BIDS

### Bid No. 20-017

The Roanoke Regional Airport Commission ("Commission") will accept sealed bids for furnishing all labor, materials, and equipment and performing all work for the:

#### ROANOKE REGIONAL AIRPORT COMMISSION HANGAR 4 PAVEMENT AND DRAINAGE REPAIRS

The work involves the replacement of drop inlet stormwater structures and the remediation of an area of deteriorating asphalt overlay and replacement with two inch thick asphalt overlay. Bids shall be received until 2:00 P.M. local time on November 10, 2020 in the Office of Roanoke Regional Airport Commission, 5202 Aviation Drive, Roanoke, Virginia 24012. Bids will be publicly opened and read aloud at that time in Conference Room A on the Second Floor of the Airport Terminal Building.

Contract Documents will be distributed electronically and will be posted on eVA, Virginia Department of General Services' central electronic procurement website, at <https://eva.virginia.gov>. Electronic copies of the Contract Documents can also be obtained by emailing Erin Henderson, Contracts Administration, Roanoke Regional Airport, at [Erin.Henderson@flyroa.com](mailto:Erin.Henderson@flyroa.com)."

Bidders are invited to submit bids for this work on the bid forms provided in the package; other bid forms will not be accepted. The successful bidder shall be required to have and maintain a Class "A" Virginia Contractor's License and not less than \$5,000,000 in general liability, \$1,000,000.00 in motor vehicle insurance, and \$5,000,000.00 umbrella insurance. Contractor, its employees and any subcontractors' employees will be required to submit to federal security threat assessments, may be subject to fingerprint-based criminal records checks, and must be and remain approved by the Commission for access to airport secure areas.

Each bid must be accompanied by a bid security in a form acceptable to the Commission in an amount equal to at least five percent (5%) of the amount of the bid by the Contractor, payable to the Roanoke Regional Airport Commission, as a guaranty that if the bid is accepted, the bidder will execute the Contract and file required Performance and Payment Bonds within the time provided in the Instructions to Bidders.

Minority 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 an award.

A Pre-bid Meeting and site review will be on site on October 22, 2020 at 10:00 A.M. local time. No other escorted reviews of the site will be provided. See Appendix D for location map.

The Roanoke Regional Airport Commission reserves the right to waive any informalities, technicalities, or irregularities in a Bid, or to reject any or all bids, or to re-advertise for bids and to award or refrain from awarding the Contract for the project specified, should any such action be deemed to be in the best interest of the Commission.



## ROANOKE REGIONAL AIRPORT COMMISSION

### INSTRUCTIONS TO BIDDERS

#### I. GENERAL

- A. The Contractor covenants and agrees that it and its agents and employees shall comply with and shall be solely responsible for compliance with all applicable municipal, state and federal laws, national and local codes, and Roanoke Regional Airport Commission rules and regulations applicable to the removal, preparation, and installation of materials and other associated products and services to be provided pursuant to the Contract Documents.
- B. As used herein, the terms "Owner," "Commission," "Airport Commission," or "Sponsor," or shall refer to the Roanoke Regional Airport Commission.
- C. As used herein, the terms "Work," or "Project" shall refer to all construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations.
- D. As used herein, the terms "Contractor" and "successful bidder" shall refer to the person or entity selected to enter a contract with the Commission for the above referenced Work.
- E. As used herein, the term "Contract" or "Contract Documents" shall mean and include the Invitation to Bid, Instruction to Bidders, Bid Forms, the Performance Bond, Labor and Material Payment Bond, Contract Form, General Conditions, Drawings, Technical Specifications, Supplementary Drawings, any addenda issued to bidders, and any other documents specifically incorporated by reference in the Contract Form.
- F. Attention of all prospective bidders is directed to the fact that the Airport Commission is a governmental body, and in accordance with Virginia law is not subject to state sales tax; however, such exclusion does not extend to Contractor in its purchase of goods and services for the Project.
- G. The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the Work.
- H. **LIQUIDATED DAMAGES.** Time is of the essence in the completion of the Work. Bidders are advised that the Contract Documents do contain provisions for liquidated damages, including without limitation, liquidated damages for failure to complete the Work in a timely manner. **By submitting a bid, a bidder acknowledges and agrees that the bidder has been advised of such liquidated damages and has reviewed and agreed to all liquidated**

**damages provision in the Contract Documents, including, without limitation, Contractor's waiver of any defenses as to the validity of such liquidated damages based on such liquidated damages being void as penalties or not being reasonably related to actual damages.**

- I. All proposals or bids and any accompanying or related information submitted to the Commission will become the property of the Commission and will not be returned. Trade secrets or proprietary information submitted by a proposer or bidder may not be subject to the Virginia Freedom of Information Act (Section 2.2-3700 et seq.), provided that the proposer or bidder: (i) properly invokes the protections of the applicable sections of the Virginia Code, as amended, including, without limitation, Virginia Public Procurement Code Section 2.2-4342 for trade secrets or proprietary information prior to or upon submission of the data or other materials to be protected; (ii) clearly identifies the data or other materials in the proposal to be protected; and, (iii) states in writing the reasons why protection is necessary.

By submitting a proposal or bid, the submitting entity consents and agrees that, notwithstanding any express or implied claim of copyright, any and all documents submitted to the Commission are not subject to copyright and, as such, may be copied; however, the release of such documents shall be governed by applicable law, including, without limitation, the Virginia Freedom of Information Act.

- J. Note: This public body does not discriminate against faith-based organizations in accordance with the Code of Virginia 2.2-4343.1 or against a bidder or offeror because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment.

## II. **GENERAL BOND REQUIREMENTS**

### A. **Bid Bond**

Each separate Bid shall be accompanied by a Certified or Cashier's Check or a Bid Bond on the form provided herein in the amount of not less than five percent (5%) of the total amount bid, including all alternates, made payable to the Roanoke Regional Airport Commission. If a Bid Bond is provided in lieu of a Certified or Cashier's Check, it must be signed by the bidder as principal and by a corporate surety authorized to transact business in Virginia, be substantially on the form included with the Bid Forms herein, include an executed surety bond affidavit and be accompanied by a valid power of attorney indicating that the person signing the bond on behalf of the Surety has full legal authority to do so.

**B. Performance and Labor and Material Payment Bonds**

Good and sufficient Performance and Labor and Material Payment Bonds in substantially the forms contained in these specifications and in the sum of not less than 100 percent of the contract amount, with a surety Company satisfactory to the Owner and licensed to conduct business in the Commonwealth of Virginia, will be required of the Contractor guaranteeing that the contract, including the various guarantee periods hereunder, will be faithfully performed and that labor and material suppliers shall be paid. The fully executed Bonds, along with appropriate Power of Attorney and the executed Contract shall be delivered to Owner, no later than fifteen (15) calendar days from the date of receipt of Owner's Notice of Award. If, at any time after the execution of the agreement, Owner shall deem the surety or sureties upon such bond or bonds to be unsatisfactory, or if, for any reasons, such bond or bonds ceases to be adequate to cover the performance of the work as above specified, Contractor shall, at its expense within five (5) days of receipt of Owner's written notice to do so, furnish additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the Owner. In such event, no payment to the Contractor shall be deemed due under the agreement until such new or additional bond or bonds are furnished in a manner and form satisfactory to the Owner.

Only the Performance and Labor and Material Payment Bond Forms in substantially the form as are bound as CPB-1 thru CPB-4 and LMPB-1 thru LMPB-5 within these documents are acceptable.

**III. PREPARATION AND SUBMISSION OF BIDS**

- A. The Bidder must submit its Bid on the Bid Forms contained herein; no other form is acceptable. Any bid received after the time specified in the Invitation to Bid for receipt shall be returned to the bidder unopened.
- B. All blank spaces in the Bid Forms must be correctly and completely filled in, where indicated, in ink or type written, except that all signatures shall be signed in ink by an official of the firm who is authorized to submit the bid.
- C. The Bidder must state the price(s) (typewritten or in ink) both in words and numerals. Where a discrepancy occurs between the prices quoted in words and/or in numbers, the figure quoted in words shall take precedence and govern in the determining final costs or award of the contract.
- D. Erasures or other changes in a Bid shall be made on the bid form and be explained or noted and dated over the signature of the Bidder prior to the bid submittal time and the sealing of the bid envelope. No alterations to the bid figures by notations on the outside of the envelope will be considered.

- E. Bids containing reservations, exceptions, conditions, omissions, unexplained erasures or alterations, items not required in the bid or irregularities of any kind may be rejected by the Owner.
- F. When requested by the Owner, a Power of Attorney or other satisfactory evidence of the authority of the official signing in behalf of the firm shall be furnished for the Owner's records.
- G. The cost of any item whatsoever, not listed in the Bid Form, yet which is mentioned in the Specifications or shown on the Plans, shall be considered to be included in the cost of some other item of bid in the Bid Form or as part of the total bid price.
- H. Information Required
  1. The bidder must supply all information required by the bid **and fully complete each page of the Bid Form in Section C, and shall provide with its Bid the additional information and documents listed in this Section H. and Section I. below.**
  2. Each bidder shall present evidence of its experience, qualifications and financial ability, upon the form enclosed herein, to perform the work and to satisfactorily complete the project. Qualifications information shall include the identification of the proposed on-site superintendent with relevant project experience on similar work at the same level of responsibility (complete Part III of the Section C Bid Form).
  3. No bid will be received and tabulated or considered, nor any contract awarded, unless the bidder has demonstrated in the bid form that it is properly licensed as a Class A Contractor, as required under the Code of Virginia (1950), as amended (complete Part II of the Section C Bid Form).
  4. Each Bidder shall complete and submit with its bid the Worker's Compensation Certificate of Coverage appearing as Part V of the of the Section C Bid Form of these contract documents. No award shall be made to any Bidder who fails to show such evidence of required Worker's Compensation coverage.
  5. Every bidder shall include in its bid the identification number issued to it by the State Corporation Commission confirming that it is organized or authorized to transact business in the Commonwealth pursuant to Title 13.1 or Title 50. If the bidder is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 or as otherwise required by law, the bidder or shall include in its bid a statement describing why the bidder is not required to be so authorized. Any bidder that fails to provide the required information shall not receive an award unless a waiver of this requirement is granted by the

Commission's Executive Director. (Complete Part VI of the Section C Bid Form.)

7. Each bidder shall provide the bid bond or security specified in Section A.II.A. above. (Complete Bid Bond Form found in Section C Bid Form of these bid documents)

I. Bid Package

1. Each Bidder shall present its Bid in a sealed, opaque 9 x 12 inch envelope. The outside of the envelope shall be plainly marked on the bottom left hand corner with:

Bid For: HANGAR 4 PAVEMENT AND DRAINAGE  
REPAIRS  
Bid No. 20-017  
Roanoke Blacksburg Regional Airport  
Roanoke, Virginia  
Class "A" Virginia Contractor No. \_\_\_\_\_

with the name and address of the Bidder in the upper left hand corner. The Owner shall not be responsible for premature opening of bids not properly addressed and identified, as required herein.

2. The envelope shall contain the signed original of:

Bid Form Fully completed with all blanks filled in and all requested information provided (see Section A..H. 1-5) and including the signature of an authorized official of Bidder and the Bidder's Class "A" Virginia Contractor's License Number;

Bid Bond Bid Bond or Guarantee (see Section A.II.A.), fully completed and signed by Bidder and, if applicable, its Surety.

- J. All bids shall be delivered to the Roanoke Regional Airport Commission, Administrative Offices, 5202 Aviation Drive, Roanoke, VA 24012, no later than 2:00 P.M. local time, on November 10,2020.

- K. When sent by mail, the sealed Bid, marked as indicated in I.1. above, shall be sent by certified mail with return receipt requested or by overnight express carrier. No bid will be considered unless received by the Commission on or before the time and at the place designated in the Invitation to Bid. The Commission will in no way be responsible for delays caused by the U. S. Postal Service or any other deliverer of the bid, or for delay caused by any other occurrence. Any bid received after the time specified in the Invitation to Bid for receipt of bids, shall be returned to the Bidder unopened.

- L. A pre-bid meeting and site review will be provided by Commission's representatives on October 22, 2020 at 10:00 A.M. in order to assist Bidders in preparing their bid packages. Any interested bidder should arrive at the Commission's office, Second Floor Terminal Building, by the specified time in order to discuss the project and be escorted to view the site. As certain areas of work are in non-public, secure locations, all perspective bidders are strongly encouraged to attend the pre-bid meeting. No additional meetings or site reviews will be provided or allowed.

#### IV. **INTERPRETATIONS**

- A. Each Bidder shall carefully examine the Contract Documents and all addenda or other revisions and thoroughly familiarize itself with the detailed requirements prior to submitting a Bid. Should a Bidder find discrepancies or ambiguities in, or omission from the Contract Documents, or should it be in doubt as to their meaning, it shall at once, and in any event, not later than 2:00 P.M. on October 29, 2020 notify Erin Henderson, the Owner's Contracts Administrator in writing, or by fax to (540) 563-4838, of the nature of the problem or question. Said Contracts Administrator will send or arrange for the sending of written Addenda and/or answers to questions to all Bidders of record who have requested a bid package. Bidders shall not seek nor be entitled to rely upon any oral instructions, statements, or interpretations by Owner or Owner's Consultant. All Addenda sent to Bidders will become a part of the Contract Documents.
- B. Acknowledgment or receipt of all Addenda shall be made by each bidder in the space provided in the Bid Form.

V. **MODIFICATIONS AND/OR WITHDRAWAL OF PROPOSALS**

A. Prior to Bid Opening:

A Bidder may withdraw or revise (by withdrawal of one bid and submission of another) a bid, provided that Bidder's request for withdrawal is received by the Owner in writing or by telegram or fax before the time specified for opening bids. Revised bids must be received at the place specified in the Invitation to Bid before the time specified for opening all bids.

B. Withdrawal After Bid Opening:

1. A Bidder may withdraw its bid from consideration if the price bid is substantially lower than the other bids due solely to a mistake therein, provided the bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of a bid, which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the bid sought to be withdrawn. The Bidder shall give notice in writing of its claim of right to withdraw its bid within two (2) business days after the conclusion of the bid opening procedure, and shall submit original work papers, documents and materials used in preparation of such bid with the written notice. The work papers, documents and materials submitted by the bidder shall, at the bidder's request, be considered trade secrets or proprietary information. The mistake shall be proved only from the original work papers, documents and materials delivered as required herein.
2. No bid may be withdrawn under this section when the result would be the awarding of the contract on another bid of the same Bidder or of another bidder in which the ownership of the withdrawing bidder is more than five (5) percent.
3. If a bid is withdrawn under the authority of this section, the lowest remaining responsive and responsible bid shall be deemed to be the low bid.
4. No Bidder who is permitted to withdraw a bid shall, for compensation, supply any material or labor to or perform any subcontract or other work agreement for the person or firm to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the project for which the withdrawn bid was submitted.
5. The Executive Director shall notify the bidder in writing within five business days of the decision regarding the bidder's request to withdraw its bid. If the Commission's Executive Director denies the withdrawal of a

bid under the provisions of this Section, the Executive Director shall notify the Bidder and Commission in writing shall state in such notice the reasons for the decision and shall recommend award of the Contract by Commission to such Bidder at the bid price, provided such Bidder is a responsible and responsive bidder. At the same time that the notice is provided, the Commission shall return all work papers and copies thereof that have been submitted by the bidder.

VI. **REJECTION OF BIDS**

- A. Bids containing any omission, alterations of form, additions, exceptions or conditions not called for, conditional or alternate bids unless called for, or incomplete bids may be considered nonresponsive, irregular, or informal and may be rejected.
- B. If the bid from the lowest responsible and responsive bidder exceeds funds budgeted and tentatively allocated for this specific project, the Executive Director may negotiate with the apparent low bidder to obtain a contract price within available funds. The Executive Director shall determine that the lowest responsible and responsive bid exceeds funds available for this project and notify such bidder in writing of the Commission's desire to negotiate. Thereafter, negotiations with the apparent low bidder may be held to obtain a contract within available funds involving discussions of reduction of quantities, or other cost saving mechanisms. Any such negotiated contract shall be subject to the Commission's final approval.
- C. The Commission reserves the right to award the Contract to a Bidder other than the apparent low Bidder if such bidder is not the lowest responsible and responsive bidder. Should a contract be awarded to a Bidder other than the apparent low Bidder, it will be awarded to the lowest responsive and responsible Bidder meeting all requirements of these Contract Documents.
- D. The Commission reserves the right to accept or reject alternates in any order or combination, to waive any informalities or irregularities in any bid, to accept any part of or combination of bids, to reject any or all bids, and to re-advertise and rebid, should any said action be deemed to be in the best interest of the Commission.

VII. **AWARD AND EXECUTION OF CONTRACT**

A. **Consideration of Bids and Award of Contract**

The Commission reserves the absolute right to consider all bids and to determine, after such consideration, whether to award a contract for the Project. If a contract is awarded, the award will be to the lowest responsive and responsible bidder selected by the Commission; as such award may be evaluated to be in the best interest of the Commission. No award will be

made until the Commission has concluded such investigations as it deems necessary to establish the responsibility, qualifications and financial ability of the bidders and their products to perform in accordance with the contract documents to the satisfaction of the Commission within the time prescribed. The Commission reserves the right to reject the bid of any bidder who does not pass such investigation to the Commission's satisfaction. If the Contract is awarded, the Commission will give the successful bidder written notice of the award within sixty (60) calendar days after the opening of the bids. Until the final execution and delivery of the Contract back to the successful bidder, the Commission reserves the right to reject any or all bids, to waive informalities, technicalities or non-material defects or to advertise for new bids, or to proceed to do the work otherwise should any such action be deemed to be in the best interests of the Commission.

B. Acceptance of Bid

As soon as the bids have been reviewed and compared, which shall occur within thirty (30) consecutive calendar days after the Bid Opening date, the Roanoke Regional Airport Commission may give written "Notice of Bid Acceptance." The successful bidder shall be required, within fifteen (15) consecutive calendar days after the receipt of the "Notice of Bid Acceptance" to execute the Contract and return the Contract to the Commission.

C. Execution of Contract

The successful Bidder shall sign (execute) the Contract and return such signed Contract to the Owner, along with required insurance certificates and completed bond forms within fifteen (15) calendar days from the date of receipt of the Notice of Award by Owner. If the successful Bidder shall fail to execute the Contract within such fifteen (15) day period, the Commission may require forfeiture of the Bid Security, pursue any other remedies available at law or in equity, rescind the contract award and/or the Commission may then proceed to accept the Bid of the next lowest responsive and responsible Bidder. If the Contract is mailed, special handling is recommended.

D. Approval of Contract

Upon receipt from the successful bidder of required insurance documents, the executed Contract, the Performance and Payment Bonds, the construction schedule and any other required documents, the Owner may complete the execution of the Contract in accordance with applicable laws, and return a copy of the fully executed Contract to the Contractor. No contract is binding upon the Owner until it has been executed by the Owner and delivered to the Contractor. Work shall commence only upon Contractor's receipt of a written notice to proceed from Owner.

E. Failure to Execute Contract

Failure of the successful bidder to execute the Contract and furnish the required insurance documents and bonds within the 15 calendar days period after receiving Notice of Award shall be just cause for cancellation of the award. An award may then be made to the next lowest responsive and responsible bidder, or the work re-advertised, or handled as the Owner may determine in its sole and exclusive discretion.

F. Failure to Accept Bids

Should no "Notice of Bid Acceptance" be issued by Owner within sixty (60) consecutive calendar days after the opening of bids, each Bidder may have its bid security returned from Owner.

## **GENERAL CONDITIONS**

### **SECTION B**

Not included in Project Manual. Available by emailing  
Erin Henderson at [Erin.Henderson@flyroa.com](mailto:Erin.Henderson@flyroa.com)



**BID FORM**

**SECTION C**



**BID FORM**

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(Name of Bidder)

For

**HANGAR 4 PAVEMENT AND DRAINAGE REPAIRS**

AT

**ROANOKE BLACKSBURG REGIONAL AIRPORT  
ROANOKE, VIRGINIA**

**SUBMITTED TO THE**

**ROANOKE REGIONAL AIRPORT COMMISSION  
ROANOKE, VIRGINIA**

**BID NO. RRAC 20-017**

**THE BIDDER SHALL COMPLETE ALL ITEMS AND FILL IN ALL  
BLANKS IN THESE BID FORM PAGES**

**I. BID CONDITIONS AND PRICE:**

In compliance with the Invitation for Bids, the undersigned hereby proposes to furnish the materials and labor and to perform the work for the completion of the Hangar 4 Pavement and Drainage Repairs in strict accordance with the Invitation to Bid, Instructions to Bidders, the General Conditions, Technical Specifications, Drawings, Supplementary Drawings, and all other contract documents for the consideration of the price quoted in the following bid form, and agrees, upon receipt of written notice of award, that it will execute a contract in accordance with the bid as accepted and give the required contract bonds with good and sufficient surety, within fifteen (15) calendar days after receipt of notice of formal award of contract and presentation of the prescribed forms.

It is agreed that the undersigned has informed itself fully in regard to all conditions pertaining to the place where the work is to be done; that it has examined the drawings and specifications for the work and contractual documents thereto, including the special provisions, prior to the opening of bids, and that it has satisfied itself relative to the work to be performed.

It is agreed that the description of each item, being stated, implies although it does not mention, all incidentals and that the price stated is intended to cover all such work, materials, labor, equipment, and incidentals as constitute the bidder's obligations as

described in the specifications, and any details not specifically mentioned, but evidently included in the contract, shall be compensated for in the total lump sum price bid.

It is understood that this bid is submitted for the purpose of obtaining the work included in subject project at the Roanoke Blacksburg Regional Airport.

Said work is described in the project contract documents which also include the place, date, and time of opening bids.

Except to the extent extended by manufacturer's warranties required by the specifications and drawings, it is understood that all workmanship and materials under all items of work are guaranteed for two years from the date of final acceptance.

It is understood that the Owner reserves the right to accept or reject any or all bids and waive informalities.

It is understood that the quantities of work to be done are approximate only and are intended principally to serve as a guide in evaluation of bids, with the right reserved by the Owner to delete all or any portion of minor bid items-

The undersigned agrees that if awarded the contract, it will commence and complete the work in accordance with the provisions, requirements and deadlines of Section 2 of the General Conditions.

It is understood and agreed that for each calendar day that the work remains incomplete after the contract time and/or the milestone times (including all extensions and adjustments as provided in the Contract Documents), the amount per day as specified in Section 4, Contract Sum and Liquidated Damages of the form Contract (see Section D of these Specifications) shall be liquidated damages and may be retained, deducted and/or offset from any amounts due or to become due to the Contractor or its Surety. Such liquidated damages shall not be a penalty, but shall be considered as an agreed liquidation of a reasonable portion of damages that will be incurred by Owner as a result of the Contractor failing to complete the Work in the time provided in the Contract Documents. It is understood and agreed that: (a) the actual damages that may result from failure to complete the Work within the required time are uncertain and difficult to determine with exactness and that the fixed amount is not out of proportion to the probable loss; (b) Owner retains the right to make such retentions, deductions and/or offsets for liquidated damages at any time and that Owner's imposition and the retention, deduction and/or offset of any liquidated damages hereunder shall not be subject to any prior notice or claim requirements; and, (c) **by submitting this Bid, Contractor acknowledges and agrees that Contractor waives any defenses as to the validity of any liquidated damages provisions in this Contract based on such liquidated damages being void as penalties or not being reasonably related to actual damages.** It is further agreed, however, that application of liquidated damages hereunder shall not be Owner's exclusive

remedy and shall not bar any other claim, cause of action, or remedy that Owner may have against Contractor under applicable law in the performance of this Contract.

It is understood that this project is funded by local and state government funds and the Contractor shall be subject to all laws and regulations applicable to recipients of such funds.

Enclosed is security as required, consisting of \_\_\_\_\_ (cash, certified check, or bid bond) payable to the Roanoke Regional Airport Commission, in the amount of \$\_\_\_\_\_.

This amount equals five percent of the total amount bid submitted by the Contractor.

The Contractor shall be a licensed Class A Contractor registered with the Commonwealth of Virginia, shall list its registration number at the end of the bid in the designated location and shall enclose a copy of its licensing certificate.

This bid will remain valid and binding on Bidder for a period of forty-five (45) days from date of bid opening.

**Lump sum price for all work associated with the Base Bid for the Hangar 4 Pavement And Drainage Repairs and all associated services on the Project in accordance with Contract Documents:**

\_\_\_\_\_ (\$\_\_\_\_\_)  
(use words) (dollar figures)

Contract Time: Thirty (30) consecutive calendar days from Phase 1 Administrative Services Notice to Proceed and Substantially Complete within Sixty (60) calendar days and achieve Final Acceptance within Ninety (90) calendar days of the effective date of the Phase 2 Notice to Proceed, including all inspections and testing procedures required by these contract documents.

For Liquidated Damages Contract Provision: See Section 4.B. of the Contract Form – Section D

Five Hundred Dollars (\$500.00) per day may be claimed as liquidated damages and retained, offset or deducted from any money due or to become due to the Contractor or its Surety.

**Project work will occur in the airport secure area. Contractor will be required to go through the airport badging and security process. Security and badging documents are not included in the Project Manual but are required for the project.**

**Additional documents not included in the Project Manual but available from Erin Henderson include General Conditions, Including Special Conditions; Contract Forms; and General Terms and Conditions.**

**II. BIDDER CERTIFICATION OF LICENSURE AND LICENSURE OF SUBCONTRACTORS**

The undersigned Bidder hereby covenants and agrees to comply with Title 54.1, Chapter 11, Code of Virginia (1950), as amended, with respect to licensure of Bidder and all subcontractors who may be employed to perform the Work for the Roanoke Regional Airport Commission.

Bidder further represents and covenants: (i) that Bidder has verified that all subcontractors, currently identified in the Bid to perform a portion of the Work hold, or prior to performing any work at the airport, will hold required Commonwealth of Virginia and local licenses, including, without limitation, Contractor and business licenses; and, (ii) that if it is the Successful Bidder, Bidder shall verify that any additional subcontractors employed to perform the Work, subsequent to the date of this certification, shall hold all required Commonwealth of Virginia and local licenses, including, without limitation, Contractor and business licenses.

Bidder acknowledges and agrees that if it is awarded a contract for the Work, this Certification shall constitute a material part of Bidder's contract with the Commission and violation of the terms of this Certification shall constitute a breach of such Contract.

All persons signing this Bid, and thereby executing this Certification, on behalf of Bidder hereby warrant and represent that they have been duly authorized by proper action of Bidder to execute this Certification, and that upon such execution, this Certification shall be binding upon and enforceable against Bidder.

**IN WITNESS WHEREOF, the Bidder has affixed its hand and seal.**

\_\_\_\_\_  
**(Insert Bidder's Name)**

**Contractor's License Number:** \_\_\_\_\_

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

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

**Date:** \_\_\_\_\_

**III. QUALIFICATION OF BIDDERS**

**Each bidder shall fully complete the information below, which may be used in determining Bidder's competency and responsibility in accordance with the General Conditions.**

FIRM: \_\_\_\_\_

ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

PHONE: \_\_\_\_\_ FAX: \_\_\_\_\_

Contact in your firm for inquiries: \_\_\_\_\_

Years of business under present name: \_\_\_\_\_

Date of Incorporation: \_\_\_\_\_

Place of Incorporation: \_\_\_\_\_

Contracting Specialties: \_\_\_\_\_

Years performing work specialties: \_\_\_\_\_

Maximum Bonding Limits of firm: \_\_\_\_\_

List equipment available for project: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Name of proposed on-site Superintendent and relevant project experience during last five (5) years: \_\_\_\_\_

(Complete next page for relevant project experience of proposed on-site project superintendent)



List three (3) most recent contracts or subcontracts completed in the last five (5) years which included work similar to that required in this project.

| <u>Type of Project</u> | <u>Contract With<br/>Contact Person/<br/>Phone No.</u> | <u>Contract<br/>Amount</u> | <u>Date<br/>Completed</u> |
|------------------------|--|----------------------------|---------------------------|
|                        |  |                            |                           |
|                        |  |                            |                           |
|                        |  |                            |                           |
|                        |  |                            |                           |
|                        |  |                            |                           |

List of key subcontractors to be utilized on this project and their responsibilities:

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**IV. CERTIFICATION OF NON-COLLUSION**

The undersigned bidder hereby certifies that the accompanying bid is not the result of or affected by, any act of collusion with another person or company engaged in the same line of business or commerce, or any act of fraud punishable under Title 18.2, Chapter 12, Article 1.1 of the Code of Virginia, 1950, as amended. Furthermore, I understand that fraudulent and collusive bidding is a crime under the Virginia Governmental Frauds Act, the Virginia Government Bid Rigging Act, the Virginia Antitrust Act, and Federal Law and can result in fines, prison sentences, and civil damage awards.

The undersigned bidder agrees to abide by all conditions of this bid and the person signing this bid on behalf of bidder hereby certifies that (s)he is authorized to sign this bid for the bidder.

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

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

Signature: \_\_\_\_\_

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

Date: \_\_\_\_\_

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

Registered Virginia Contractor No. \_\_\_\_\_

**ATTACH A COPY OF VIRGINIA CONTRACTOR'S LICENSE**

**V. COMMONWEALTH OF VIRGINIA WORKERS' COMPENSATION CERTIFICATE  
OF COVERAGE (Revised 04/05/12)**

Section 2.2-4332, Code of Virginia, requires construction contractors and subcontractors to obtain and maintain workers' compensation insurance for the duration of the Work on behalf of the Commonwealth of Virginia, its departments, institutions or agencies, or local governmental entities.

Satisfactory evidence of coverage on this form must be provided to the Commission prior to commencement of work.

The undersigned organization stipulates that it:

- A. Has workers' compensation insurance and is in compliance with the Workers' Compensation statues of the Commonwealth of Virginia \_\_\_ Yes \_\_\_ No

Insurance Company \_\_\_\_\_

Policy expiration date \_\_\_\_\_, or

- B. Is self insured for workers' compensation \_\_\_\_\_ Yes.

Title of Construction Contract: \_\_\_\_\_

Bid Number: \_\_\_\_\_

Signed by: \_\_\_\_\_

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

Name of Company: \_\_\_\_\_

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

**VI. COMPLIANCE WITH STATE LAW; FOREIGN AND DOMESTIC BUSINESSES AUTHORIZED TO TRANSACT BUSINESS IN THE COMMONWEALTH**

Pursuant to Virginia Code Section 2.2-4311.2 (effective July 1, 2010), each bidder or offeror organized or authorized to transact business in the Commonwealth of Virginia pursuant to Title 13.1 or Title 50 of the Code of Virginia, (1950), as amended, or as otherwise required by law, is required to include in its bid or proposal its Virginia State Corporation Commission (SCC) Identification Number. Any bidder or offeror that is not required to be authorized to transact business in the Commonwealth of Virginia as a domestic or foreign business entity under title Title13.1 or Title 50 or as otherwise required by law is required to include in its bid or proposal a statement describing why the bidder or offeror is not required to be so authorized.

Please complete the following:

A. \_\_\_\_\_ Bidder/Offeror is a Virginia business entity organized and authorized to transact business in Virginia and such bidder's/offeror's SCC Identification Number is:

\_\_\_\_\_.

B. \_\_\_\_\_ Bidder/Offeror is an out-of-state (foreign) business entity authorized to transact business in Virginia and such bidder's/offeror's SCC Identification Number is:

\_\_\_\_\_.

C. \_\_\_\_\_ Bidder/Offeror does not have an Identification Number issued to it by the SCC and such bidder/offeror is not required to be authorized to transact business in Virginia by the SCC for the following reason(s):

\_\_\_\_\_.

\_\_\_\_\_.

Please attach additional sheets of paper if more space is needed to explain why such bidder/offeror is not required to be authorized to transact business in Virginia.

The undersigned hereby acknowledges the receipt of the following Addenda to the Contract Documents.

Addendum No. One Issued \_\_\_\_\_(DATE)

Addendum No. Two Issued \_\_\_\_\_(DATE)

Addendum No. Three Issued \_\_\_\_\_(DATE)

Addendum No. Four Issued \_\_\_\_\_(DATE)

Addendum No. Five Issued \_\_\_\_\_(DATE)

**EACH BIDDER MUST COMPLETE AND SIGN THE INFORMATION BLOCK BELOW  
OR ELSE ITS BID SHALL BE DETERMINED TO BE NON-RESPONSIVE.**

\_\_\_\_\_  
Complete Firm Name of Bidder

\_\_\_\_\_  
Signature of Authorized Official

\_\_\_\_\_  
Name & Title of Signing Official

Business Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone:

(    )

Area Code

Email Address:

\_\_\_\_\_

CONTRACTOR'S VIRGINIA "CLASS A" CONTRACTOR NO: \_\_\_\_\_

**\*\* END OF BID \*\***



ROANOKE REGIONAL AIRPORT COMMISSION  
BID BOND FOR CONSTRUCTION PROJECT

KNOW ALL MEN BY THESE PRESENTS: that

\_\_\_\_\_

Insert full name or legal title and address of Principal)

as Principal (hereinafter referred to as "Contractor"), and

\_\_\_\_\_

(Insert full name or legal title and address of Surety),

as Surety (hereinafter referred to as "Surety"),

a corporation duly organized under the laws of the State of \_\_\_\_\_ and legally authorized to do business in the Commonwealth of Virginia, are held and firmly bound unto the ROANOKE REGIONAL AIRPORT COMMISSION, 5202 Aviation Drive, Roanoke, Virginia 24012, as obligee (hereinafter referred to as "Commission"), in the amount of \_\_\_\_\_ DOLLARS (\$ \_\_\_\_\_ 00.00), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein.

WHEREAS, Contractor has submitted to Commission a certain bid dated \_\_\_\_\_ (Bid. No.20-017), to enter into a contract ("Contract") for the following construction project: \_\_\_\_\_ Project at the Roanoke Blacksburg Regional Airport ("Bid"), including, without limitation and as may be applicable, the Invitation To Bid, Instructions to Bidders, General Conditions, completed Bid Forms, Specifications, Plans and Drawings, if any, which documents are referred to collectively as "Bid Documents" and are expressly incorporated herein by reference and made a part of this bond.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION are as follows:

- a. If the Contractor's Bid shall be rejected, or if said Bid shall be accepted and the Contractor shall timely deliver to Commission the Contract and all required documentation fully completed and properly executed in the form required in the Bid and Contract Documents, including all documents necessary to form a valid and binding contract, as determined by Commission, and, if Contractor shall in all other respects perform the obligations created by the acceptance of said Bid, then this obligation shall be null and void, otherwise this obligation and all provisions of this bond shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event,

exceed the penalty amount of this bond.

- b. If Contractor's bid shall be accepted but Contractor shall fail to timely deliver to Commission all required documentation fully completed and properly executed in the form and as required in the Bid and Contract documents, or in any other respect fail to perform the obligations created by the acceptance of said Bid, as determined by Commission, Contractor and Surety shall defend, indemnify, and hold Commission harmless from and against any and all liability, loss, cost, damage, or expense, including reasonable attorney's fees and/or the cost of any other professional services, which Commission may incur or which may result from or be imposed upon Commission by reason of such failure.
- c. The Surety, for value received, hereby stipulates and agrees that the obligations of the Surety and this bond shall be in no way impaired or affected by any extension by Commission of the time within which Commission may accept such Bid, and the Surety does hereby expressly waive any notice of any such extension.
- d. The provisions of this bond shall be governed by and are intended to be consistent with the laws of the Commonwealth of Virginia. In light of this express choice of law provision, Virginia law for determining governing law shall not apply to the provisions of this bond. Contractor, for itself and its successors and assigns, and the Surety, for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of Commission to require a bond containing the provisions contained herein and they hereby further expressly waive any defense which they or either of them might interpose to any action brought hereon upon the ground that there is no law authorizing the Commission to require the provisions herein.
- e. This bond shall continue in full force and effect and shall not be deemed canceled or to have expired unless and until written notice of cancellation or expiration from Surety is received by Commission at least 90 calendar days prior to the effective date of such cancellation or expiration.
- f. Wherever possible, each provision of this bond shall be interpreted in such manner as to be effective and valid under applicable law. If any provision of this bond is held illegal or unenforceable in a judicial proceeding, such provision shall be severed and shall be inoperative, and all remaining provisions of this bond shall remain operative and binding on the parties.
- g. Any suit or action hereunder shall be brought in a Virginia court of competent jurisdiction in and for the City of Roanoke, or in the United States District Court for the Western District of Virginia, Roanoke Division, and not elsewhere.

- h. This bond shall be construed and interpreted without regard to the identity of the party which drafted its various provisions. Every provision of this bond shall be construed as if all parties participated equally in the drafting of that provision. Any legal principle or rule of construction that a document is to be construed or interpreted against the drafting party shall not be applicable in any legal or other proceeding involving the provisions of this bond, and such principle or rule is expressly waived by the parties to this bond.
- i. Each party to this bond represents and covenants that the individual executing this bond on its behalf has full, unconditional authority to execute this bond and that, upon the signing of the bond by the authorized individual for each party, this bond shall become binding upon all parties

SIGNED and SEALED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, in the presence of:

|          |                  |
|----------|------------------|
|          | _____            |
|          | Contractor       |
| WITNESS: | By: _____ (Seal) |

|       |                       |
|-------|-----------------------|
| _____ | _____                 |
|       | (Type Name and Title) |

|          |                  |
|----------|------------------|
|          | _____            |
|          | Surety           |
| WITNESS: | By: _____ (Seal) |

|       |                       |
|-------|-----------------------|
| _____ | _____                 |
|       | Attorney-In-Fact      |
|       | (Type Name and Title) |

(SURETY: Affix seal and attach current power of attorney)



## **CONTRACT FORMS**

### **SECTION D**

Not included in Project Manual. Available by emailing  
Erin Henderson at [Erin.Henderson@flyroa.com](mailto:Erin.Henderson@flyroa.com)



**GENERAL TERMS AND CONDITIONS**

**SECTION E**

Not included in Project Manual. Available by emailing  
Erin Henderson at [Erin.Henderson@flyroa.com](mailto:Erin.Henderson@flyroa.com)



**DRAWING SHEET INDEX**

**SECTION F**



### DRAWING SHEET INDEX

|      |                                 |
|------|---------------------------------|
| C100 | EXISTING / DEMOLITION SITE PLAN |
| C200 | SITE PLAN                       |
| C300 | MISCELLANEOUS DETAILS           |



**TECHNICAL SPECIFICATIONS**  
**SECTION G**



## **SECTION 01 1000 - SUMMARY**

### **PART 1 GENERAL**

#### **1.1 PROJECT**

- A. The Project consists of the construction of involves the replacement of drop inlet stormwater structures and the remediation of an area of deteriorating asphalt overlay and replacement with two inch thick asphalt overlay.

#### **1.2 CONTRACT DESCRIPTION**

- A. Contract Type: A single prime contract based on a Stipulated Price as described in the Agreement.

#### **1.3 OWNER OCCUPANCY**

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

**END OF SECTION**

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## **SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. General administrative requirements.
- B. Pre-construction conference.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Progress photographs.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Requests for Interpretation (RFI) procedures.
- J. Submittal procedures.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6000 - Product Requirements: General product requirements.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.1 PRE-CONSTRUCTION CONFERENCE**

- A. Owner will schedule a meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.
  - 2. Architect/Engineer.
  - 3. Contractor.
- C. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Submission of initial Submittal schedule.
  - 6. Designation of personnel representing the parties to Contract, [\_\_\_\_\_] and .
  - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 8. Scheduling.
- D. Architect will record minutes and distribute copies within five days after meeting to participants with one copy to Contractor, Owner, participants, and those affected by decisions made.
- E. Record minutes and distribute copies within five days after meeting to participants, with one copy to Architect/Engineer, Owner, participants, and those affected by decisions made.

#### **3.2 SITE MOBILIZATION MEETING**

- A. Schedule meeting at the Project site prior to Contractor occupancy.

- B. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Architect/Engineer.
  - 4. Contractor's superintendent.
  - 5. Major subcontractors.
- C. Agenda:
  - 1. Use of premises by Owner and Contractor.
  - 2. Owner's requirements.
  - 3. Construction facilities and controls provided by Owner.
  - 4. Temporary utilities provided by Owner.
  - 5. Survey and building layout.
  - 6. Security and housekeeping procedures.
  - 7. Schedules.
  - 8. Application for payment procedures.
  - 9. Procedures for testing.
  - 10. Procedures for maintaining record documents.
  - 11. Requirements for start-up of equipment.
  - 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within five days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

### **3.3 PROGRESS MEETINGS**

- A. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Architect/Engineer.
  - 4. Contractor's superintendent.
  - 5. Major subcontractors.
- C. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems that impede, or will impede, planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Review of RFIs log and status of responses.
  - 7. Review of off-site fabrication and delivery schedules.
  - 8. Maintenance of progress schedule.
  - 9. Corrective measures to regain projected schedules.
  - 10. Planned progress during succeeding work period.

11. Coordination of projected progress.
  12. Maintenance of quality and work standards.
  13. Effect of proposed changes on progress schedule and coordination.
  14. Other business relating to work.
- D. Record minutes and distribute copies within five days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

### **3.4 CONSTRUCTION PROGRESS SCHEDULE**

- A. Prepare schedule for Pre Construction Conference per Project Manual General Conditions.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

### **3.5 PROGRESS PHOTOGRAPHS**

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect/Engineer.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
- E. Views:
  1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
  2. Consult with Architect/Engineer for instructions on views required.
  3. Provide factual presentation.
  4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
  1. Delivery Medium: Via email.
  2. File Naming: Include project identification, date and time of view, and view identification.
  3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
  4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

### **3.6 REQUESTS FOR INTERPRETATION (RFI)**

- A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  1. Prepare a separate RFI for each specific item.

- a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
  - b. Do not forward requests which solely require internal coordination between subcontractors.
- 2. Prepare in a format and with content acceptable to Owner.
- 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- B. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
  - 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
  - 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
    - a. Approval of substitutions (see Section - 01 6000 - Product Requirements)
    - b. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
  - 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
- C. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
  - 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
  - 2. Owner's, Architect/Engineer's, and Contractor's names.
  - 3. Discrete and consecutive RFI number, and descriptive subject/title.
  - 4. Issue date, and requested reply date.
  - 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
  - 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
  - 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
  - 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
  - 2. Note dates of when each request is made, and when a response is received.
  - 3. Highlight items requiring priority or expedited response.
- F. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to

lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect/Engineer within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### **3.7 SUBMITTAL SCHEDULE**

- A. Submit to Architect/Engineer for review a schedule for submittals in tabular format.
  1. Submit at the same time as the preliminary schedule.
  2. Coordinate with Contractor's construction schedule and schedule of values.
  3. Format schedule to allow tracking of status of submittals throughout duration of construction.

### **3.8 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
  1. Product data.
  2. Design data.
  3. Shop drawings.
  4. Samples for selection.
  5. Samples for verification.
- B. Submit to Architect/Engineer for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

### **3.9 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
  1. Certificates.
  2. Test reports.
  3. Inspection reports.
  4. Manufacturer's instructions.
  5. Manufacturer's field reports.
  6. Field engineering daily reports.
  7. Other types indicated.
- B. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.

### **3.10 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Warranties.
  - 4. Bonds.
  - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

### **3.11 NUMBER OF COPIES OF SUBMITTALS**

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Extra Copies at Project Closeout: See Section 01 7800.
- C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect/Engineer.
  - 1. After review, produce duplicates.
  - 2. Retained samples will not be returned to Contractor unless specifically so stated.

### **3.12 SUBMITTAL PROCEDURES**

- A. General Requirements:
  - 1. Use a separate transmittal for each item.
  - 2. Transmit using approved form.
    - a. Use Contractor's form, subject to prior approval by Architect/Engineer.
  - 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
  - 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
  - 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
    - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
  - 6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    - a. Send submittals in electronic format via email to Architect/Engineer.
  - 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
    - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    - b. For sequential reviews involving Architect/Engineer's consultants, Owner, or another affected party, allow an additional 7 days.

- c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect/Engineer's approval, allow an additional 30 days.
  8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
  9. Provide space for Contractor and Architect/Engineer review stamps.
  10. When revised for resubmission, identify all changes made since previous submission.
  11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
  12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
  13. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
  2. Collect required information into a single submittal.
  3. Submit concurrently with related shop drawing submittal.
  4. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
  2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
  2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
  3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.
- E. Submittal number shall indicate Specification Section number followed by a hyphen and sequentially-numbered submittal number; "Rev" and a sequentially-numbered revision number complete the submittal number format. For example, 06 1000-1 Rev0 indicates the first submittal for Specification Section 06 1000, whereas 06 1000-2 Rev0 indicates the second submittal. 06 1000-1 Rev1 indicates a resubmittal for the first submittal under Specification Section 06 1000.
1. When revised for resubmission, clearly identify all changes made since previous submission and include all portions of the original submittal such that the final resubmittal is a complete representation of all items reviewed.
- F. For internal tracking purposes, the Architect/Engineer may also apply a sequential number to submittals indicating order of receipt, including a sequentially alphabetic suffix (R1, R2, etc.) to indicate resubmittals.
- G. For each submittal for review, allow 15 calendar days excluding delivery time to and from the Contractor. Additional review time may be required for large or complex submittals. Submittals received after 2 p.m. will be considered as received on the next business date.

- H. Do not make "mass submittals" to Architect/Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 15 or more submittals or items in one week. If "mass submittals" are received, Architect/Engineer's review time stated above will be extended as necessary to perform proper review. Architect/Engineer will review "mass submittals" based on priority determined by Architect/Engineer after consultation with Owner and Contractor.

### **3.13 SUBMITTAL REVIEW**

- A. Submittals for Review: Architect/Engineer will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect/Engineer will acknowledge receipt and review. See below for actions to be taken.
- C. Architect/Engineer's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect/Engineer's and consultants' actions on items submitted for review:
  - 1. Authorizing purchasing, fabrication, delivery, and installation:
    - a. "Approved", or language with same legal meaning.
    - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
      - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
    - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
      - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
      - 2) Non-responsive resubmittals may be rejected.
  - 2. Not Authorizing fabrication, delivery, and installation:
    - a. "Revise and Resubmit".
      - 1) Resubmit revised item, with review notations acknowledged and incorporated.
      - 2) Non-responsive resubmittals may be rejected.
    - b. "Rejected".
      - 1) Submit item complying with requirements of Contract Documents.
- E. Architect/Engineer's and consultants' actions on items submitted for information:
  - 1. Items for which no action was taken:
    - a. "Received" - to notify the Contractor that the submittal has been received for record only.
  - 2. Items for which action was taken:
    - a. "Reviewed" - no further action is required from Contractor.

### **END OF SECTION**

## **SECTION 01 4000 - QUALITY REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Submittals.
- B. References and standards.
- C. Control of installation.
- D. Tolerances.
- E. Defect Assessment.

#### **1.2 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect/Engineer's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
  - 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
  - 2. Include required product data and shop drawings.
  - 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
  - 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

#### **1.3 REFERENCES AND STANDARDS**

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in any reference document.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.1 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.

- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### **3.2 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **3.3 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect/Engineer, it is not practical to remove and replace the work, Architect/Engineer will direct an appropriate remedy or adjust payment.

**END OF SECTION**

## **SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Temporary sanitary facilities.
- B. Temporary Controls: Barriers, enclosures, and fencing.
- C. Security requirements.
- D. Vehicular access and parking.
- E. Waste removal facilities and services.

#### **1.2 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

#### **1.3 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

#### **1.4 FENCING**

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

#### **1.5 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

#### **1.6 VEHICULAR ACCESS AND PARKING**

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Existing parking areas located at overflow lot may be used for construction parking.

#### **1.7 WASTE REMOVAL**

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

## **1.8 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

## **SECTION 01 5500 - VEHICULAR ACCESS AND PARKING**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Access roads.
- B. Parking.
- C. Existing pavements and parking areas.
- D. Permanent pavements and parking facilities.
- E. Construction parking controls.
- F. Flag persons.
- G. Haul routes.
- H. Maintenance.
- I. Removal, repair.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

- A. Temporary Construction: Contractor's option.

#### **2.2 SIGNS, SIGNALS, AND DEVICES**

- A. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

#### **3.2 ACCESS ROADS**

- A. Tracked vehicles not allowed on paved areas.
- B. Provide and maintain access to fire hydrants free of obstructions.

#### **3.3 PARKING**

- A. Use of designated areas of existing parking facilities by construction personnel is permitted.

#### **3.4 PERMANENT PAVEMENTS AND PARKING FACILITIES**

- A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
- B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

#### **3.5 CONSTRUCTION PARKING CONTROLS**

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

#### **3.6 FLAG PERSONS**

- A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

#### **3.7 HAUL ROUTES**

- A. Confine construction traffic to designated haul routes.

- B. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

### **3.8 MAINTENANCE**

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

### **3.9 REMOVAL, REPAIR**

- A. Repair existing facilities damaged by use, to original condition.
- B. Remove equipment and devices when no longer required.
- C. Repair damage caused by installation.

### **END OF SECTION**

## **SECTION 01 6000 - PRODUCT REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Transportation, handling, storage and protection.
- B. Product option requirements.
- C. Substitution limitations.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

#### **1.3 SUBMITTALS**

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

### **PART 2 PRODUCTS**

#### **2.1 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by Contract Documents.

#### **2.2 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

### **PART 3 EXECUTION**

#### **3.1 SUBSTITUTION LIMITATIONS**

- A. See Section 01 2500 - Substitution Procedures.
- B. Submit substitution requests by completing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- C. Submit three hard copies or one electronic copy of request for substitution for consideration. Limit each request to one proposed substitution.

### **3.2 TRANSPORTATION AND HANDLING**

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### **3.3 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**END OF SECTION**

## **SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, [\_\_\_\_\_].
- C. Pre-Installation meetings.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

#### **1.3 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
  - 1. On request, submit documentation verifying accuracy of survey work.
  - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
  - 3. Submit surveys and survey logs for the project record.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

#### **1.4 QUALIFICATIONS**

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect/Engineer. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

#### **1.5 PROJECT CONDITIONS**

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

## **1.6 COORDINATION**

- A. See Section 01 1000 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## **PART 2 PRODUCTS**

### **2.1 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means

acceptance of existing conditions.

### **3.2 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### **3.3 PRE-INSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect/Engineer four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within five days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

### **3.4 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect/Engineer of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect/Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and [\_\_\_\_\_].
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations, and [\_\_\_\_\_].
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

### **3.5 GENERAL INSTALLATION REQUIREMENTS**

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

### **3.6 ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Architect/Engineer before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove items indicated on drawings.
  - 2. Relocate items indicated on drawings.
  - 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  - 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and [\_\_\_\_]): Remove, relocate, and extend existing systems to accommodate new construction.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. Provide temporary connections as required to maintain existing systems in service.
  - 4. Verify that abandoned services serve only abandoned facilities.
  - 5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- D. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

- F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- G. Refinish existing surfaces as indicated:
  - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
  - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- H. Clean existing systems and equipment.
- I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- J. Do not begin new construction in alterations areas before demolition is complete.
- K. Comply with all other applicable requirements of this section.

### **3.7 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.8 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.9 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### **3.10 FINAL CLEANING**

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and [\_\_\_\_\_].
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### **3.11 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect/Engineer.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect/Engineer when work is considered ready for Architect/Engineer's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect/Engineer's Substantial Completion inspection.
- E. Owner will occupy all of the building as specified in Section 01 1000.
- F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect/Engineer's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect/Engineer.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Notify Architect/Engineer when work is considered finally complete and ready for Architect/Engineer's Substantial Completion final inspection.
- I. Complete items of work determined by Architect/Engineer listed in executed Certificate of Substantial Completion.

### **END OF SECTION**

## **SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

### **PART 1 GENERAL**

#### **1.1 WASTE MANAGEMENT REQUIREMENTS**

- A. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- B. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- C. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
- D. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.1 WASTE MANAGEMENT PROCEDURES**

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

### **END OF SECTION**

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## **SECTION 01 7800 - CLOSEOUT SUBMITTALS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 00 7210 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

#### **1.3 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect/Engineer with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.1 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.

3. Addenda.
  4. Change Orders and other modifications to the Contract.
  5. Reviewed shop drawings, product data, and samples.
  6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
  - C. Store record documents separate from documents used for construction.
  - D. Record information concurrent with construction progress.
  - E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
    1. Manufacturer's name and product model and number.
    2. Product substitutions or alternates utilized.
    3. Changes made by Addenda and modifications.
  - F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
    1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
    2. Field changes of dimension and detail.
    3. Details not on original Contract drawings.

### **3.2 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- B. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

### **3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  1. Description of unit or system, and component parts.

2. Identify function, normal operating characteristics, and limiting conditions.
  3. Include performance curves, with engineering data and tests.
  4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

### **3.5 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS**

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect/Engineer, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
  1. Project Directory.
  2. Table of Contents, of all volumes, and of this volume.
  3. Operation and Maintenance Data: Arranged by system, then by product category.
    - a. Source data.
    - b. Product data, shop drawings, and other submittals.
    - c. Operation and maintenance data.
    - d. Field quality control data.
    - e. Photocopies of warranties and bonds.

### **3.6 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until

Date of Substantial completion is determined.

- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

**END OF SECTION**

**APPENDIX**

**SECTION H**

**Appendix A – Hangar 4 Storm System Evaluation – 5 June 2020**





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ENGINEERS ARCHITECTS SURVEYORS

June 5, 2020

Mr. Richard Osborne  
Director of Planning and Engineering  
Roanoke Regional Airport Commission  
5202 Aviation Drive, NW  
Roanoke, Virginia 24012

Re: Hangar 4 Storm System Evaluation  
T&L Project Number: 15391

Dear Mr. Osborne:

### **Background**

The Roanoke Regional Airport Commission (RRAC) has been experiencing stormwater system issues near Hangar 4. RRAC would like to replace three (3) drop inlets (DI) and the associated piping near Hangar 4. The DI's are generally located to along the north side of Hangar 4 with one DI located on the west side and two DI's located on the east side of the hangar. The west side DI is a brick structure and appears to be in danger of failing. It is currently protected by an orange safety cone to minimize the amount of vehicular traffic over the DI. The two DI's located on the east side of the hangar are not in the direct path of vehicle travel but are still subject to vehicular traffic. In addition to the DI's, one concrete manhole structure is not level with the surrounding concrete and asphalt. RRAC would like to level the concrete and asphalt surface with the manhole structure. Please see Exhibit 1 for a map illustrating the locations of the structures.

### **Findings**

T&L performed a site visit to document and evaluate existing conditions of the stormwater infrastructure. Below is a summary of the findings.

**Structure 4** is located off the northwest corner of Hangar 4. The pavement around Structure 4 has sunken and has cracked. Structure 4 is a brick manhole that has been previously lined with concrete. Most of the concrete lining has cracked and missing. Additionally, bricks have begun to crack and fail which has resulted in multiple half and full bricks falling off and into the bottom of the structure. The pipes appeared to be reinforced concrete. There were no visible cracks or failures in the pipes on the day of the



site visit. Due to the quantity of stormwater collected by the inlet, bricks have been displaced by the stormwater and the pipe has partially filled with bricks and concrete debris.



Structure 4 wall falling in.



Bricks and debris laying in pipe from Structure 4 to Structure 5.

**Structure 5** is located off the northeast corner of Hangar 4. Structure 5 is a brick manhole lined with concrete. The concrete was cracked and chipping off exposing brick on areas inside the manhole. The pipes appeared to be reinforced concrete. There were no visible cracks or failures in the pipes on the day of the site visit. Daylight was detected at the end of the pipes at Structures 4 & 7 indicating the pipes are intact. Please see the photos below for reference.



Structure 5 walls and bottom.



Typical depiction of pipes from Structure 5, indicating no issues.

**Structure 7** is located directly northeast of Structure 5. Structure 7 is a brick manhole lined with concrete. The majority of the concrete was cracked and deteriorated. The concrete was easily chipping off with minimal effort. Bricks and concrete were laying in



the bottom of the manhole and inside of the pipes. The pipes appeared to be reinforced concrete. There were no visible cracks or failures in the pipes on the day of the site visit. Please see the photos below for reference.



Structure 7 concrete walls deteriorating.



Bricks and concrete laying in pipe from Structure 7 to Structure 5.

**Structure 8** is located in the parking lot off the southeast side of Hangar 4. Structure 8 is a brick manhole lined with concrete. The grate was stuck to the frame and we were unable to access the inside of the manhole. Through the grate, we observed concrete and asphalt in the bottom of the manhole. We were unable to evaluate the pipes through the grate. Please see the photos (taken through the grate) below for reference.



Asphalt laying in bottom of Structure 8.



Asphalt laying in pipe from Structure 8 to Structure 5.

**Roof Drains** located along the north side of Hangar 4 are terracotta fittings connected to concrete pipes. The roof drains appear to connect directly into the reinforced concrete pipe between Structures 4 & 5. It is evident that the horizontal roof drains are not appropriately sized, failing, or backwater impacts are occurring as there is erosion



around the vertical roof drain to horizontal roof drain connection points indicated stormwater is discharging around the connection points. It appears a concrete slab was set to help prevent the spread of the erosion at one of the roof drains. Please see the photos below for reference.



Concrete slab laying on top of eroded ground caused by roof drains flooding.



Broken terracotta fitting at roof drain connection.

### **Recommendations**

Structures 4 and 7 are experiencing severe deterioration and Structures 5 and 8 are beginning to deteriorate. T&L recommends replacing Structures 4, 7, and 8 with a 4-foot diameter VDOT Standard Monolithic B-1 manhole with VDOT Standard T-DI-1 top/grates. T&L recommends replacing Structure 5 with a 5-foot diameter VDOT Standard Monolithic or Doghouse B-1 manhole with a VDOT Standard T-DI-1 top/grate. The contractor shall verify if the "Doghouse" manhole is feasible with the existing pipe diameters and angles.

T&L recommends backfilling the excavated area around the new structured with VDOT #57 stone. The pavement around the manholes shall be replaced to at least the existing pavement depth or the depth illustrated on the "Heavy-Duty Pavement" and the "Concrete Rigid Pavement" details on Exhibit III, whichever is greater. T&L recommends that the pavement around Structure 6 be replaced to ensure a smooth transition to the top of the structure and to level the pavement/concrete with the top of the structure.

The existing stormdrains appear to be reinforced concrete pipe and there were no visible cracks or failures on the day of the site visit; therefore, T&L recommends leaving the existing stormdrains in place and cleaning out any debris that may be visible.

T&L recommends replacing the roof drain connections with HDPE. Furthermore, is recommended that the roof drains are evaluated during storm events to determine the



Mr. Richard Osborne

June 5, 2020

Page 5

severity of leakage. Extensive discharge around the horizontal to vertical connections during light rainfall indicates that the pipes are damaged and/or collapsing and need to be replaced. Damaged or failed pipes should be replaced with dual wall HDPE pipes. Replacement may require extensive excavation. Based on our observations the discharge around the horizontal to vertical connections is causing erosion but is not significantly impacting the foundation of the building.

The work as recommended above shall be considered maintenance and exempt from the City of Roanoke's Erosion & Sediment Control and Stormwater Management permits.

If you have any questions, comments, and/or require any additional services, please contact us at (540) 633-1897. We appreciate this opportunity to provide services to the Commission and look forward to continuing with this project until completion.

Sincerely,

Chad Robertson  
Civil Designer

Attachments



**APPENDIX**

**SECTION H**

**Appendix B – Hangar 4 Pavement Evaluation – 4 August 2020**





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ENGINEERS ARCHITECTS SURVEYORS

August 4, 2020

Mr. Richard Osborne  
Director of Planning and Engineering  
Roanoke Regional Airport Commission  
5202 Aviation Drive, NW  
Roanoke, Virginia 24012

Re: Hangar 4 Pavement Evaluation  
T&L Project Number: 15391

Dear Mr. Osborne:

### **Background**

The Roanoke Regional Airport Commission (RRAC) has contracted Thompson & Litton (T&L) to investigate and evaluate the concrete and asphalt surfaces surrounding Hangar 4. RRAC would like recommendations to repair the concrete and asphalt surfaces. Please see Exhibit 1 for a map illustrating the locations of the aforementioned surfaces.

### **Findings**

T&L performed a site visit to document and evaluate existing conditions of the concrete and asphalt paved surfaces located on the northeast & southwest side of Hangar 4. Additionally, T&L contracted Froehling & Robertson, Inc. (F&R) to perform subsurface exploration and geotechnical engineering analyses on the asphalt paved surface located southwest of Hangar 4. Below is a summary of the findings and recommendations in reference with this evaluation.

T&L performed a field evaluation of the concrete paved surface located to the northeast of Hangar 4. The concrete pavement is experiencing minor cracking and deterioration. Additionally, holes within the concrete pavement exposing steel reinforcing bars were observed in multiple locations. It appears they may have been used as anchor points for tie downs. Overall, the concrete pavement appears to be in sufficient order and T&L does not recommend replacing the concrete pavement at this time. Please review the photos below for a visual representation.



Overall photo of the concrete pavement.



Cracking in concrete pavement.



Exposed steel reinforcing bar.



Exposed steel reinforcing bar.

F&R performed subsurface exploration and geotechnical engineering analyses on the asphalt paved surface located southwest of Hangar 4. As noted in their geotechnical report, they encountered 1-inch to 2-inch thick asphalt pavement overlaid on rigid concrete pavement ranging in thickness from 6.5-inches to 8.5-inches. Beneath the rigid concrete pavement a base stone layer was encountered ranging in thickness from 7-inches to 16-inches. Furthermore, the asphalt surface is experiencing longitudinal reflection cracking. The cracking is most likely due to the freeze-thaw cycle of the rigid concrete pavement. Deteriorated concrete will draw in moisture and freeze-thaw causing expansion and retraction (rise and fall) of the concrete. The rise and fall of the concrete can cause the asphalt overlay to crack. Please review the photos below for a visual representation of the longitudinal cracking in the asphalt pavement overlay.



Longitudinal cracking of asphalt overlay



Longitudinal cracking of asphalt overlay.

### **Recommendations**

As stated within F&R's geotechnical report, the concrete pavement underneath the asphalt overlay does not appear to require immediate replacement. The following options for immediate remediation of the existing asphalt overlay is as follows:

#### **Option 1**

An option to remediate the deteriorating asphalt overlay is to demolish the existing asphalt overlay and replace with a 2-inch thick asphalt overlay. This option would require the existing concrete pavement to be inspected for substantial cracking once the existing asphalt overlay has been removed. If additional cracks are identified in the concrete pavement, the concrete shall be evaluated at the cracks via coring in order to determine if the cracks are superficial or if the crack continues through the entire thickness of the concrete. Once all repairs to the concrete pavement have been completed, the concrete shall be milled or ground to ensure a better bond to the asphalt overlay. As mentioned previously, there is a possibility of the existing concrete pavement expanding and retracting causing the new asphalt overlay to crack in the future.

#### **Option 2**

Another option for immediate remediation of the deteriorating asphalt overlay is to demolish the existing asphalt overlay and concrete pavement and replace with concrete pavement. F&R stated in their report that a steel reinforcing bar was encountered during one of the subsurface borings. If the steel reinforcing bar encountered is reinforcement running through the entirety of the concrete pavement, demolition costs will be substantially higher due to the removal of the reinforced concrete. Following removal of the existing concrete pavement, the aggregate subbase will require inspection for any contamination that may need removed. The aggregate subbase would be replaced with an approved aggregate. Additionally, this option would require a formal pavement design to determine the required thickness of the concrete. A 10-inch rigid concrete section is assumed to be utilized based on existing conditions for the cost estimate.



Mr. Richard Osborne  
August 4, 2020  
Page 4

Finally, this option provides the most reliable remediation that will last the foreseeable future.

The work as recommended above shall be considered maintenance and not require soil disturbance. This determination deems the project exempt from the City of Roanoke's Erosion & Sediment Control and Stormwater Management permits.

If you have any questions, comments, and/or require any additional services, please contact us at (540) 633-1897. We appreciate this opportunity to provide services to the Commission and look forward to continuing with this project until completion.

Sincerely,

Chad Robertson  
Civil Designer

Attachments:      F&R Geotechnical Report  
                         Exhibit 1  
                         Cost Estimates

**APPENDIX**

**SECTION H**

**Appendix C – Report of Subsurface Exploration and Geotechnical  
Services – 10 July 2020**



# FROEHLING & ROBERTSON, INC.



*Engineering Stability Since 1881*

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1734 Seibel Drive, NE  
Roanoke, Virginia 24012  
T 540.344.7939 | F 540.344.3657

**F&R Project No.: 62Y0120**

10 July 2020

Thompson & Litton, Inc.  
726 Auburn Avenue  
Radford, VA 24141

(via email: bcollier@t-l.com)

Attention: Mr. Barry Collier  
Project Architect/ Project Manager

Subject: Subsurface Exploration and Geotechnical Services  
RBRAA Hanger #4 Pavement Rehabilitation  
Roanoke, Virginia

Dear Mr. Collier:

The purpose of this report is to present the results of our subsurface exploration program and geotechnical engineering analyses performed by Froehling & Robertson, Inc. (F&R) in connection with the above referenced project and in general accordance with F&R Proposal No. 2062-00067R1. The attached report presents our understanding of the project, reviews our exploration procedures, describes existing site and general subsurface conditions, and presents our evaluations, conclusions, and recommendations.

## **PROJECT INFORMATION**

Project information was provided by Mr. Barry Collier of Thompson & Litton, Inc. (T&L) as well as our previous experience in the site vicinity and with similar projects. The project consists of improvements at the Roanoke Airport Hanger No. 4 (See Site Vicinity Map, Drawing No. 1, Appendix A). Based on the provided information, we understand that rehabilitation is being considered for the existing concrete pavement overlaid with asphalt on the west side of Hanger No. 4 as well as the concrete pavement on the east side.

## **SCOPE OF SERVICES**

The purposes of our involvement on the project were as follows: 1) provide general descriptions of the pavement condition and subsurface conditions at the exploration locations at the west side of Hanger No. 4 and 2) provide general geotechnical commentary with respect to soil support conditions. To accomplish these objective, we undertook the following scope of services:

- 1) Visited the site to observe existing surface conditions and features and mark boring locations.
- 2) Coordinated utility clearance with Miss Utility services.



- 3) Reviewed and summarized readily available geologic information relative to the project site.
- 4) Executed a subsurface exploration consisting of four (4) standard penetration test borings and five (5) offset borings, drilled to depths of up to five feet below the existing ground surface.
- 5) Recovered four bulk samples for supplemental laboratory testing.
- 6) Performed a laboratory testing program including four (4) soil classifications test (Natural moisture content, Atterberg Limits, and wash No. 200) and four (4) California Bearing Ratio tests with associated Standard Proctors.
- 7) Evaluated the findings of the test borings and laboratory testing results relative to existing pavement conditions.
- 8) Prepared this written report summarizing our work on the project, providing descriptions of the encountered pavement and subsurface conditions, providing general commentary with regards to the need for rehabilitation and discussing geotechnical related aspects of the support conditions. Copies of the test boring logs and laboratory test results are included.

Our scope of services did not include survey services, quantity estimates, preparation of plans or specifications, formal retaining wall design, foundation design, pavement design, detention pond considerations, infiltration testing, evaluations of earthquake motions, sinkhole evaluation, or the identification and evaluation of wetland or other environmental aspects of the project site.

### **SUBSURFACE EXPLORATION SERVICES**

The subsurface exploration program consisted of four test borings and five offset borings (designated as Borings B-1 through B-4 and offset Borings B-1A, B-2A, B-3A, B-4A, B-4B) performed 4 through 8 June 2020 at the approximate locations shown on the attached Boring Location Plan (Drawing No. 2). Offset boring were generally performed to obtain an adequate amount of soil for laboratory testing. F&R personnel marked the borings locations in the field by taping and/or otherwise estimating distances from existing features shown on the provided image and/or using a hand held global positioning system (GPS) devise. No claim is made as to the accuracy of the information contained in the provided documents. We consider the test boring locations shown on the attached Boring Location Plan to be approximate.

The test borings were performed in accordance with generally accepted practice using a track mounted Diedrich 120 and a truck mounted CME 55 drill rig equipped with an automatic hammer. Hollow-stem augers were advanced to pre-selected depths, the center plug was removed, and representative soil samples were recovered with a standard split-spoon sampler (1 3/8 in. ID, 2 in. OD) in general accordance with ASTM D 1586, the Standard Penetration Test. Utilizing an automatic hammer, the split-spoon sampler was driven into the soil by freely dropping a weight of 140 pounds from a height of 30 inches. The number of blows required to drive the split-spoon sampler three consecutive 6-inch increments is recorded, and the blows of



the last two increments are summed to obtain the Standard Penetration Resistance (N-value). The N-value provides a general indication of in-situ soil conditions and has been correlated with certain engineering properties of soils.

An automatic hammer was used to perform the Standard Penetration Test (SPT) on this project. Research has shown that the Standard Penetration Resistance (N-value) determined by an automatic hammer is different than the N-value determined by the safety hammer method. Most correlations that are published in the technical literature are based on the N-value determined by the safety hammer method. This is commonly termed  $N_{60}$  ( $N_{60}$ ) as the rope and cathead with a safety hammer delivers about 60 percent of the theoretical energy delivered by a 140-pound hammer falling 30 inches. Several researchers have proposed correction factors for the use of hammers other than the safety hammer to correct the values to be equivalent to the safety hammer SPT  $N_{60}$ -values. The correction is made using the following equation:

$$N_{60} = N_{\text{field}} \times C_E$$

$N_{\text{field}}$  in the equation above is the SPT N-value as recorded with the equipment utilized in the field, and for our use of this equation,  $C_E$  a relative hammer efficiency ratio, i.e. our automatic hammer efficiency (specifically 92.4% for the Dietrich D-120 and 95.8 for the CME 55 drill rigs used on this project) divided by the theoretical  $N_{60}$  efficiency (60%). Accordingly, we recommend a correction factor ( $C_E$ ) of approximately 1.54 (Dietrich D-120) and 1.63 (CME 55) for the conversion of the recorded  $N_{\text{field}}$  values to normalized  $N_{60}$  values for the automatic hammers used on this project. We note that the N-values reported on the Boring Logs included in this report are the actual, uncorrected, field derived N-values ( $N_{\text{field}}$ ).

Subsurface water level readings were taken in each of the borings immediately upon completion of the soil drilling process. Upon completion of drilling the boreholes were backfilled with auger cuttings (soil) and capped with grout. Periodic observation and maintenance of the boreholes should be performed due to potential subsidence at the ground surface, as the borehole backfill could settle over time.

Representative portions of the split-spoon soil samples were classified by a member of our professional staff. The soil samples were evaluated in general accordance with techniques outlined in the visual-manual identification procedure (ASTM D 2488) and the Unified Soil Classification System (ASTM D 2487). The soil descriptions and classifications discussed in this report and shown on the attached boring logs are generally based on visual observation and should be considered approximate.

Copies of the boring logs are provided and classification procedures are further explained in the attached Appendix. Split-spoon soil samples recovered on this project will be stored at F&R's office for a period of sixty days. After sixty days, the samples will be discarded unless prior notification is provided to us in writing.



## SITE & SUBSURFACE CONDITIONS

### **Regional Geology**

The proposed project site lies within the Valley and Ridge Physiographic province of Virginia. Available geologic references (Geologic Map of Virginia, 1993) indicate that the site is underlain by Cambrian-aged rocks of the Elbrook Formation. The Elbrook formation is composed of light to dark gray dolostone and limestone with lesser shale and siltstone.

The Elbrook formation contains numerous carbonate rocks. Carbonate rocks may decompose in the presence of subsurface water that is slightly acidic. This decomposition may leave subsurface voids that may ravel up to the ground surface and form sinkholes. There are numerous variations on potential sinkhole development. Regardless of the mode of development, it is important to note that changes in soil stress and water regime can greatly accelerate sinkhole development. Natural geologic processes that might otherwise occur over thousands of years can occur within several years or even months.

Construction activities such as site grading, building construction, and water impoundment have reportedly caused sinkholes to develop rapidly or to collapse suddenly. This site lies within a geologic formation known to contain solutional features; however, the potential for development of sinkholes, along with the rate at which a sinkhole will develop, are not easily determined or accurately predicted.

### **General Subsurface Conditions**

The subsurface conditions discussed in the following paragraphs and those shown on the attached boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. The transitions between different soil strata are usually less distinct than those shown on the boring logs. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Data from the specific test borings are shown on the attached boring logs. Boring generally encountered an existing pavement section underlain by existing fill materials. These materials are generally discussed in the following paragraphs.

### **Asphalt, Concrete, and Base Stone**

An approximate 1-inch to 2-inch thick asphalt pavement layer was encountered onsite at the ground surface. Beneath the asphalt layer a rigid concrete pavement section was encountered ranging in thickness from 6.5 to 8.5 inches. Boring B-4 terminated at 9 inches due to No. 6 reinforcing steel encountered within the concrete pavement. Offset borings in this vicinity did penetrate through the concrete pavement. Beneath the asphalt and concrete pavement a base stone layer ranging in thickness from 7 to 16 inches was encountered. We note that the drilling process tends to disturb existing pavement sections during penetration and removal of the augers. Therefore, the measured asphalt, concrete, and base stone thicknesses should be



considered approximate. Actual depths of these materials may vary in unexplored areas of the site.

**Existing Fill Materials**

Existing fill materials include those materials deposited by man. Materials identified as existing fill were encountered in each of the test borings extending to the boring termination depths at 5 feet. The fill soil generally consisted of clay (CH) with sand. The standard penetration resistances (N-values) in the sampled fill ranged from 4 to 6 blows per foot (bpf).

**Subsurface Water**

Subsurface water for the purposes of this report is defined as water encountered below the existing ground surface. Measurable subsurface water was not encountered in our test borings immediately upon completion of the soil drilling process. Fluctuations in subsurface water levels and soil moisture can be anticipated with changes in precipitation, run-off, and season.

**Laboratory Testing Program**

Soil samples were tested in general accordance with applicable ASTM International (ASTM) test methods for natural moisture content (ASTM D 2216), Atterberg Limits (ASTM D 4318), percent passing No. 200 sieve (ASTM D 1140), Standard Proctor moisture-density relationship (ASTM D 698), and California Bearing Ratio, CBR (ASTM D 1883). The results of the laboratory tests are summarized in the following tables, and specific results of the Standard Proctor and CBR tests are provided in Appendix C.

**USCS Soil Classification Test Summary**

| Boring No. | Sample Depth (feet) | % Retained on No. 4 | % Finer than No. 200 | Atterberg Limits |      |      | USCS Classification               |
|------------|---------------------|---------------------|----------------------|------------------|------|------|-----------------------------------|
|            |                     |                     |                      | L.L.             | P.L. | P.I. |                                   |
| B-1        | 0-5                 | 1.5                 | 84                   | 67               | 24   | 43   | Red brown fat CLAY (CH) with sand |
| B-2        | 0-5                 | 2.3                 | 77                   | 51               | 18   | 33   | Red brown fat CLAY (CH) with sand |
| B-3        | 0-5                 | 4.3                 | 75                   | 66               | 23   | 43   | Red brown fat CLAY (CH) with sand |
| B-4        | 0-5                 | 2.4                 | 68                   | 64               | 21   | 43   | Red brown fat CLAY (CH) with sand |

**Standard Proctor and CBR Test Summary**

| Boring No. | Sample Depth (ft) | Natural Moisture Content (%) | Optimum Moisture Content (%) | Maximum Dry Density (pcf) | CBR |
|------------|-------------------|------------------------------|------------------------------|---------------------------|-----|
| B-1        | 0-5               | 47.9                         | 29.4                         | 90.3                      | 3.8 |
| B-2        | 0-5               | 22.2                         | 21.2                         | 102.4                     | 7.1 |
| B-3        | 0-5               | 30.0                         | 25.0                         | 97.8                      | 4.9 |
| B-4        | 0-5               | 22.5                         | 22.1                         | 101.2                     | 5.2 |



## GEOTECHNICAL COMMENTARY AND RECOMMENDATIONS

### General

The following evaluations and recommendations are based on interpretation of the field and laboratory data obtained during this exploration and our experience with similar subsurface conditions and projects. Soil penetration data and laboratory test results have been used to evaluate the pavement conditions. Subsurface conditions in unexplored locations may vary from those encountered.

As discussed previously, the asphalt overlay ranges in thickness from 1 inch to 2 inches and exhibits some longitudinal reflection cracking. We did not observe widespread alligator cracking generally associated with distressed pavement supported by severely substandard subgrade soils.

Although the determination of an adequate pavement section is beyond the scope of this report, the thicknesses of the asphalt overlay, concrete pavement section, and underlying base stone do not appear to be unduly insufficient. N-values, soil classification and CBR testing of the existing subgrade soil under the base stone indicates a somewhat weak material consisting of firm fat clay with sand fill.

### Recommendations

Overall the concrete pavement section does not appear to require immediate replacement. Removing the existing distressed asphalt overlay and replacing it with a dense-graded hot mix asphalt concrete similar to FAA Item P-401, or engineer approved equivalent, could increase the overall durability of the pavement section, postponing more substantial repairs.

We would recommend that once the existing asphalt has been removed the exposed concrete be observed in an effort to detect additional cracks in the concrete pavement. Concrete coring should then be performed at these cracks to observe whether the cracking is only surficial, or whether it extends through the entire thickness of the concrete which would indicate a repair more substantial than overlay replacement.

If a complete pavement replacement is desired then we would preliminarily recommend a pavement section matching the maximum thicknesses observed in our borings, or 2 inches of asphalt, 8.5 inches of concrete, 16 inches of compacted base stone, underlain by compacted subgrade soils.

Determination of an appropriate pavement system is dependent on the proposed traffic loads, soil conditions, and construction constraints such as proximity to structures, etc. and would require a formal pavement design, likely using the FAA program FAARFIELD. The subsurface exploration aids the geotechnical engineer in determining the soil stratum appropriate for pavement support. This determination includes considerations with regard to both strength and compressibility of the soil strata. In addition, since the method of construction greatly affects the soils intended for structural support, consideration must be given to the implementation of suitable methods of site preparation, fill compaction, and other aspects of construction.



## LIMITATIONS

This letter report has been prepared for the exclusive use of Thompson and Litton, or their agent, for specific application to the RBRAA Hanger 4 Pavement Evaluation project located in Roanoke, Virginia, in accordance with generally accepted soil engineering practices. No other warranty, express or implied, is made. Our conclusions are based on design information furnished to us, the data obtained from the previously described subsurface exploration program, and generally accepted geotechnical engineering practice. The geotechnical conclusions do not reflect variations in subsurface conditions which could exist intermediate of the boring locations or in unexplored areas of the site. Should such variations become apparent, it will be necessary to re-evaluate our conclusions and recommendations based upon on-site observations of the conditions.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should evaluate earthwork construction to verify that the conditions anticipated in design actually exist. If this report is copied or transmitted to a third party, it must be copied or transmitted in its entirety, including text, attachments, and enclosures. Interpretations based on only a part of this report may not be valid.



We have enjoyed working with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,  
**FROEHLING & ROBERTSON, INC.**

Erin K. Phillips, M.S., E.I.T.  
Staff Engineer



Attachments: Appendix

- GBA Information about Geotechnical Reports
- Site Vicinity Map (Drawing No.1)
- Classification of Soils for Engineering Purposes
- Key to Boring Log Soil Classification
- Boring Location Plan (Drawing No. 2)
- Boring Logs (9)
- Laboratory Test Results



## APPENDIX

# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

## Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

## You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

## This Report May Not Be Reliable

*Do not rely on this report* if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

## Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

## This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

## This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

## Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

## Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

## Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

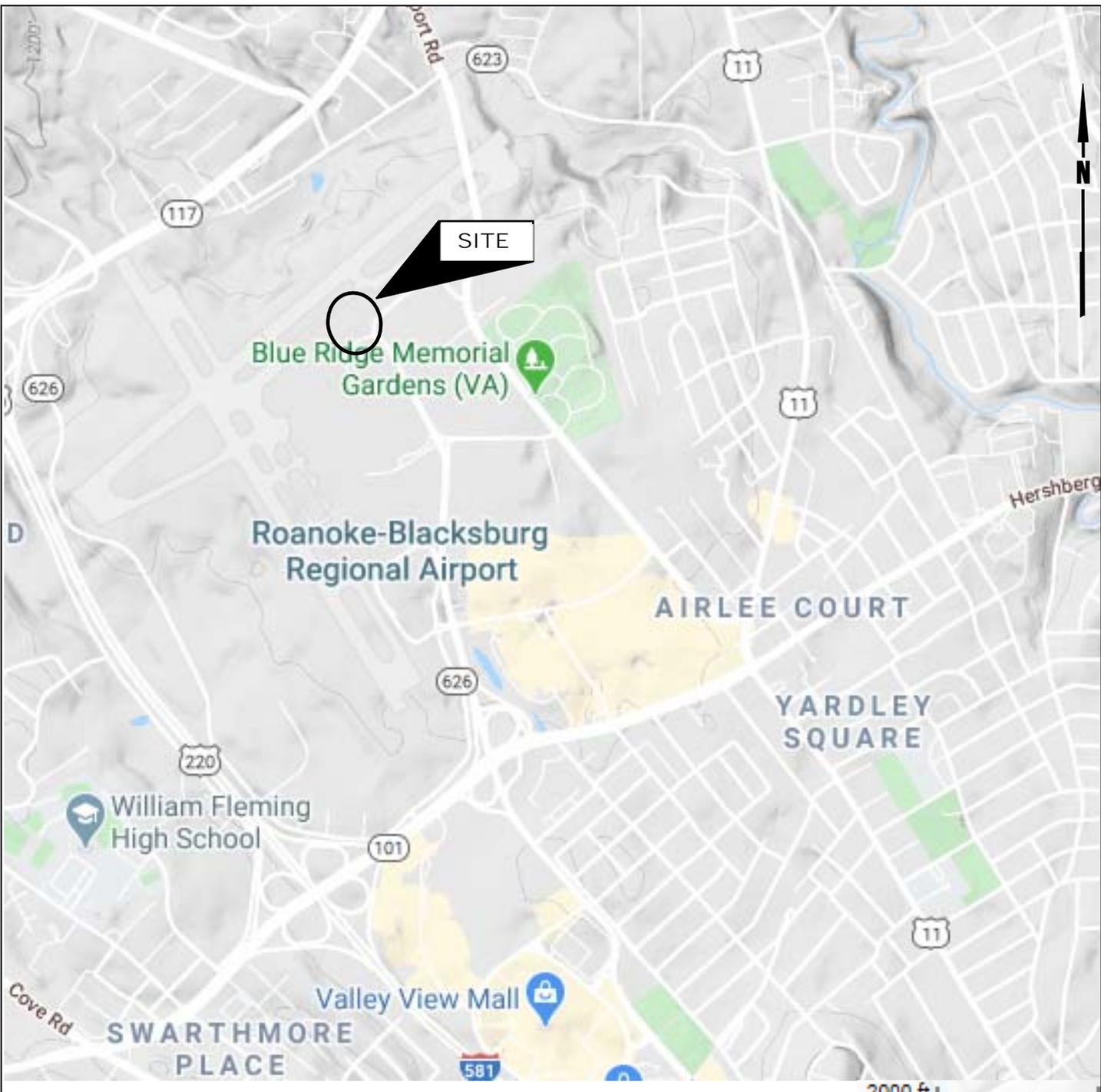
## Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



Telephone: 301/565-2733

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Adapted from *Google* imagery. No claim is made as to the accuracy of the indicated exploration location other than for conceptual purposes to illustrate the exploration location relative to existing site features, etc. In consideration of the methods used in their determination, as well as the base map's accuracy, the exploration location shown should be considered approximate.



**FROEHLING & ROBERTSON, INC.**  
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 1734 Seibel Drive, NE  
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**DATE:** July 2020

**SCALE:** As Shown

**DRAWN:** EKP

62Y0120

RBRAA Hanger 4 Pavement Evaluation  
 Thompson & Litton  
 Roanoke, Virginia

SITE  
 VICINITY  
 MAP

**DRAWING NO.**  
 1



**CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES**  
 ASTM Designation: D 2487  
 (Based on the Unified Soil Classification System)

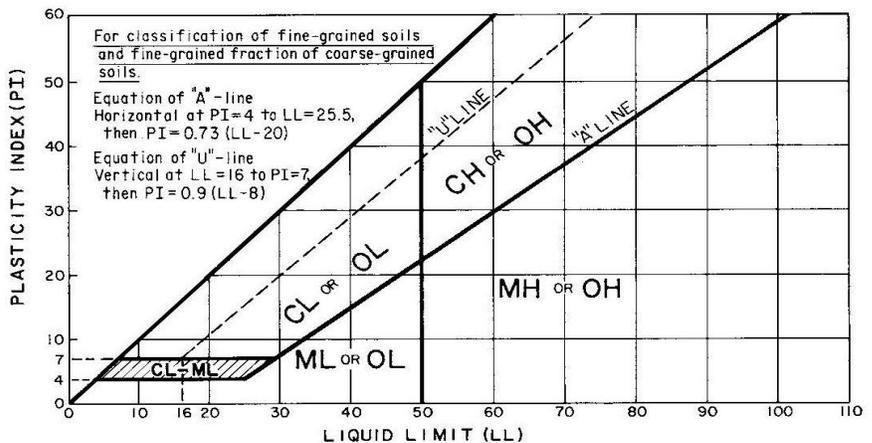
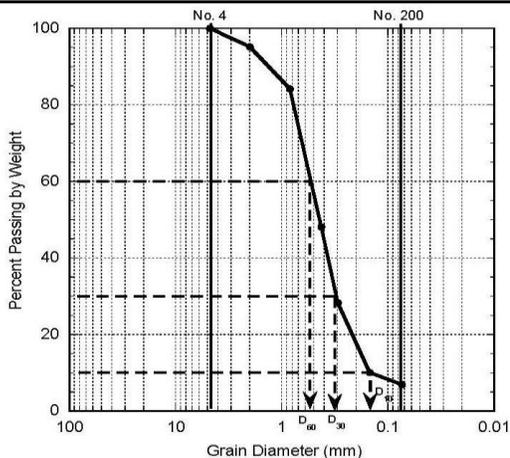
**FROEHLING & ROBERTSON, INC.**  
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| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup> |   |   |   | Soil Classification          |                                   |  |
|--|---|---|---|------------------------------|-----------------------------------|--|
|  |   |   |   | Group Symbol                 | Group Name <sup>B</sup>           |  |
| COARSE-GRAINED SOILS<br><br>More than 50% retained on the No. 200 sieve                  | Gravels<br>(More than 50% of coarse fraction retained on No. 4 sieve) | Clean gravels<br>(Less than 5% fines <sup>C</sup> )       | $Cu \geq 4$ and $1 \leq Cc \leq 3^D$  | GW                           | Well-graded gravel <sup>E</sup>   |  |
|  |   |   | $Cu < 4$ and/or $[Cc < 1$ or $Cc > 3]^D$  | GP                           | Poorly graded gravel <sup>E</sup> |  |
|  |   | Gravels with fines<br>(More than 12% fines <sup>C</sup> ) | Fines classify as ML or MH  | GM                           | Silty gravel <sup>E,F,G</sup>     |  |
|  |   |   | Fines classify as CL or CH  | GC                           | Clayey gravel <sup>E,F,G</sup>    |  |
|  | Sands<br>(50% or more of coarse fraction passes No. 4 sieve)          | Clean Sands<br>(Less than 5% fines <sup>H</sup> )         | $Cu \geq 6$ and $1 \leq Cc \leq 3^D$  | SW                           | Well-graded sand <sup>I</sup>     |  |
|  |   |   | $Cu < 6$ and/or $[Cc < 1$ or $Cc > 3]^D$  | SP                           | Poorly graded sand <sup>I</sup>   |  |
|  | Sands with fines<br>(More than 12% fines <sup>H</sup> )               | Fines classify as ML or MH                                | SM  | Silty sand <sup>F,G,I</sup>  |                                   |  |
|  |   | Fines classify as CL or CH                                | SC  | Clayey sand <sup>F,G,I</sup> |                                   |  |
| FINE-GRAINED SOILS<br><br>50% or more passes the No. 200 sieve                           | Sils and Clays<br>Liquid limit less than 50                           | Inorganic   | $PI > 7$ and plots on or above "A" line <sup>J</sup>  | CL                           | Lean clay <sup>K,L,M</sup>        |  |
|  |   |   | $PI < 4$ or plots below "A" line <sup>J</sup>   | ML                           | Silt <sup>K,L,M</sup>             |  |
|  |   | Organic   | $\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$ |                              | OL                                | Organic clay <sup>K,L,M,N</sup><br>Organic silt <sup>K,L,M,O</sup> |
|  |   |   |   |                              |                                   |  |
|  | Sils and Clays<br>Liquid limit 50 or more                             | Inorganic   | $PI$ plots on or above "A" line   | CH                           | Fat clay <sup>K,L,M</sup>         |  |
|  |   |   | $PI$ plots below "A" line   | MH                           | Elastic silt <sup>K,L,M</sup>     |  |
|  |   | Organic   | $\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$ |                              | OH                                | Organic clay <sup>K,L,M,P</sup><br>Organic silt <sup>K,L,M,Q</sup> |
|  |   |   |   |                              |                                   |  |
| HIGHLY ORGANIC SOILS   | Primarily organic matter, dark in color, and organic in odor          |   |   | PT                           | Peat                              |  |

- <sup>A</sup> Based on the material passing the 3-in. (75-mm) sieve.
- <sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- <sup>C</sup> Gravels with 5 to 12 % fines require dual symbols:  
 GW-GM well-graded gravel with silt  
 GW-GC well-graded gravel with clay  
 GP-GM poorly graded gravel with silt  
 GP-GC poorly graded gravel with clay
- <sup>D</sup>  $Cu = \frac{D_{60}}{D_{10}}$      $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
- <sup>E</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.
- <sup>F</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

- <sup>G</sup> If fines are organic, add "with organic fines" to group name.
- <sup>H</sup> Sands with 5 to 12 % fines require dual symbols:  
 SW-SM well-graded sand with silt  
 SW-SC well-graded sand with clay  
 SP-SM poorly graded sand with silt  
 SP-SC poorly graded sand with clay
- <sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.
- <sup>J</sup> If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

- <sup>K</sup> If soil contains 15 to  $< 30\%$  plus No. 200, add "with sand" or "with gravel", whichever is predominant.
- <sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly sand, add "sandy" to group name.
- <sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel add "gravelly" to group name.
- <sup>N</sup>  $PI \geq 4$  and plots on or above "A" line.
- <sup>O</sup>  $PI < 4$  or plots below "A" line.
- <sup>P</sup>  $PI$  plots on or above "A" line.
- <sup>Q</sup>  $PI$  plots below "A" line.





## KEY TO BORING LOG SOIL CLASSIFICATION

### Particle Size and Proportion

Visual descriptions are assigned to each soil sample or stratum based on estimates of the particle size of each component of the soil and the percentage of each component of the soil.

|               | Boulder | Cobble          | Gravel           |                 | Sand          |                |                 | Silt   | Clay   |
|---------------|---------|-----------------|------------------|-----------------|---------------|----------------|-----------------|--------|--------|
|               |         |                 | Coarse           | Fine            | Coarse        | Medium         | Fine            |        |        |
| Pass Retained | 12 in.  | 12 in.<br>3 in. | 3 in.<br>3/4 in. | 3/4 in.<br>#4 M | #4 M<br>#10 M | #10 M<br>#40 M | #40 M<br>#200 M | #200 M | #200 M |

Notes: 1.) Particle size is designated by U.S. Standard Sieve Sizes      2.) Because of the small size of the split-spoon sampler relative to the size of gravel, the true percentage of gravel may not be accurately estimated.

| <b>&lt; 50% Fines (-200 Mesh)</b><br>Descriptive Terms |  |                                  | <b>&gt; 50% Fines (-200 Mesh)</b><br>Descriptive Terms |  |                                   |
|--|--|----------------------------------|--|--|-----------------------------------|
| Comp.  | Term   | Percentage                       | Comp.  | Term   | Percentage                        |
| Major  | Uppercase Letters<br>(GRAVEL, SAND)              | % Gravel > % Sand                | Major  | Uppercase Letters<br>(CLAY, SILT)                  | % Clay > % Silt                   |
| Secondary  | With sand/gravel<br>Adjective<br>(Clayey, Silty) | ≥ 15% Sand/Gravel<br>≥ 15% Fines | Secondary  | Adjective<br>(Sandy, Gravelly)<br>With gravel/sand | ≥ 30% Coarse<br>% Sand > % Gravel |
| Minor  | With clay/silt<br>Do Not Note                    | 10% Fines<br>≤ 5% Fines          |  |  | Rem. Coarse > 15%                 |
|  |  |                                  | Minor  | With gravel/sand<br>Do Not Note                    | 15% -25% Coarse<br><15% Coarse    |

### Density or Consistency

The standard penetration resistance values (N-values) are used to describe the density of coarse-grained soils (GRAVEL, SAND) or the consistency of fine-grained soils (SILT, CLAY). Sandy silts of very low plasticity may be assigned a density instead of a consistency.

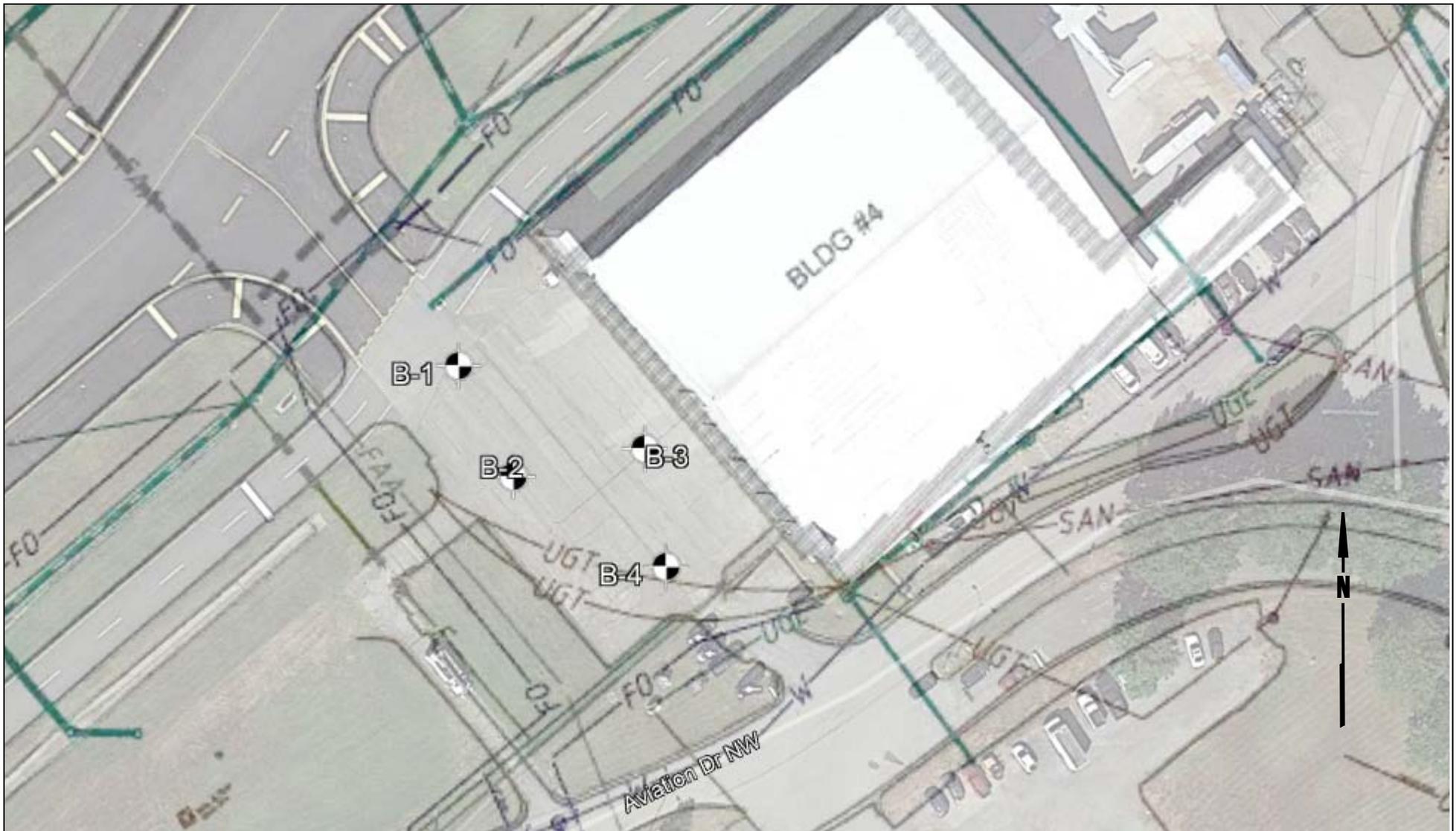
| <b>DENSITY</b> |         | <b>CONSISTENCY</b> |         |
|----------------|---------|--------------------|---------|
| Term           | N-Value | Term               | N-Value |
| Very Loose     | 0 - 4   | Very Soft          | 0 - 1   |
| Loose          | 5 - 10  | Soft               | 2 - 4   |
| Medium Dense   | 11- 30  | Firm               | 5 - 8   |
| Dense          | 31 - 50 | Stiff              | 9 - 15  |
| Very Dense     | > 50    | Very Stiff         | 16 - 30 |
|                |         | Hard               | >30     |

**Notes:**

- The N-value is the number of blows of a 140 lb. Hammer freely falling 30 inches required to drive a standard split-spoon sampler (2.0 in. O.D., 1-3/8 in. I.D.) 12 inches into the soil after properly seating the sampler 6 inches.
- When encountered, gravel may increase the N-value of the standard penetration test and may not accurately represent the in-situ density or consistency of the soil sampled.

# SOIL CLASSIFICATION CHART

| MAJOR DIVISIONS  |  |   | SYMBOLS   |   | TYPICAL DESCRIPTIONS  |  |
|--|--|---|---|---|---|--|
|  |  |   | GRAPH   | LETTER  |   |  |
| <b>COARSE GRAINED SOILS</b><br><br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | <b>GRAVEL AND GRAVELLY SOILS</b><br><br>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | CLEAN GRAVELS<br><br>(LITTLE OR NO FINES)   |   | <b>GW</b>   | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES   |  |
|  |  | GRAVELS WITH FINES<br><br>(APPRECIABLE AMOUNT OF FINES)                                       |   | <b>GP</b>   | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |  |
|  |  | CLEAN SANDS<br><br>(LITTLE OR NO FINES)   |   | <b>GM</b>   | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES                      |  |
|  |  | SANDS WITH FINES<br><br>(APPRECIABLE AMOUNT OF FINES)   |   | <b>GC</b>   | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES                     |  |
|  | <b>SAND AND SANDY SOILS</b><br><br>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE       | CLEAN SANDS<br><br>(LITTLE OR NO FINES)   |   | <b>SW</b>   | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES             |  |
|  |  | SANDS WITH FINES<br><br>(APPRECIABLE AMOUNT OF FINES)   |   | <b>SP</b>   | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES            |  |
|  |  | SANDS WITH FINES<br><br>(APPRECIABLE AMOUNT OF FINES)   |   | <b>SM</b>   | SILTY SANDS, SAND - SILT MIXTURES                                 |  |
|  |  | SANDS WITH FINES<br><br>(APPRECIABLE AMOUNT OF FINES)   |   | <b>SC</b>   | CLAYEY SANDS, SAND - CLAY MIXTURES                                |  |
|  |  | <b>FINE GRAINED SOILS</b><br><br>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | <b>SILTS AND CLAYS</b><br><br>LIQUID LIMIT LESS THAN 50 |   | <b>ML</b>   | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
|  |  |   |   |   | <b>CL</b>   | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS                  |
|  | <b>OL</b>  |   |   | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY             |   |  |
| <b>SILTS AND CLAYS</b><br><br>LIQUID LIMIT GREATER THAN 50                                     |  |   | <b>MH</b>   | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS |   |  |
|  |  |   | <b>CH</b>   | INORGANIC CLAYS OF HIGH PLASTICITY                                  |   |  |
|  |  |   | <b>OH</b>   | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS           |   |  |
| <b>EXISTING FILL</b>   |  |   |   | <b>FILL</b>   | EXISTING FILL MATERIALS   |  |



Adapted from provided utility plan and google imagery. The test boring location shown should be considered approximate.



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|               |                   |         |
|---------------|-------------------|---------|
| <b>DATE:</b>  | July 2020         |         |
| <b>SCALE:</b> | No Scale Intended |         |
| <b>DRAWN:</b> | EKP               | 62Y0120 |

RBRAA Hanger 4 Pavement Evaluation  
 Thompson & Litton  
 Roanoke, Virginia

CONCEPTUAL  
 BORING LOCATION  
 PLAN

**DRAWING NO.**  
 2



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:** See Boring Location Plan  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.60  
**Date Drilled:** 6/8/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification)                         | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks  |
|-----------|-------|---|----------------|---------------------|--------------------|--|
|           | 0.1   | 1" Asphalt  |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling. |
|           |       | 8.5" Concrete   |                |                     |                    |  |
|           | 0.8   | 14" Base Stone  |                |                     |                    |  |
|           | 2.0   | <b>FILL:</b> Sampled as firm, tan, moist, FAT CLAY (CH) with sand | 2-3-3          | 2.0                 | 6                  |  |
|           | 3.5   | Sampled as firm, yellow-tan, moist, FAT CLAY (CH) with sand       | 1-3-2          | 3.5                 | 5                  |  |
|           | 5.0   | Boring Terminated at 5'   |                | 5.0                 |                    | Cave-in depth at 5'  |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:**  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.60  
**Date Drilled:** 6/8/20  
**Driller:** G.Hinkley

| Elevation | Depth | Description of Materials (Classification) | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks  |
|-----------|-------|---|----------------|---------------------|--------------------|--|
|           | 0.1   | 1" Asphalt                                |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling. |
|           |       | 8.5" Concrete                             |                |                     |                    |  |
|           | 0.8   | 14" Base Stone                            |                |                     |                    |  |
|           | 2.0   | Auger Probe to 5'                         |                |                     |                    |  |
|           | 5.0   |   |                |                     |                    | Cave-in depth at 5'  |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:** See Boring Location Plan  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.60  
**Date Drilled:** 6/8/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification)                               | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks   |
|-----------|-------|---|----------------|---------------------|--------------------|---|
|           | 0.1   | 1.75" Asphalt   |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling |
|           |       | 8.5" Concrete   |                |                     |                    |   |
|           | 0.9   | 14" Base Stone  |                |                     |                    |   |
|           | 2.0   | <b>FILL:</b> Sampled as soft, red-brown, moist, FAT CLAY (CH) with sand | 2-1-3          | 2.0                 | 4                  |   |
|           | 3.5   | Sampled as firm, tan, moist, FAT CLAY (CH) with sand                    | 3-3-3          | 3.5                 | 6                  |   |
|           | 5.0   | Boring Terminated at 5'   |                | 5.0                 |                    | Cave-in depth at 5'   |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:**  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.60  
**Date Drilled:** 6/8/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification) | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks  |
|-----------|-------|---|----------------|---------------------|--------------------|--|
|           | 0.1   | 1.75" Asphalt                             |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling. |
|           |       | 8.5" Concrete                             |                |                     |                    |  |
|           | 0.9   | 14" Base Stone                            |                |                     |                    |  |
|           | 2.0   | Auger Probe to 5'                         |                |                     |                    |  |
|           | 5.0   |   |                |                     |                    | Cave-in depth at 5'  |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:** See Boring Location Plan  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.60  
**Date Drilled:** 6/8/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification)                         | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks   |
|-----------|-------|---|----------------|---------------------|--------------------|---|
|           | 0.2   | 2" Asphalt  |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling |
|           |       | 7" Concrete   |                |                     |                    |   |
|           | 0.8   | 15" Base Stone  |                |                     |                    |   |
|           | 2.0   | <b>FILL:</b> Sampled as firm, red, moist, FAT CLAY (CH) with sand | 2-2-4          | 2.0                 | 6                  |   |
|           | 3.5   | Sampled as firm, red-brown, moist, FAT CLAY (CH) with sand        | 2-2-3          | 3.5                 | 5                  |   |
|           | 5.0   | Boring Terminated at 5'   |                | 5.0                 |                    | Cave-in depth at 4.7'   |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:**  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.60  
**Date Drilled:** 6/8/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification) | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks   |
|-----------|-------|---|----------------|---------------------|--------------------|---|
|           | 0.2   | 2" Asphalt                                |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling |
|           |       | 7" Concrete                               |                |                     |                    |   |
|           | 0.8   | 15" Base Stone                            |                |                     |                    |   |
|           | 2.0   | Auger Probe to 5'                         |                |                     |                    |   |
|           | 5.0   |   |                |                     |                    | Cave-in depth at 4.7'   |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 0.8'  
**Boring Location:** See Boring Location Plan  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.54  
**Date Drilled:** 6/4/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification)  | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks |
|-----------|-------|--|----------------|---------------------|--------------------|---------|
|           | 0.2   | 2" Asphalt   |                |                     |                    |         |
|           |       | 7" Base Stone  |                |                     |                    |         |
|           | 0.8   | Boring Terminated at 9" due to No. 6 reinforcing steel encountered within concrete |                |                     |                    |         |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:**  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.54  
**Date Drilled:** 6/4/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification)                             | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks  |
|-----------|-------|---|----------------|---------------------|--------------------|--|
|           | 0.1   | 1.5" Asphalt  |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling. |
|           |       | 6.5" Concrete   |                |                     |                    |  |
|           | 0.7   | 16" Base Stone  |                |                     |                    |  |
|           | 2.0   | <b>FILL:</b> Sampled as firm, red-tan, moist, FAT CLAY (CH) with sand | 2-3-3          | 2.0                 | 6                  |  |
|           | 3.5   | Sampled as: soft, red-tan-brown, moist, FAT CLAY (CH) with sand       | 1-1-3          | 3.5                 | 4                  |  |
|           | 5.0   | Boring Terminated at 5'   |                | 5.0                 |                    |  |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**Project No:** 62Y-0120  
**Client:** Thompson & Litton, Inc.  
**Project:** RBRAA Hanger 4 Pavement Eval  
**City/State:** Roanoke, VA

**Elevation:**  
**Total Depth:** 5.0'  
**Boring Location:**  
**Latitude:**  
**Longitude:**

**Drilling Method:** 2.25" I.D. HSA  
**Hammer Type:** Automatic  
**Hammer Efficiency:** 1.54  
**Date Drilled:** 6/4/20  
**Driller:** G. Hinkley

| Elevation | Depth | Description of Materials (Classification) | * Sample Blows | Sample Depth (feet) | N-Value (blows/ft) | Remarks   |
|-----------|-------|---|----------------|---------------------|--------------------|---|
|           | 0.1   | 1.5" Asphalt                              |                |                     |                    | No subsurface water was encountered immediately upon completion of drilling |
|           | 0.7   | 6.5" Concrete                             |                |                     |                    |   |
|           | 2.0   | 16" Base Stone                            |                |                     |                    |   |
|           | 5.0   | Auger Probe to 5'                         |                |                     |                    |   |

BORING\_LOG\_62Y-0120.GPJ F&R.GDT 7/9/20

\*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



**FROEHLING & ROBERTSON, INC.**

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**California Bearing Ratio (ASTM-D1883)**

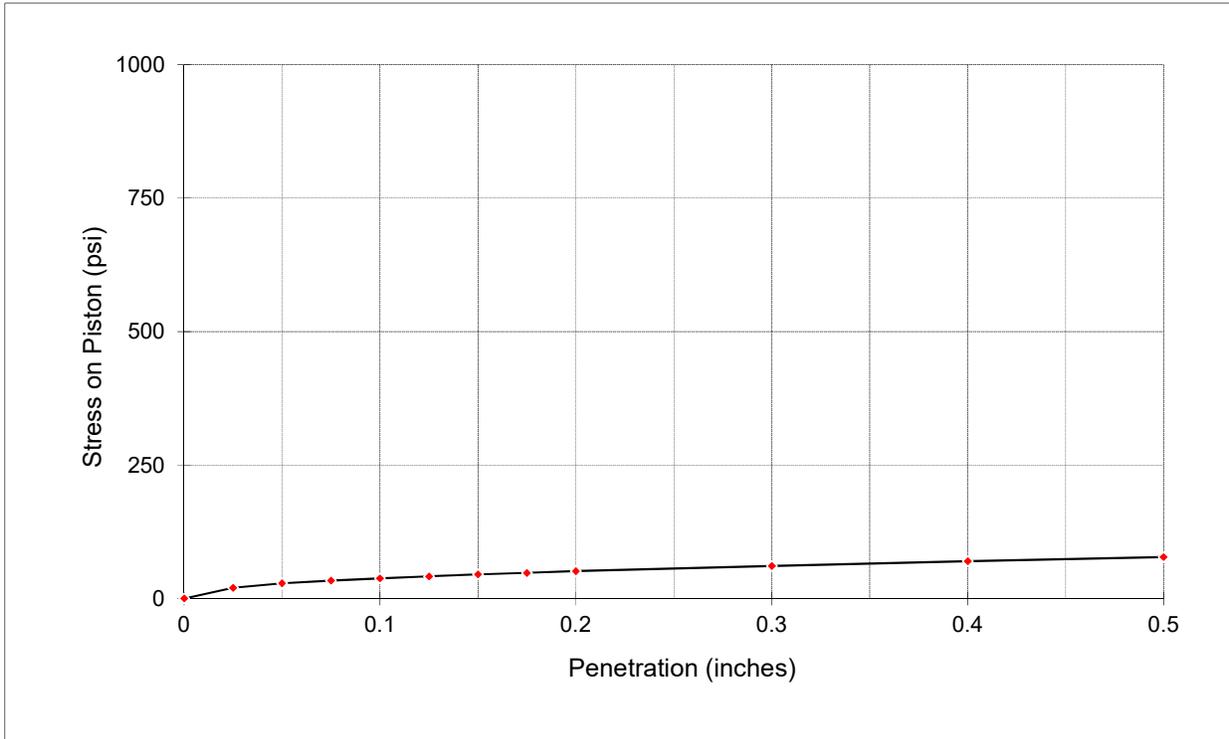
Record No.: 62Y0120

Client: Thompson & Litton  
Project: RBRAA Hangar 4

Test Date: June 30, 2020

Test Method: ASTM D1883  
Compaction Method: ASTM D698

X Soaked CBR



CBR: penetration @ 0.1 in. 3.8

Swell (%): 0.7%

Dry Density Before Soaking (pcf): 87.8

Dry Density as Percentage of Maximum Dry Density: 97.2%

Percentage of +No. 4 in sample 2

Surcharge Weight (lb): 10

Moisture Content Before Soaking (%): 30.2%  
After Testing, Top Inch 34.5

Maximum Dry Density (pcf): 90.3  
Optimum Moisture Content (%): 29.4

Visual Description:  
Red brown fat CLAY (CH) with sand

F&R Lab No.: 132618

Source: B-1, 0'-5'

**FROEHLING & ROBERTSON, INC.**

Performed by: J. Taylor



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**California Bearing Ratio (ASTM-D1883)**

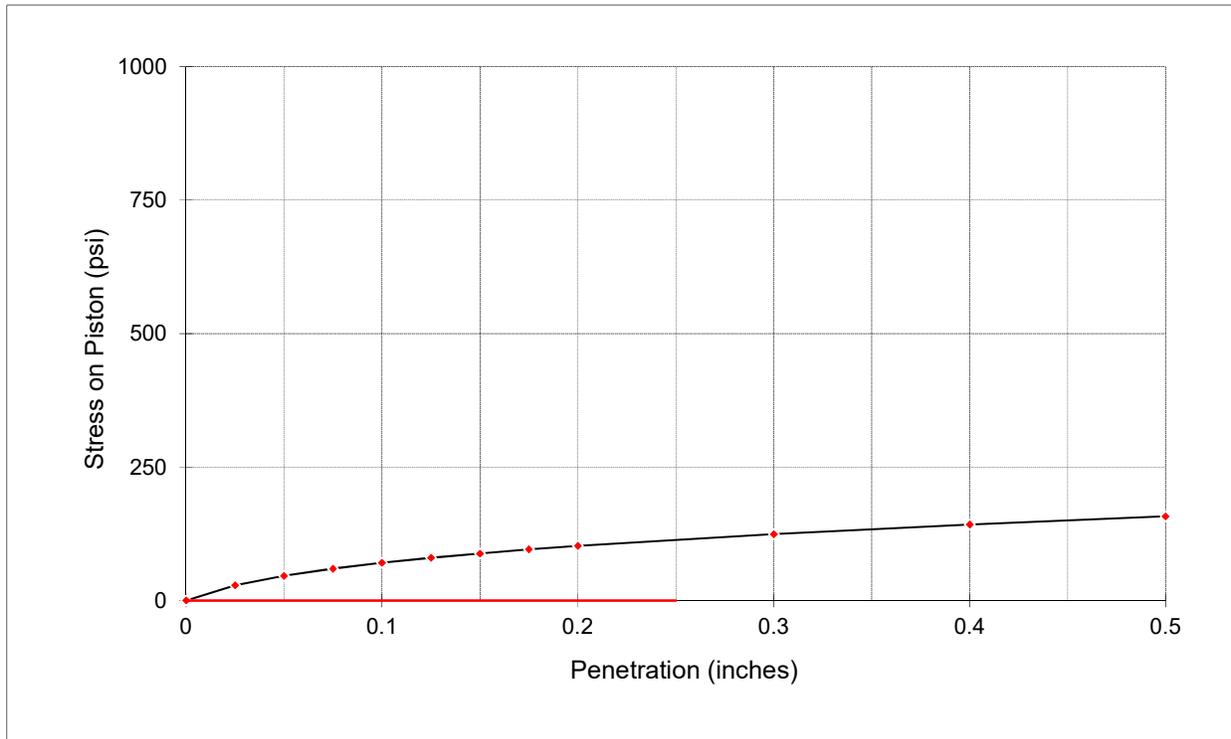
Record No.: 62Y0120

Client: Thompson and Litton  
Project: RBRAA Hangar 4

Test Date: June 30, 2020

Test Method: ASTM D1883  
Compaction Method: ASTM D698

X Soaked CBR



CBR: penetration @ 0.1 in. 7.1

Swell (%): 0.2%

Dry Density Before Soaking (pcf): 105.4

Dry Density as Percentage of Maximum Dry Density: 102.9%

Percentage of +No. 4 in sample 2

Surcharge Weight (lb): 10

Moisture Content Before Soaking (%): 20.7%  
After Testing, Top Inch 23.2

Maximum Dry Density (pcf): 102.4  
Optimum Moisture Content (%): 21.2

Visual Description:  
Red brown fat CLAY (CH) with sand

F&R Lab No.: 132619  
Source: B-2, 0'-5'

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Performed by: J. Taylor



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**California Bearing Ratio (ASTM-D1883)**

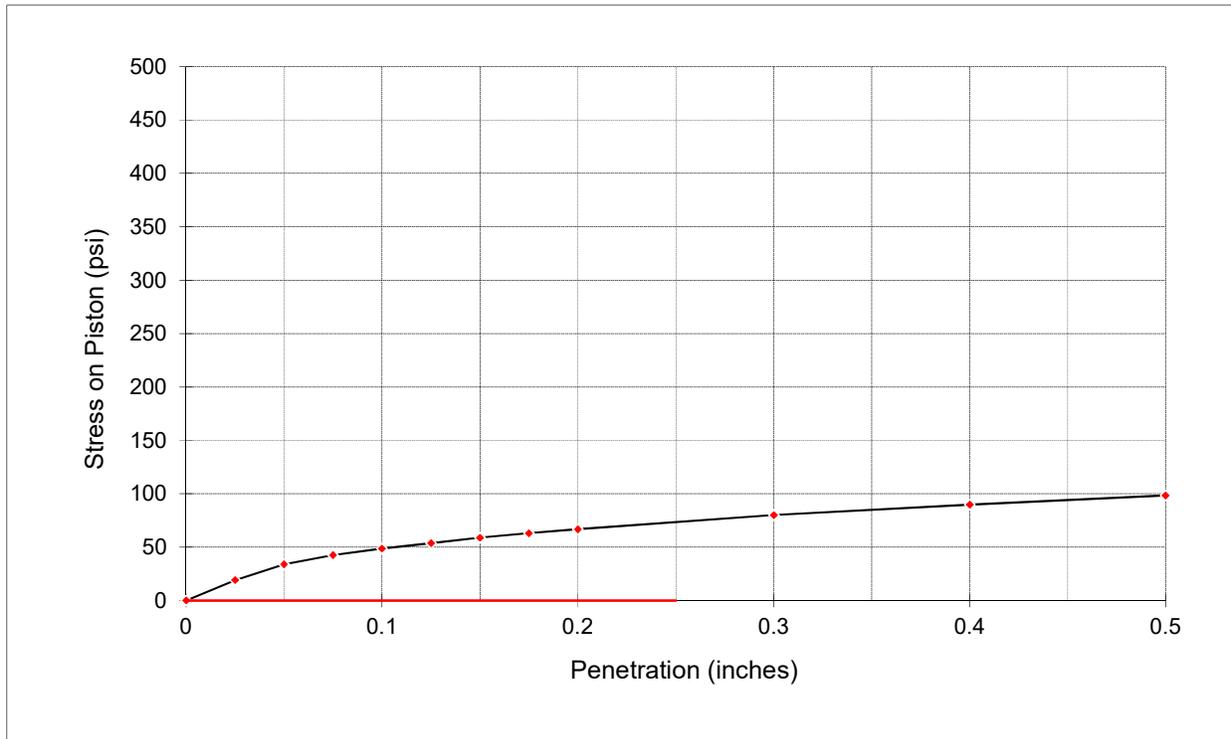
Record No.: 62Y0120

Client: Thompson and Litton  
Project: RBRAA Hangar 4

Test Date: June 30, 2020

Test Method: ASTM D1883  
Compaction Method: ASTM D698

X Soaked CBR



CBR: penetration @ 0.1 in. 4.9

Swell (%): 0.6%

Dry Density Before Soaking (pcf): 96.3

Dry Density as Percentage of Maximum Dry Density: 98.4%

Percentage of +No. 4 in sample 4

Surcharge Weight (lb): 10

Moisture Content Before Soaking (%): 25.7%  
After Testing, Top Inch 29.7

Maximum Dry Density (pcf): 97.8  
Optimum Moisture Content (%): 25.0

Visual Description:  
Red brown fat CLAY (CH) with sand

F&R Lab No.: 132620  
Source: B-3, 0'-5'

**FROEHLING & ROBERTSON, INC.**

Performed by: J. Taylor



**FROEHLING & ROBERTSON, INC.**

Engineering Stability Since 1881

1734 Seibel Drive

Roanoke, Virginia 24012-5624 | US

T 540.344.7939 | F 540.344.3659

**California Bearing Ratio (ASTM-D1883)**

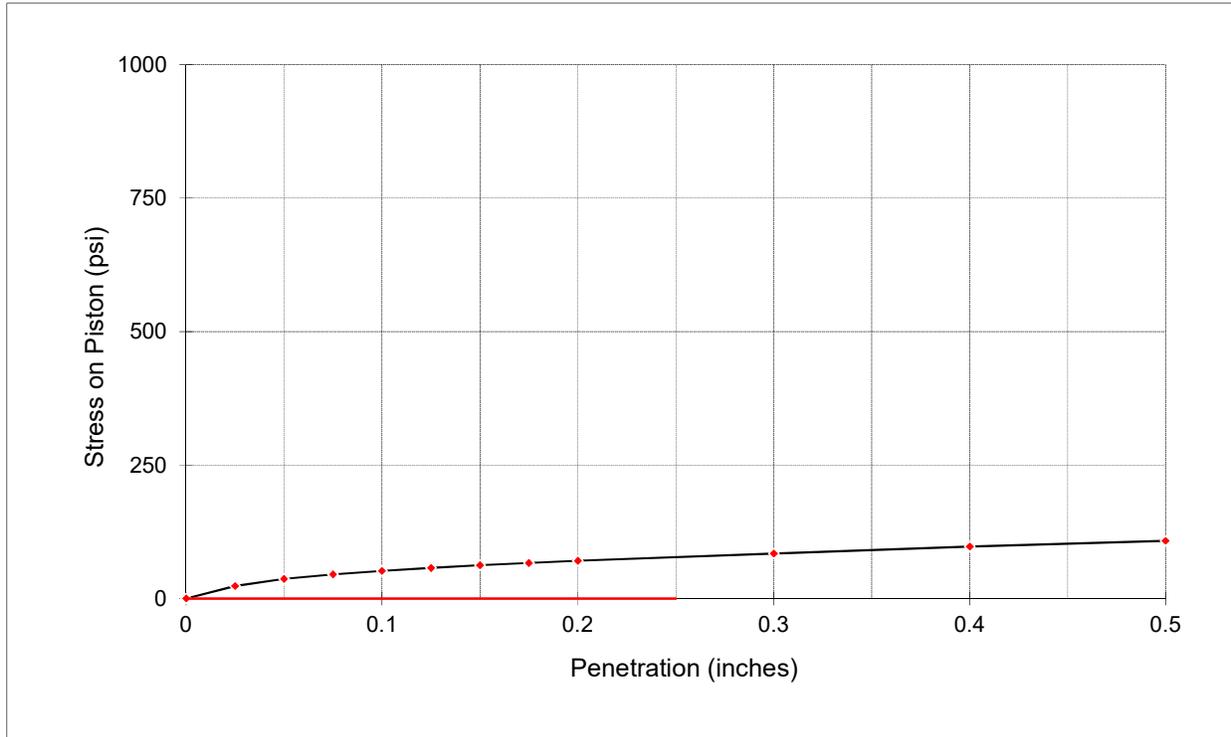
Record No.: 62Y0120

Client: Thompson and Litton  
Project: RBRAA Hangar 4

Test Date: July 6, 2020

Test Method: ASTM D1883  
Compaction Method: ASTM D698

X Soaked CBR



CBR: penetration @ 0.1 in. 5.2

Swell (%): 0.2%

Dry Density Before Soaking (pcf): 102.5

Dry Density as Percentage of Maximum Dry Density: 101.3%

Percentage of +No. 4 in sample 2

Surcharge Weight (lb): 10

Moisture Content Before Soaking (%): 22.5%  
After Testing, Top Inch 25.9

Maximum Dry Density (pcf): 101.2  
Optimum Moisture Content (%): 22.1

Visual Description:  
Red brown fat CLAY (CH) with sand

F&R Lab No.: 132621

Source: B4, 0'-5'

**FROEHLING & ROBERTSON, INC.**

Performed by: J. Taylor



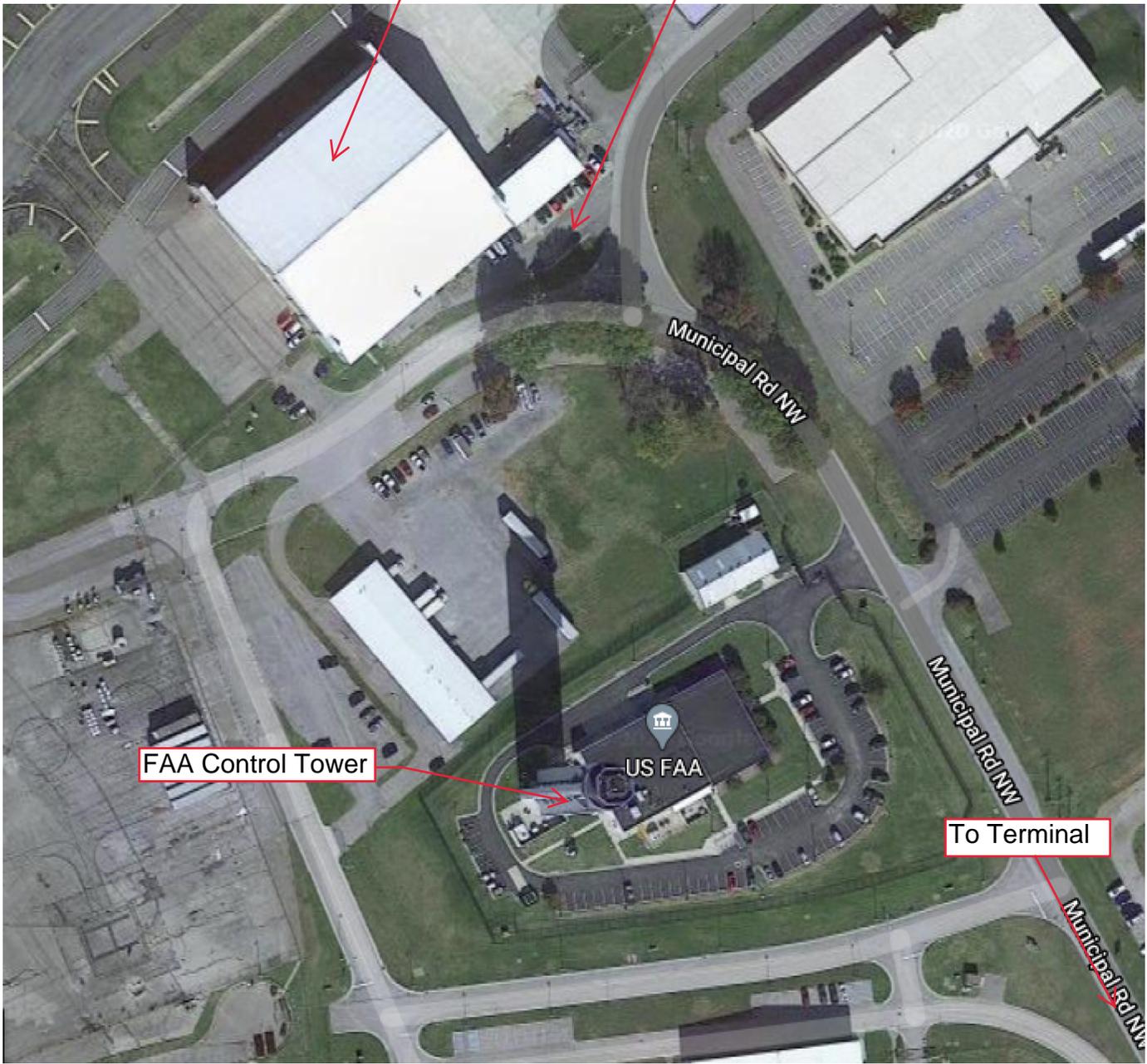
## **APPENDIX**

### **Appendix D – Hangar 4 Location Map**



Hangar 4

Pre-Bid Meeting Location  
10/22/20, 10:00 AM



FAA Control Tower

US FAA

To Terminal

Municipal Rd NW

Municipal Rd NW

Municipal Rd NW