RALEIGH DURHAM AIRPORT AUTHORITY

PROJECT MANUAL

TAXIWAY B REHABILITATION
RDU Project No. 211120
AIP No. 3-37-0056-050-2018

BID DOCUMENTS

May 22, 2018

PREPARED BY:

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DO NOT USE FOR CONSTRUCTION

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NOTICE TO BIDDERS

Sealed proposals will be received by the Raleigh Durham Airport Authority in the office of the President and CEO at the Raleigh-Durham International Airport up to **2:00 PM, Tuesday, June 19, 2018, from Prequalified Bidders** and immediately thereafter publicly opened and read for the furnishing of labor, material and equipment entering into the construction of the following items of work:

Taxiway B Rehabilitation
RDU Project No. 211120
FAA AIP PROJECT NO. 3-37-0056-050-2018

Complete plans, specifications and contract documents will be available for inspection on or about **May 22, 2018**. Such plans, specifications and contract documents can be downloaded in PDF format from the RDU.com website, www.rdu.com. Drawings should be printed in 22"x 34" size for proper scale. Drawing dimensions govern. It is the responsibility of the Contractor to check for any posted addenda or additional information.

Plans may also be reviewed at the offices of the Raleigh Durham Airport Authority (Owner) located at 1000 Trade Drive, RDU Airport, NC 27623 and in the office of WK Dickson (Engineer) located at 720 Corporate Center Drive, Raleigh NC, 27607, telephone (919) 782-0495. Documents will also be available for inspection in the offices of the Authority's Project Management Team, Parsons Transportation Group (Parsons), at Terminal 1 (Level 1 South End), 1600 John Brantley Blvd., Raleigh-Durham International Airport, NC 27623, telephone (919) 840-5284.

In accordance with the Airport Authority's "Prequalification of Bidders for Construction or Repair Projects Policy" only bids from Pre-Qualified General Contractors will be accepted.

List of Prequalified bidders will be provided by Addendum for this project.

All prequalified Contractors are hereby notified that they must comply with any and all Federal or State Contractor Licensing Requirements including any requirements applicable for furnishing and installing the work depicted in bid documents. Prequalified General Contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina will be observed in receiving and awarding general contracts.

The United States Government has agreed to reimburse the Owner for portions of the Project costs. The Owner will not accept or consider proposals from any Contractor whose name, at the time of opening of bids or award, appears on the current list of ineligible contractors published by the Comptroller General of the United States under Section 5.6(b) of the Regulations of the Secretary of Labor 29 CFR, nor a proposal from any firm, corporation, partnership or proprietorship in which an ineligible Contractor has a substantial interest. The Owner will not accept or consider a proposal from any Contractor who, at the time of the opening of bids or the award, is removed from the North Carolina Department of Transportation's list of prequalified contractors.

Each proposal shall be accompanied by a cash deposit or a certified check drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation in an amount equal to but not less than 5% of the proposal or a bid bond of 5% of the bid executed as set forth in the Instruction to Bidders by a surety company licensed under the laws of North Carolina to execute such bonds. The deposits shall be made payable to the Owner and shall be retained by the Owner as liquidated damages in the event

the successful bidder fails to properly execute the contract within ten (10) days after the award and to give satisfactory surety as required by law.

By submitting a bid the Contractor certifies that it, and its proposed subcontractors, has under its direct control or at his disposal the personnel, equipment and materials required to execute the Project work as specified. Lack of such control or availability of personnel, equipment and materials shall constitute failure to properly execute the contract.

Performance and Labor and Material Payment Bonds will be required for 100% of the Contract Sum.

The Owner reserves the right to retain all bids for a period of 120 days after the scheduled closing time for receipt of bids. No bid may be withdrawn by a bidder within 120 days after the scheduled closing time for receipt of bids. Construction tentatively scheduled to commence Spring 2019.

By submitting a bid under this solicitation, except for those items listed by the Bidder in a clearly identified attachment to the Proposal, the Bidder certifies that steel and each manufactured product is produced in the United States (as defined in the clause Buy American – Steel and Manufactured Products for Construction Contracts), and that components of unknown origin are considered to have been produced or manufactured outside the United States.

The Owner reserves the right to reject any or all bids and to waive informalities and minor irregularities.

NON-DISCRIMINATION CLAUSE: The Raleigh-Durham Airport Authority, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

DISADVANTAGED BUSINESS ENTERPRISE (DBE)

Policy. It is the policy of the Department of Transportation and the Raleigh-Durham Airport Authority that Disadvantaged Business Enterprises (DBE's), as defined in 49 CFR Part 26, be ensured nondiscrimination in the performance of contracts and subcontracts financed in whole or in part with Federal funds. Consequently, the DBE requirements of 49 CFR Part 26 apply to this contract.

The Bidder shall make good faith efforts, as defined in Appendix A of 49 CFR Part 26, Regulations of the Office of the Secretary of Transportation, to subcontract **Eleven percent (11%)** of the dollar value of the Contract Sum to small business concerns owned and controlled by socially and economically disadvantaged individuals. In the event that the Bidder for this solicitation qualifies as a DBE, the contract goal shall be deemed to have been met. Individuals who are rebuttably presumed to be socially and economically disadvantaged include women, Blacks, Hispanics, Native Americans, Asian-Pacific Americans, and Asian-Indian Americans. The apparent successful competitor will be required to submit (with the bid) information concerning the DBE's that will participate in this contract. The information will include the name and address of each DBE, a description of the work to be performed by each named firm, and the dollar value of the contract. If the Bidder fails to achieve the contract goal stated herein, it will be required to provide (within 48 hours after the opening of the bids)

documentation demonstrating that it made good faith efforts in attempting to do so. A bid that fails to meet these requirements will be considered non-responsive.

A non-mandatory DBE Workshop, Pre-Bid Conference and Site Tour is scheduled for **Tuesday, June 5, 2018 at 10:30 AM**, at the Raleigh-Durham Airport Authority's Administration Building, RDU Airport, located at 1000 Trade Drive, RDU Airport, NC 27623. The purpose of this workshop is to inform Pre-Qualified Bidders and prospective subcontractors of the Project and the requirements for meeting the DBE goals set forth for this contract.

All questions concerning the Plan and Specifications during the bidding period must be emailed to the attention of Jim Novak, Director of Facilities Engineering at jim.novak@rdu.com. The Authority, the Project Management Team, and the Engineer are not obligated to respond to questions submitted verbally concerning interpretation of the Plans and Specification, including those raised at the Pre-Bid conference, but shall instead direct the person or company raising the question to direct the question to the Owner as indicated herein. The deadline for receipt of questions is **4:30 PM, Friday, June 8, 2018.** The Authority, The Project Management Team, and the Engineer do not commit, and are not obligated, to respond to all questions submitted in writing, but, in their sole discretion, may respond in the form of an addendum to questions which they believe require clarification of the Contract Documents.

RALEIGH DURHAM AIRPORT AUTHORITY
EQUAL OPPORTUNITY EMPLOYER

FARAD ALI
CHAIRMAN

MICHAEL LANDGUTH
PRESIDENT & CEO

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INSTRUCTIONS TO BIDDERS

Proposals to be considered must be in accordance with the following instructions:

1. PROPOSALS

Proposals must be made in strict conformity with the "Proposal" provided and these Instructions to Bidders. The Proposal may be detached from the other Contract Documents. All blank spaces for bids and bid alternatives must be properly filled in (written in ink or typed). Unit prices and total prices shall be stated in figures where required. The total amount bid shall be stated both in writing and in figures in the proper place in the proposal form. The completed form shall be without alterations or erasures. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The Bidder shall complete the form of proposal as follows:

(A) If the documents are executed by a sole proprietor, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.

(B) If the documents are executed by a partnership, that fact shall be evidenced by the word "Partner" appearing after the name of the partner executing them.

(C) If the documents are executed by a corporation, they shall be executed in the name of the corporation by either the President or the Vice President and attested by the Secretary or Assistant Secretary and its seal shall be impressed on each copy of the documents.

(D) All signatures must be in ink and properly witnessed.

Proposals shall be addressed to the **Raleigh-Durham Airport Authority ("Owner"), Attn: Jim Novak**, and shall be delivered to the Raleigh-Durham Airport Authority, located at 1000 Trade Drive, RDU Airport, NC 27623, enclosed in a sealed envelope marked "Proposal" and bearing the title of the work, the name and business address of the Bidder and the Bidder's contractor's license number. It shall be the responsibility of the Bidder to deliver his bid to the proper official at the appointed time and prior to the announced time for the opening of bids. Later delivery of the bid for any reason shall disqualify the bid. A Bidder may withdraw a bid provided that the Bidder's request for withdrawal is received by the Owner in writing before the time specified for opening bids. Modification or withdrawal of bids will be acceptable only if delivered in writing (including facsimile at 919-840-0175) to the Owner prior to the time for opening of bids. Should the Bidder find discrepancies in or omissions from the drawings or Contract Documents, or should he or she be in doubt as to their meaning, he/she shall at once notify the Owner who, when necessary, will send a written instruction to all Bidders. Neither the Owner nor its representatives will be responsible for providing any oral instruction.

2. BID SECURITY

Each bid shall be accompanied by a cash deposit, or a certified check drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation, or a duly executed bid bond in an amount equal to not less than five percent (5%) of the bid, said deposit to be retained by the Owner as liquidated damages should the successful Bidder fail to execute the contract within ten (10) days after the award or to give satisfactory surety as required by law. Bid bonds shall be executed under seal by the Bidder and by the surety and shall be written on the AIA standard form of bid bond, current as of the date of the bid.

3. ADDENDA

Any addenda to the Contract Documents issued during the time of bidding will be considered a part of the Contract Documents and will become a part of the Contract. Receipt of addenda shall be acknowledged by the Bidder on the Proposal form in the space provided.

4. CONSIDERATION OF "OR EQUAL" PRODUCTS

Prospective Bidders desiring to furnish proposed substitute materials and products must deliver submittals for consideration by the Engineer not less than 14 calendar days after the date established for the Notice to Proceed. Submittals shall be in compliance with the Special Conditions.

5. INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES

An estimate of quantities of work to be done and materials to be furnished under the specifications is given in the Proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly or by implication agree that the actual quantities involved will correspond exactly therewith; nor shall the Bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities or work performed or materials furnished in accordance with the Plans and Specifications. It is understood that the quantities may be increased or decreased without in any way invalidating the bid unit prices.

6. DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

A. Policy. It is the policy of the DOT and the Raleigh-Durham Airport Authority that Disadvantaged business enterprises as defined in 49 CFR Part 26 be ensured nondiscrimination in the performance of contracts and

subcontracts financed in whole or in part with federal funds. Consequently, the DBE requirements of 49 CFR Part 26 applies to this contract.

B. Definitions. As used in this Plan:

(1) The term "Disadvantaged Business Enterprise" means a for-profit small business concern who is a citizen or lawful permanent resident of the United States and who is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged or, in the case of a corporation, in which 51 percent of the stock is owned by one or more socially and economically disadvantaged individuals The Authority presumes certain groups are disadvantaged, including women, Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Subcontinent Asian-Pacific Americans, or other minorities found to be disadvantaged by the U.S. Small Business Administration (SBA). :

(2) The term "goal" means that the Owner has established written guidelines specifying the actions that the prime contractor must take to ensure a good faith effort in the recruitment and selection of disadvantaged businesses for participation in contracts awarded under this section; the required actions are set forth in the Disadvantaged Business Enterprise Plan provisions included in the General Conditions and must be documented in writing by the Contractor to the Owner.

3. The term “socially and economically disadvantaged individual” is defined as those socially disadvantaged individuals that have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member or a group without regard to their individual qualities as defined in 15 U.S.C. 637.

C. Participation Goals. The Goals for DBE participation on construction contract, expressed in percentage terms, for each prime contractor's aggregate share of the work are as follows:

DBE Contract Goal:

Eleven percent (11%)

The Goal is applicable to all of the contractor's construction work, and achievement of the goal will be determined by dividing the total dollar volume of the work subcontracted to DBEs respectively by the total dollar amount of the contractor's work. Each DBE included in the bid must be certified by the Owner and must be identified by name, address, DBE category, type of work, and dollar amount of subcontract.

D. Good Faith Efforts: All bidders shall agree by the submission of a bid for this project ensures that DBEs have the maximum opportunity to participate in the performance of contracts and subcontracts. All bidders shall be required to take all steps reasonably necessary in accordance with this Plan to ensure that DBEs have the maximum opportunity to participate in the work. Failure to make a good faith effort and to adequately document such efforts to the Authority will be grounds for disqualifying a bid as non-responsive. Bidders shall not discriminate on the basis of race, color, national origin or gender in the selection of suppliers and subcontractors and in the performance of this contract.

E. Compliance. All bidders for work on construction projects at Raleigh-Durham International Airport are hereby notified that failure to carry out the obligations of this Plan will constitute a breach of good faith in dealing with the Owner, and the Owner will take any and all actions permitted by law to ensure compliance by all contractors employed by it. Any bidder who fails to meet or exceed the goals and fails to provide satisfactory evidence of its Good Faith Effort to include DBEs in its bid will be deemed to have submitted an incomplete or non-responsive bid and its bid will be rejected.

F. Contract Award. The Owner will award construction contracts to the lowest responsible bidder submitting a reasonable bid in accordance with the requirements of Article 8 of Chapter 143 of the N.C. General Statutes. The Owner shall be the sole arbiter to determine if a bidder has made a reasonable Good Faith Effort toward DBE participation in its proposal on any project. The Owner reserves the right to reject any and all bids submitted and to reject the bid of any bidder who fails to make a Good Faith Effort and submit timely, satisfactory evidence of its Good Faith Effort.

G. DBE Subcontracts. Each bidder shall enter all the information regarding how it intends to meet the DBE goal. The listing of DBEs shall constitute a commitment by the bidder to utilize the listed DBEs, subject to the replacement provisions. All DBE participation must be identified and included in the sealed bid. Any increase in DBE participation which occurs after the bids are opened will not be considered in determining the bidder's achievement of the DBE Contract Goal or its Good Faith Effort to achieve the goal.

A contractor may count toward its achievement of DBE participation goals expenditures for materials and supplies obtained from DBE suppliers and manufacturers, provided that the DBE assumes the actual and contractual responsibility for the provision of the material and supplies.

A contractor may count its entire expenditures to a DBE manufacturer (i.e., a supplier that produces goods from raw materials or substantially alters them before resale).

A contractor may count sixty (60%) percent of its expenditures to DBE suppliers that are not manufacturers, provided that the DBE supplier performs a commercially useful function in the supply process (i.e., assumes the contractual responsibility for the provision of the materials supplied).

H. Available DBEs. The listing of approved DBE firms is available from the North Carolina Department of Transportation at:

https://www.ebs.nc.gov/VendorDirectory/default.html

Credit toward the DBE Contract Goal will not be counted unless the DBE to be used has been DBE certified prior to the bid opening or certification can be verified by the Owner based upon information provided by the contractor to the Owner prior to the award of the contract.

If a proposed DBE firm fails to become certified prior to award of the contract, the contractor must make good faith efforts (as defined in paragraph J of the Instructions to bidders) to perform the same work or other work of equal value with other RDU or DOT certified contractors.

I. Bidder's Required Submissions. Each bidder shall include in his proposal the following information concerning DBE participation in the contract:

(1) A description of all proposed DBE and non-DBE subcontracts, subcontracts, and supplier agreements to be utilized in performing the prime contract and the names and addresses of all proposed DBE and non-DBE subcontractors and suppliers. (Appendix 1 to the Proposal).

(2) Written documentation of its Good Faith Efforts to involve DBE subcontractors in the portions of the work that will not be subcontracted to DBE firms. (Appendix 2 to the Proposal) Prospective contractors who propose to perform the entire contract with their own work force shall submit information sufficient for the Owner to determine that it is a normal and necessary practice of the bidder to perform all such elements of a project without the use of subcontractors, and, if possible, shall document at least four (4) similar contracts within the past two (2) years in which they have done so (Appendix 3 to the Proposal). Such bidders are encouraged to make maximum use of DBE suppliers whenever possible.

APPENDICES 1 & 2 MUST BE SUMITTED WITH THE PROPOSAL. ALSO, APPENDIX 3 IF SELF-PERFORMING.

J. Satisfactory Good Faith Effort. Each bidder shall submit with its bid documentation which demonstrates that it made Good Faith Efforts to meet the Verifiable Goals applicable to its portion of the work.

NOTE: Any bidder who fails to provide satisfactory evidence of its Good Faith Effort with its bid and desires to be permitted to provide additional evidence of its Good Faith Effort must make that request in writing to the Airport Authority's Facility Development Department not later than two hours following the time for opening of bids; otherwise, the opportunity to do so will be forfeited. Additional evidence of the bidder's Good Faith Effort must be in written form and must be delivered to the Airport Authority's Facility Development Department not later than twenty-four (24) hours following the time for opening of bids; otherwise, the opportunity to do so will be forfeited.

The following criteria will be considered and should be addressed point by point in the bidder's submission:

(1) Whether the bidder attended Pre-bid/DBE conference?

(2) Whether the bidder advertised contractual opportunities in general circulation, trade association, or minority-focus media concerning opportunities?

Whether the advertising was specific to the project in question?

(3) Whether the bidder provided satisfactory written solicitations requesting participation of DBEs that reasonably could have been expected to submit a quote that were known to the Contractor or available on state or local government maintained lists no later than ten (10) days prior to the bid opening?

(4) Whether the bidder provided DBEs with: (a) adequate description of all work to be contracted? (b) adequate information about the location of the plans, specifications, and requirements of the contact? and (c) the date the quotation was due to the bidder?

(5) Whether the bidder followed up initial solicitations of interest in person or by telephone to determine if the DBE was interested in participation?

(6) Whether the bidder broke down or combined elements of work to be performed by DBEs into economically feasible units in order to facilitate minority participation?

(7) Whether the bidder made available or provided prospective DBEs with plans, specifications, and requirements for the work to be subcontracted at least 10 days before bids or proposals were due?

(8) Whether the bidder negotiated in good faith with DBEs? Whether the bidder rejected DBEs as unqualified for any reason?

(9) Whether the bidder negotiated in good faith with interested DBEs whose initial responses were not the lowest bids for the work to be subcontracted?

(10) Whether the bidder offered assistance to interested DBEs in obtaining bonding or insurance required by RDU or by the bidder?

(11) Whether the bidder worked with minority trade, community or contractor organizations identified by the North Carolina Department of Transportation or the Office of Historically Underutilized Businesses or included in the bid documents that provide assistance in the recruitment and placement of DBEs?

(12) Whether the bidder specifically negotiated with subcontractors to assume part of the responsibility to meet the contract Verifiable Goals when the work to be sublet includes potential for DBE participation?

(13) Whether the bidder provided assistance to otherwise qualified DBEs in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies or letters of credit, including waiving credit that is ordinarily required or assisted DBEs in obtaining the same unit pricing with bidder's suppliers in order to help DBEs in establishing credit?

(14) Whether the bidder provided quick pay agreements and policies to enable DBEs to meet cash flow demands?

NOTE: The fourteen (14) items set forth above are minimum requirements and the Owner may require the bidder to submit information on additional actions a bidder took to secure DBE participation. Bidders are encouraged to submit to the Owner information on all additional efforts made to include DBEs in its bid.

K. Contractor Assurances. Agreements between a bidder and a DBE in which the DBE promises not to provide subcontracting quotations to other bidders are prohibited. Contractors shall make a satisfactory good faith effort to replace any DBE subcontractor that is unable to perform successfully with another DBE subcontractor. All substitutions shall be coordinated with and approved by the DBE Coordinator and the Authority's project manager prior to being made. (Attachment 4A to the Instructions to Bidders must be used for proposed DBE subcontractor changes.)

The Contractors shall establish and maintain records and submit monthly reports which will identify and assess progress in achieving DBE subcontract

participation. The report shall include a certification by the Contractor and Subcontractor regarding payment to each DBE subcontractor for the prior month's work. These reports will be certified as true and correct by an appropriate company official **(See Attachments to these Instructions)**.

L. DBE Obligation. The contractor agrees to ensure that the DBEs have the maximum opportunity to participate in the performance of contracts and subcontracts for work to be performed.

In this regard, all contractors shall take all necessary and reasonable steps to ensure that DBEs have the maximum opportunity to compete for and perform such contracts and subcontracts. Contractors shall not discriminate on the basis of race, color, national origin, or gender in the performance of any contracts awarded by the Owner.

The DBE Coordinator shall be available to bidders and DBEs to provide assistance to the parties to encourage participation of qualified DBEs in the contract.

M. Achievement of Goals. Bidders shall provide identifying information **(Appendices 4 & 5 to the Proposal)** for all DBE subcontractors and suppliers who it proposes to engage in carrying out and completing the work called for by this proposal. These forms must be signed by the apparent low Bidder and by each prospective DBE and must be received by the Authority within seventy-two (72) hours of the bid opening. Following the opening of the bids, no change shall be made in any of the DBE subcontractors proposed to be engaged by the bidder without the prior written consent and approval of the DBE Coordinator and the Authority's project manager.

7. EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK

The Bidder shall examine carefully the site of the work contemplated, the plans and specifications, and the proposal and contract forms therefor. The submission of a bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered; as to the character, quality, and scope of work to be performed; the quantities of materials to be furnished; and as to the conditions and requirements of the proposal form, plans, specifications, and contract under which his bid is offered.

A Bidder or Contractor is cautioned to make such independent investigation and examination as he deems necessary to satisfy himself as to conditions to be encountered in the performance of the work with respect to possible local material sources, the quality and quantity of material available from such property, and the

type and extent of processing that may be required in order to produce material conforming to the requirements of the specifications.

The work is located in controlled-access (non-public) areas of the airport. In order to gain access to the controlled-access portions of the site, Bidders shall contact the Owner to arrange a site visit and/or investigation. Bidders interested in performing subsurface borings shall contact the Owner to arrange access to any and all areas of the work. Bidders interested in using destructive investigative methods are subject to limitations regarding when and where such investigations may be made. Such investigations will be allowed between the hours of 11:00 PM. and 5:00 AM. Test pits or similar excavations will not be permitted; however, borings may be taken during the prescribed times. Bidders using destructive investigative methods are solely responsible for notifying utility owners prior to commencement of activities and otherwise complying with Article 8, Chapter 87 of the North Carolina General Statutes titled the Underground Damage Prevention Act and for restoring disturbed areas and facilities.

8. PREBID CONFERENCE, EXAMINATION OF CONDITIONS AND MINORITY BUSINESS ENTERPRISE WORK SHOP

A Non-mandatory Pre-bid Conference/Disadvantaged Business Enterprise (DBE) Workshop will be held at **10:30 AM on Tuesday, June 5, 2018**, at the Raleigh-Durham Airport Authority's Administration Building, 1000 Trade Drive, RDU Airport, NC, 27623. The purpose of the conference is to give the pre-qualified Bidders an opportunity to ask questions concerning the Plans, Specifications, and Contract Documents. The purpose of the DBE Workshop is to give the Bidders and subcontractors an opportunity to ask questions concerning the DBE plan.

9. CONTRACTOR QUALIFICATIONS

All contractors are hereby notified that they must comply with any and all Federal or State Contractor Licensing Requirements. General contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina will be observed in receiving and awarding general contracts.

For the purposes of RDU Project 211120, the Raleigh Durham Airport Authority will accept bids only from prequalified Bidders. A list of prequalified Bidders can be found in the "Notice to Bidders" in this document.

10. ALTERNATE BIDS

Section not used.

11. AWARD OF CONTRACT

The award of the contract will be made to the lowest responsible Bidder as soon as practicable; provided that in the selection of equipment or materials or contract time, a contract may be awarded to a responsible Bidder other than the lowest in the interest of standardization, ultimate economy or time of commencement and completion if the advantage of such standardization, ultimate economy or time of commencement and completion is clearly evident. The Owner reserves the right to reject any or all bids and to waive informalities and minor irregularities. The Owner may require the apparent low Bidder to qualify himself/herself to be a responsible Bidder by furnishing financial statements, evidence of experience in completion of similar projects, the names of holders of trade licenses and similar information.

12. INELIGIBLE CONTRACTORS

The United States Government has agreed to reimburse the Owner for portions of the project costs. The Owner will not accept or consider proposals from any Contractor whose name, at the time of opening of bids or award, appears on the current list of ineligible Contractors published by the Comptroller General of the United States under Section 5.6(b) of the Regulations of the Secretary of Labor (29 CFR Part 5) nor a proposal from any firm, corporation, partnership or proprietorship in which an ineligible Contractor has a substantial interest. The Owner will not accept or consider a proposal from any contractor who, at the time of the opening of bids or the award, is removed from the North Carolina Department of Transportation's list of prequalified contractors or is not listed as a Pre-Qualified Bidder for this Project in the “Notice to Bidders.”

13. CANCELLATION OF AWARD

The Owner reserves the right to cancel the award without liability to the Bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and Notice to Proceed has been issued and approved by the Owner.

14. CORRECTION OF BID ERRORS

The provisions of this article shall apply to irregularities and correcting apparent clerical errors and omissions in the “unit bid price” and “amount bid” for bid items.

A. Omitted Unit Bid Price--Amount Bid Completed--Quantity Bid on Is One Unit:
In the case of a bid item for which the “amount bid” is completed, but the “unit bid price” is omitted and the “quantity” shown in the proposal for the bid item is only one unit, the “unit bid price” shall be deemed to be the same as the amount bid for that item and shall constitute the “contract unit price” for that bid item.

B. Omitted Unit Bid Price--Amount Bid Completed--Quantity Bid on Is More Than One Unit:
In the case of a bid item for which the "amount bid" is completed (extension of the "unit bid price" by the quantity), but the "unit bid price" is omitted and the "quantity" shown in the proposal for the bid item is more than one unit, the "unit bid price" shall be deemed to be the amount derived by dividing the "amount bid" for that item by the quantity shown in the proposal for that item and shall constitute the "contract unit price" for that bid item.

C. Discrepancy in the "Unit Bid Price" and "Amount Bid":
In the case of a bid item in which there is a discrepancy between the "unit bid price" and the extension for the bid item ("amount bid"), the "unit bid price" shall govern. As an exception to the above, the extension for the bid item ("amount bid") shall govern when the discrepancy consists of an obvious clerical mistake in the "unit bid price" consisting of the misplacement of a decimal point. The correction to the "unit price bid" will be made when the following two conditions are met:

1. The corrected "unit bid price" multiplied by the quantity equals the "amount bid" for the bid item.

2. The corrected "unit bid price" is closer to the engineer's estimate and the individual bids for the contract item than the uncorrected "unit bid price".

15. PERFORMANCE AND LABOR AND MATERIALS PAYMENT BONDS

The Bidder shall furnish surety bonds in the form indicated in the contract documents executed by a surety company authorized to do business in North Carolina. Each such bond shall be in an amount equal to **one hundred percent (100%)** of the contract price. A separate security shall be provided each for the faithful performance of the contract and for the payment of all persons performing labor and furnishing materials in connection therewith.

16. INSURANCE

The Bidder's attention is called to Article 11 of the AIA General Conditions, entitled "Insurance and Bonds." The Bidder shall advise his/her insurer on the particulars of the contract insurance requirements in Section 11.1 and make certain that the insurer is able and willing to completely fulfill these requirements. Prior to execution of a contract, it will be necessary for the Contractor to provide an insurance certificate with the appropriate language required and the endorsements as specified, including an endorsement clearly stating that the Contractor's insurance is primary, non-contributing.

Accordingly, the Bidder is required to submit with his/her bid the Insurer's Letter of Commitment, completed and signed by the Bidder and its proposed insurer. The form for the Insurer's Letter of Commitment follows these "Instructions to Bidders."

End of Instructions to Bidders

INSURER'S LETTER OF COMMITMENT

(To be submitted with the Bid)

We, the _____,
(name of proposed insurer or agent)

on behalf of _____,
(Bidder's name)

have been advised and have become fully aware of the insurance requirements dictated in the bid documents for the Raleigh-Durham Airport Authority project entitled, **"Taxiway B Rehabilitation" (RDU 211120).** We understand that time is of the essence in terms of initiating and completing this work, and, accordingly, upon the offer of a Contract to the Bidder named above, we will immediately offer the Bidder documentation of the required coverages.

_____
Signature and printed name of Insurer

_____
Date

_____
Signature and printed name of Bidder

_____
Date

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PROPOSAL FOR
TAXIWAY B REHABILITATION
RDU NO. 211120
FAA AIP PROJECT NO. 3-37-0056-050-2018

TO: Raleigh-Durham Airport Authority
P.O. Box 80001
RDU Airport, NC 27623

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no person other than those herein mentioned, has any interest in the proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud.

A bidder shall be considered disqualified for any of the following reasons, among others:

(a) Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.
(b) Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Authority until any such bidder has been reinstated by the Authority as a qualified bidder.

The bidder further declares that it has examined the site of the work and informed itself fully in regard to all conditions pertaining to the place where the work is to be done, that it has examined the specifications for the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that it has satisfied itself relative to the work to be performed. In case of conflict between words and figures, the words will govern.

The bidder proposes and agrees that if this proposal is accepted, to contract with the Raleigh-Durham Airport Authority in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to perform all construction in full and complete agreement with the plans and specifications and contract documents to the full and entire satisfaction of the Raleigh-Durham Airport Authority as computed from the schedule of unit prices hereinafter shown. The quantities of work shown by unit prices are approximations only and the contract price will be based on the actual quantities included in the work.

The Authority reserves the right to reject any or all bids or sections thereof or to accept such bids or sections thereof, as it appears in its judgment to be in the best interest of the Authority.
The bidder agrees, if awarded the contract, to commence work on the commencement date stated in the Notice to Proceed or within ten (10) days after such specified commencement date.

The bidder agrees, if awarded the contract, to complete fully all work hereunder within **510 consecutive calendar days,** from and including the specified commencement date indicated in the Notice to Proceed, which shall be as calculated in Paragraph B of the Special Conditions.

Liquidated damages for failure to complete in full all work hereunder by the specified completion date are fixed at **$3,000 (three thousand dollars) per day** for each consecutive day by which the actual completion date exceeds the specified completion date. Further requirements and definition of liquidated damages, and description of interim liquidated damages per phase, are contained in Paragraph 3.3 of the Standard Form of Agreement Between Owner and Contractor, AIA Document A132-2009.

These damages will also be in addition to any other damages, penalties, or retainages that may be assessed and withheld under other provisions of this contract. Liquidated damages will be assessed for each consecutive calendar day by which the date of actual completion exceeds the end day of the specified contract time. These damages will be assessed separately for each date or duration not met and the total amount assessed will be cumulative.

The Owner reserves the right to retain all bids for a period of 120 days after the scheduled closing time for the receipt of bids. No bid shall be withdrawn by a bidder within 120 days after the scheduled closing time for the receipt of bids. Should the successful bidder default and not execute a contract, the contract may be offered to the next lowest and responsible bidder.

BOND:
The Undersigned agrees, if awarded the contract, to furnish and deliver to the Engineer within 10 days following receipt of notice of the award, a signed Contract, satisfactory Performance and Labor and Material Payment Bonds, each in an amount of 100% of the Contract Price, and all required certificates of insurance and insurance policy endorsements.

CERTIFIED CHECK OR BID BOND:
The bidder further agrees that in the case of failure on his part to execute said contract and provide the required bonds and certificates of insurance within ten (10) consecutive calendar days after written notice is given of the award of contract, the certified check, cash, or bid bond accompanying this bid shall be paid into the hands of the Authority as liquidated damages for such failure. Otherwise, the certified check, cash, or bid bond accompanying this proposal shall be returned to the undersigned bidder.

CONTRACTOR'S LICENSE, QUALIFICATIONS AND PERFORMANCE REQUIREMENTS:

The undersigned certifies that it, or its subcontractor(s), complies with any and all Federal and State Contractor Licensing Requirements including any requirements applicable for the work depicted and described in the bid documents prepared by the Engineer.

OWNER'S RIGHT OF REJECTION

The Authority reserves the right to reject any or all bid(s), or sections thereof, as it appears in its judgment to be in the best interest of the Authority.

DBE OBLIGATION

The contractor agrees to ensure that DBE Enterprises have the maximum opportunity to participate in the performance of the contracts and subcontracts. In this regard, all contractors shall take all necessary and reasonable steps to ensure that DBE Enterprises have the maximum opportunity to compete for and perform contracts. Contractors shall not discriminate on the basis of race, color, national origin, or sex in the performance of this or subsequent subcontractors.

DBE GOOD FAITH EFFORT PLAN

The bidder shall provide information in connection with the Authority's DBE Good Faith Effort Plan as specified in the "Instructions to Bidders".

ADDENDA RECEIVED:

ADDENDUM NO._____ DATED_____

ADDENDUM NO._____ DATED_____

ADDENDUM NO._____ DATED_____

ADDENDUM NO._____ DATED_____

ADDENDUM NO._____ DATED_____

ADDENDUM NO._____ DATED_____

ADDENDUM NO._____ DATED_____

Work Item Description: Provide all materials, tools, labor, and incidentals to accomplish the work "**Taxiway B Rehabilitation"** located at the Raleigh Durham International Airport as depicted on drawings and as described in the specifications created by **WK Dickson & Co., Inc.** The work, as well as the bid price listed, shall include all necessary permitting, licensing, and taxes to complete construction.

ALL INFORMATION REQUIRED WITH BID

Bid Schedule is on the following pages

PROJECT TOTAL - IN WORDS

_____

_____

ALTERNATE BID ITEMS

Not applicable for this project

Respectfully submitted this_____day of _____, 2018.

_____
(Name of Bidder)

_____
(Address of Bidder)

_____

(Corporation)

By_____ Corporate Seal
President

Attest: _____
Secretary

(Partnership)

By_____

Title_____

Witness: _____

(Proprietorship)

By_____

Title_____

Witness: _____

BID SECURITY

Attach Bid Security herein:

POWER OF ATTORNEY

Attach Power of Attorney herein:

(This form may be copied)

EQUAL EMPLOYMENT OPPORTUNITY (EEO) REPORT STATEMENT
(41 CFR Part 60-1.7)

The Bidder shall complete the following statement by checking the appropriate boxes. Failure to complete these blanks may be grounds for rejection of bid.

1. The Bidder (Proposer) has___has not___developed and has on file at each establishment affirmative action programs pursuant to 41 CFR 60-1.40 and 41 CFR 60-2.

2. The Bidder (Proposer) has___has not___participated in any previous contract or subcontract subject to the equal opportunity clause prescribed by Executive Order 11246, as amended.

3. The Bidder (Proposer) has_____has not_____filed with the Joint Reporting Committee the annual compliance report on Standard Form 100 (EEO-1 Report).

4. The Bidder (Proposer) does___does not___employ fifty (50) or more employees.

Name of Bidder:_____

By:_____

Title:_____

Date:_____

CERTIFICATE OF PROMPT PAYMENT

The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than seven (7) days from the receipt of each payment the prime contractor received from the Owner. The prime contractor agrees further to return retainage payments to each subcontractor within seven (7) days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above-referenced time frame may occur only for good cause following written approval of the Owner. This clause applies to both DBE and non-DBE subcontractors.

Name of Bidder:_____

By:_____

Title:_____

Date:_____

CERTIFICATION

The undersigned hereby certifies to the Raleigh-Durham Airport Authority:

TRADE RESTRICTION CERTIFICATION

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

a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);

b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;

c. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

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

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

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

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

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

BUY AMERICAN CERTIFICATION

The contractor agrees to comply with 49 USC § 50101, which provides that Federal funds may not be obligated unless all steel and manufactured goods used in AIP-funded projects are produced in the United States, unless the FAA has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

A bidder or offeror must complete and submit the Buy America certification included herein with their bid or offer. The Owner will reject as nonresponsive any bid or offer that does not include a completed Certificate of Buy American Compliance.

Certificate of Buy American Compliance for Manufactured Products

(Non-building construction projects, equipment acquisition projects)

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

☐ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:

a) Only installing steel and manufactured products produced in the United States, or;
b) Installing manufactured products for which the FAA has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing, or;
c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

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

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

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

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

4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

Required Documentation

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

a) Listing of all product components and subcomponents that are not comprised of 100% US domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety)
b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture.
c) Percentage of non-domestic component and subcomponent cost as compared to total "item" component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

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

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

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

Date	Signature
Company Name	Title

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally-assisted construction contractor certifies that she or he does not maintain or provide, for his employees, any segregated facilities at any of his establishments and that she or he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies that she or he will not maintain or provide, for his employees, segregated facilities at any of his establishments and that she or he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, timeclocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The federally-assisted construction contractor agrees that (except where she or he has obtained identical certifications from proposed subcontractors for specific time periods) she or he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that she or he will retain such certifications in his files.

Name of Bidder:_____

By:_____

Title:_____

Date:_____

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

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

Name of Bidder:_____

By:_____

Title:_____

Date:_____

CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Name of Bidder:_____

By:_____

Title:_____

Date:_____

CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

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

Certifications

1) The applicant represents that it is (✓) is not (✓) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

2) The applicant represents that it is (✓) is not (✓) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

Note

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

Term Definitions

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

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

Name of Bidder:_____

By:_____

Title:_____

Date:_____

AFFIDAVIT OF NON-COLLUSION

STATE OF _____
COUNTY _____

Personally appeared before me _____ being duly sworn says that he is a member of the firm of _____ _____ and further says that his firm, association, or cooperation has not, either directly or indirectly, entered any agreement, participated in any collusion, or otherwise taken any action in resistant of for competitive bidding in connection with the submission of a bid on the above-named project.

Further, _____ swears and affirms that all legal formalities required for the proper execution of affidavits pursuant to the laws of his state have been complied with an further agrees on behalf of himself, his firm association, or corporation, that in any subsequent prosecution of perjury of him, his firm association, or corporation, it shall note a defense to such charge perjury that said formalities were not in fact complied with.

_____
Typed Name and Title

_____
Legal Signature

SWORN to me before this _____ day of _____, 20__.

_____

Notary Public for _____

Raleigh-Durham International Airport
Taxiway B Rehabilitation

Item No.	Spec. Section	Item Description	Quantity	Unit	Unit Price	Extended Total
1	M-101-1	Mobilization	1	LS		
2	01 50 00	Engineer's Field Office	1	LS		
3	Plans	Access Route Repair (Asphalt -Partial Depth)	17,000	SY		
4	Plans	Access Route Repair (Asphalt - Full Depth)	17,000	SY		
5	P-101-1	Concrete Pavement Removal, Full Depth	85,000	SY		
6	P-101-2	Asphalt Pavement Removal, Full Depth	800	SY		
7	P-101-3	Isolated Slab Removal & Replacement	10	EA		
8	P-101-4	Asphalt Base Removal	2,975	SY		
9	P-152-1	Unclassified Excavation	45,000	CY		
10	P-152-2	Undercut Excavation, replace with backfill	10,000	CY		
11	P-152-3	Undercut Excavation, replace with stone	10,000	CY		
12	P-152-4	Embankment in Place	9,500	CY		
13	P-156-1	Temporary Seeding and Mulching	20	AC		
14	P-156-2	Construction Entrance	4	EA		
15	P-156-3	Temporary Drop Inlet Protection	25	EA		
16	P-156-4	Linear Fiber Roll Protection	5,500	LF		
17	P-156-5	Erosion Control Matting	11,100	SY		
18	P-156-6	Temporary Fiber Check Dams	50	EA		
19	P-156-7	Silt Fence	5,000	LF		
20	P-156-8	Excavated Inlet Protection	5	EA		
21	P-156-9	Temporary Skimmer Sediment Basin	2	EA		
22	P-156-10	Temporary Slope Drain (15")	325	LF		
23	P-156-11	Temporary Slope Drain (18")	180	LF		
24	P-156-12	Temporary Diversion Ditch	2,000	LF		
25	P-156-13	Dewatering	29	EA		
26	P-156-14	Silt Fence Outlet	6	EA		
27	P-160-1	Asphalt Milling (2.5")	19,000	SY		
28	P-209-1	Crushed Aggregate Base Course	7,050	CY		
29	P-219-1	Recycled Concrete Aggregate Subbase Course (12")	93,100	SY		
30	P-219-2	Recycled Concrete Aggregate Base Course (Under Shoulder)	17,900	CY		
31	P-306-1	Lean Concrete Base Course (6")	93,100	SY		
32	P-401-1	Hot Mixed Asphalt (HMA) Surface Course	3,100	TON		
33	P-403-1	Hot Mixed Asphalt (HMA) Surface Course	9,800	TON		
34	P-501-1	Portland Cement Concrete Pavement (16")	93,100	SY		
35	P-501-2	Spall Repair (Non-AIP Eligible)	20	SF		
36	P-602-1	Bituminous Prime Coat	10,600	GAL		
37	P-603-1	Bituminous Tack Coat	12,500	GAL		
38	Plans	Non-Woven Bond Breaker	93,100	SY		
39	Plans	Non-Woven Filter Fabric	93,100	SY		
40	P-605-1	Joint Sealing	100,900	LF		
41	P-620-1	Permanent Pavement Markings - Reflective, Type I Glass Beads	26,555	SF		
42	P-620-2	Permanent Pavement Markings - Reflective, Type III Glass Beads	2,860	SF		
43	P-620-3	Permanent Pavement Markings, Non-Reflective, Black	71,651	SF		
44	P-620-4	Pavement Marking Removal	1,350	SF		
45	P-620-5	Surface Painted Holding Position Sign	10	EA		
46	32 17 23-A	Paint Pavement Marking Lines, 6", Solid	3,500	LF		
47	32 17 23-B	Paint Pavement Marking Lines, 6", Dashed	3,500	LF		
48	32 17 23-C	Paint Pavement Marking Lines, 12", Solid	1,000	LF		
49	33 17 23-D	Thermoplastic Pavement Marking Lines, 24", Solid	60	LF		
50	32 17 23-E	Thermoplastic Pavement Marking Symbols	5	EA		
51	F-162-1	Temporary Chain Link Fence	2,450	LF		

Raleigh-Durham International Airport
Taxiway B Rehabilitation

52	F-162-2	Temporary 8' Chain Link Gate - 20 Foot Opening	2	EA		
53	F-162-3	Temporary 8' Chain Link Gate - 30 Foot Opening	1	LF		
54	D-701-1	18 inch RCP, Class IV	176	LF		
55	D-705-1	4-inch Perforated PVC	15,100	LF		
56	D-705-2	6-inch Perforated PVC	12,300	LF		
57	D-705-3	6-inch Non-Perforated PVC	3,450	LF		
58	D-705-4	Underdrain Cleanout	194	EA		
59	D-705-5	Underdrain Connection to Existing Structure	42	EA		
60	D-705-6	Underdrain Removal	19,800	LF		
61	D-705-7	#57 Stone - Underdrain	750	CY		
62	D-705-8	Non-Woven Filter Fabric	1,650	SY		
63	D-751-1	Existing Storm Inlet Partial Reconstruction	14	EA		
64	D-751-2	Storm Manhole #12A Partial Reconstruction	1	EA		
65	D-751-3	Junction Chamber #2 Partial Reconstruction	1	EA		
66	D-751-4	Cast-in-place Storm Structure w/ Grate	5	EA		
67	T-901-1	Seeding (Mulched)	17	AC		
68	T-904-1	Sodding	15,000	SY		
69	T-905-1	Topsoiling	6,000	CY		
70	Plans	#57 Stone (NCDOT) (Contingency Pay Item)	1,500	TON		
71	L-104-1	Temporary Airfield Lighting Jumpers – Complete	1	LS		
72	L-105-1	Demolish Existing Fixture/Base Can in Turf	204	EA		
73	L-105-2	Demolish Existing Fixture/Base Can in Full Strength Pavement	105	EA		
74	L-105-3	Demolish Existing Sign and Foundation.	35	EA		
75	L-105-4	Demolish Existing Handhole/ Manhole	10	EA		
76	L-105-5	Remove Fixture and Transformer, Install New Steel Cover on Existing Base Can	6	EA		
77	L-108-1	No. 8 AWG, 5 kV, L-824, Type C Cable	50,500	LF		
78	L-108-2	No. 6 AWG, Solid, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors	38,900	LF		
79	L-108-3	3/4" x 10' Copper Clad Ground Rod - Supplemental	560	EA		
80	L-108-4	Pavement Sensor Cable - Type IIA	300	LF		
81	L-110-1	1 Way 2-inch Conduit Direct Earth Buried	2,600	LF		
82	L-110-2	1 Way 2-inch Conduit in Asphalt Shoulder Pavement	18,600	LF		
83	L-110-3	1 Way 2-inch Conduit - Concrete Encased	15,300	LF		
84	L-110-4	2 Way 2-inch Conduit - Concrete Encased	300	LF		
85	L-110-5	4 Way 2-inch Conduit - Concrete Encased	175	LF		
86	L-110-6	1 Way 3/4 inch Conduit - Drainage Line	800	LF		
87	L-115-1	Electrical Junction Can Plaza – 2 Base Cans Raised to Proposed Grade	1	EA		
88	L-115-2	Electrical Junction Can Plaza – 3 Base Cans Raised to Proposed Grade	4	EA		
89	L-115-3	Electrical Junction Can Plaza – 5 Base Cans Raised to Proposed Grade	5	EA		
90	L-115-4	Electrical Junction Can Plaza – 8 Base Cans Raised to Proposed Grade	1	EA		
91	L-115-5	Electrical Junction Can Plaza – 9 Base Cans Raised to Proposed Grade	1	EA		
92	L-115-6	Electrical Junction Can Plaza – 11 Base Cans Raised to Proposed Grade	6	EA		
93	L-115-7	Electrical Junction Can Plaza – 12 Base Cans Raised to Proposed Grade	1	EA		
94	L-115-8	Electrical Junction Can Plaza – 16 Base Cans Raised to Proposed Grade	1	EA		
95	L-115-9	L-867D Junction Can Pull Box - Installed in Turf	4	EA		
96	L-115-10	L-867D Junction Can Pull Box - Installed in Asphalt Shoulder Pavement	1	EA		
97	L-125-1	L-852C(L) - LED In-Pavement Taxiway Centerline Light Uni-Directional - Narrow Beam	18	EA		
98	L-125-2	L-852C(L) - LED In-Pavement Taxiway Centerline Light Bi-Directional - Narrow Beam	124	EA		
99	L-125-3	L-852K(L) - LED In-Pavement Taxiway Centerline Light Uni-Directional - Wide Beam	50	EA		
100	L-125-4	L-852K(L) - LED In-Pavement Taxiway Centerline Light Bi-Directional - Wide Beam	55	EA		
101	L-125-5	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Shoulder Pavement	199	EA		

Raleigh-Durham International Airport
Taxiway B Rehabilitation

102	L-125-6	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Full Strength Pavement	15	EA		
103	L-125-7	L-804(L) Elevated Guard Light installed in Full Strength Pavement	2	EA		
104	L-125-8	L-804(L) Elevated Guard Light installed in Asphalt Shoulder Pavement	8	EA		
105	L-125-9	L-868B Blank Base Can with 3/4" Steel Cover	8	EA		
106	L-125-10	L-867B Blank Base Can with 3/8" Steel Cover	22	EA		
107	L-125-11	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Turf	12	EA		
108	L-125-12	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Existing Shoulder	2	EA		
109	L-125-13	L-858 LED Sign, 2-Module	2	EA		
110	L-125-14	L-858 LED Sign, 3-Module	24	EA		
111	L-125-15	L-858 LED Sign, 4-Module	10	EA		
112	L-125-16	Type IIA Pavement Sensor (Non-AIP Eligible)	1	EA		
113	L-125-17	Install 10KW L-828 Constant Current Regulator	2	EA		
114	L-125-18	Coordinate Updating of Existing ALCMS	1	LS		

TOTAL BID = _____

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Raleigh-Durham Airport Authority
SCHEDULE OF DBE SUBCONTRACTORS

Project/ Contract Name:			
Bidder/ Proposer Name:		☐DBE	☐NON-DBE
Bidder Contact Name:		**Bidder Phone Number:**	
Bidder E-mail Address:			
DBE Contract Goal:		**DBE Participation Proposed:**	

Instructions:
As part of the procedures for the submission of proposals, all bidders/contractors are required to identify DBE subcontractors/suppliers and service providers identified at of time of the bid, using the attached forms. The Authority must verify the certification status for all DBEs proposed for utilization on this project. Attach additional sheets as necessary.

Name of Subcontractor (incl. service providers and associated equipment/ supplies)	**Description of Subcontract or Service to be Performed**	**Dollar Amount of DBE Participation**	**% of DBE Participation**

Name of Supplier (Materials/ Equipment Supplier Only)	**Description of Equipment or Materials Supplied**	**Dollar Amount of DBE Participation**	**% of DBE Participation** (60% of dollar value)

Dollar Amount of Work to be Completed by DBE Subcontractors or Service Providers	$
Dollar Amount of Supplies Provided by DBE Suppliers	$
Total Amount of Bid/Proposal	$

Prime Contractor's Certification

I further understand and agree that this certification shall be attached to and become a part of the Contract. Failure to provide accurate and complete information or exercise good faith efforts (as defined by the DBE Program) may result in being considered non-responsive to the solicitation. It is understood and agreed that, if awarded a contract by the Authority, the contractor will not make additions, deletions, or substitutions to the DBEs on this certified list without the written consent of the Authority. A request for approval to replace a DBE may only be made by submitting a Request for Approval of Change to Schedule of Subcontractors. It is understood that the Authority may audit any and/or all records of the Contract/vendor and conduct interviews of owners, principals, officers, employees and applicable subcontractors/Contractors participating on the Contract. The Authority reserves the right to ensure compliance with the DBE Program to include status reports and audit of submitted DBE information as deemed necessary.

Signature: _____ **Date:** _____

Print Name and Title of Authorized Representative: _____

In order to credit the participation of DBEs, firms must be certified as by a certification agency approved by the Authority as defined in the DBE Program.

Raleigh-Durham Airport Authority
GOOD FAITH EFFORT CHECKLIST

Appendix 2

Bidder/ Proposer Name:	_____	☐ DBE	☐ NON-DBE
Project/ Contract Name:	_____	**Project #:**	_____
DBE Contract Goal:		**Proposed DBE Participation:**	

Good Faith Efforts: If a Contractors/ proposer does not meet the DBE goal, it shall nevertheless be eligible for award of the Contract if it can demonstrate to the Authority that it has made a good faith effort to meet the DBE goal. This checklist should be submitted with the bid documents. Additional documentation to support the assertions in this checklist may be required within 3 business days following the bid. Failure to submit supporting documentation may result in the bid being considered non-responsive to bid specifications.

1)	Did bidder attend DBE pre-bid or pre-proposal conference?	☐ Yes ☐ No
2)	a. Did bidder advertise contractual opportunities in general circulation, trade association, or minority-focus media concerning opportunities? *(Requires documentation)*	☐ Yes ☐ No
	b. Was advertising specific to the project in question? *(Requires documentation)*	☐ Yes ☐ No
3)	Did the bidder provide satisfactory written solicitations requesting participation of DBEs or DBEs that reasonably could have been expected to submit a quote that were known to the Contractor or available on state or local government maintained lists no later than ten (10) days prior to the bid opening?	☐ Yes ☐ No
4)	Did the bidder provide DBEs or DBEs with:	
	a. adequate description of all work to be contracted?	☐ Yes ☐ No
	b. adequate information about the location of the plans, specifications, and requirements of the contact?	☐ Yes ☐ No
	c. date the quotation was due to the bidder?	☐ Yes ☐ No
5)	Did the bidder follow-up initial solicitations of interest electronically, in person or by telephone to determine if the DBE or DBE was interested in participation? *(Requires documentation)*	☐ Yes ☐ No
6)	Did bidder break down or combine elements of work to be performed by DBEs or DBEs into economically feasible units in order to facilitate DBE participation? *(Requires documentation)*	☐ Yes ☐ No
7)	Did bidder make available or provide prospective DBEs or DBEs with plans, specifications, and requirements for the work to be subcontracted at least 10 days before bids or proposals were due? *(Requires documentation)*	☐ Yes ☐ No
8)	Did the bidder negotiate in good faith with DBEs or DBEs?	☐ Yes ☐ No
9)	Did the bidder offer assistance to interested DBEs or DBEs in obtaining bonding or insurance required by the Authority or by the bidder? *(Requires documentation)*	☐ Yes ☐ No
10)	Did the bidder work with minority trade, community or contractor organizations identified by the RDUAA Small Business Office or other local, state or Federal minority/women's business assistance offices to locate DBE or DBE firms? (Requires documentation)	☐ Yes ☐ No

11) Did bidder provide assistance to otherwise qualified DBEs or DBEs in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies or letters of credit, including waiving credit that is ordinarily required, or assist DBEs or DBEs in obtaining the same unit pricing with bidder's suppliers in order to help DBEs or DBEs in establishing credit? ☐ Yes ☐ No

Signature: _____ Date: _____

Print Name and Title of Authorized Representative: _____

Raleigh-Durham Airport Authority
STATEMENT OF INTENT TO PERFORM WORK WITHOUT SUBCONTRACTING OR SUPPLIERS

Appendix 3

Bidder/ Proposer Name:	_____	☐DBE ☐NON-DBE	
Project/ Contract Name:	_____	**Project #:**	_____
MB Contract Goal:	_____	**Proposed MB Participation:**	_____
WB Contract Goal:		**Proposed WB Participation:**	

Self-performance does not exempt Contractors from DBE Program requirements. Notwithstanding the fact that a Proposer may have the capability to complete a total project with its own work force, and without the use of Subcontractors/Subconsultants/Suppliers, all Authority Contractors are required to demonstrate sufficient Good Faith Efforts to subcontract with and/or procure supplies/services with DBEs in its Subcontractor/ Subconsultant or supplier service area. Proposers that do not meet the DBE Goal for a construction or service contract and desire to self-perform the entire contract must comply with each of the following Good Faith Effort provisions. Failure to do so shall constitute grounds for rejection of the Bid or Proposal:

We, _____, hereby certify that it is our intent to perform 100% of the work required for the contract.

In making this certification, the Proposer states the following:

i. It is a normal and necessary practice of the Proposer to perform all elements of this type of contract with its own workforce and without the use of subcontractors. *The Proposer has substantiated this by providing documentation of at least three (3) other projects within the last two (2) years on which they have done so.*

ii. The Proposer was unable to locate DBEs which could provide significant goods or materials for use in conjunction with this contract. *The Proposer has substantiated this by providing documentation.*

iii. The Proposer has a valid business reason for self-performing all work on the Contract as opposed to subcontracting with a DBE. The Bid or Proposal must describe the valid business reason for self-performing, and the Proposer must submit with its Bid or Proposal documentation sufficient to demonstrate to the Authority reasonable satisfaction the validity of such assertions.

iv. The Proposer will provide equal opportunity to DBEs to participate in significant material supplier opportunities available under the prime contract and to document good faith efforts as required herein.

v. If it should become necessary to subcontract some portion of the work at a later date, the Proposer will notify the Authority and institute good faith efforts to comply with all requirements of the DBE program in providing equal opportunities to DBEs to subcontract the work.

The undersigned hereby certifies that he or she has read the terms of this certification and is authorized to bind the Proposer in accordance herewith.

Signature: _____ Date: _____

Print Name and Title of
Authorized Representative: _____

The Proposer must provide documentation which explains how the Proposer will perform the entire contract with its own equipment, supplies, materials and/or employees.

Raleigh-Durham Airport Authority
INTENT TO PERFORM/ CONTRACT
SUBCONTRACTOR/ PROFESSIONAL SERVICE PROVIDER

Appendix 4

Bidder/ Proposer Name: _____ ☐ DBE ☐ NON-DBE

Project/ Contract Name: _____ **Project #:** _____

DBE Contract Goal: _____ **Proposed DBE Participation:** _____

Sub-contractor/ consultant: _____ **Telephone:** _____

Certification Status: ☐ DBE ☐ SBA 8(a)

Name of Certifying Agency:

The undersigned subcontractor intends to perform the following described work listed in connection with the above project:

1. Scope of Work: _____
2. Price: $ _____
3. Projected Commencement Date: _____
4. Projected Completion Date: _____

Subcontractor:

The undersigned DBE Subcontractor acknowledges that the firm is not be permitted to further subcontract the work specified in the Bid or Proposal as DBE participation without the Authority's prior written permission, which shall be given or withheld in the Authority's sole discretion.

Signature: _____ Date: _____

Print Name and Title of Authorized Representative: _____

Prime Contractor Certification

The undersigned affirms that the Prime Contractor has no ownership or financial interest in the DBE subcontracting firm stated above. Except as authorized by the Authority, the undersigned will enter into a formal agreement with the listed DBE firm for work as indicated by this form within (10) business days after receipt of the contract executed by the Authority. The undersigned will, if requested, provide the Small Business Program Office a copy of that agreement within three (3) business days of execution.

Prime Contractor:

Signature: _____ Date: _____

Print Name and Title of Authorized Representative: _____

Raleigh-Durham Airport Authority
INTENT TO PERFORM/ CONTRACT - SUPPLIER

Appendix 5

Bidder/ Proposer Name: _____ ☐ DBE ☐ NON-DBE

Project/ Contract Name: _____ **Project #:** _____

DBE Contract Goal: _____ **Proposed DBE Participation:** _____

Sub-contractor/ consultant: _____ **Telephone:** _____

Certification Status: ☐ DBE ☐ SBA 8(a)

Name of Certifying Agency:

The undersigned subcontractor intends to perform the following described work listed in connection with the above project:

1. Goods/ Equipment Supplied*: _____
2. Price: $ _____
3. Projected Commencement Date: _____
4. Projected Completion Date: _____

* A contractor may count 60% of its expenditures to DBE suppliers.

Supplier:

Signature: _____ Date: _____

Print Name and Title of Authorized Representative: _____

Prime Contractor Certification

The undersigned affirms that the Prime Contractor has no ownership or financial interest in the DBE subcontracting firm stated above. Except as authorized by the Authority, the undersigned will enter into a formal agreement with the listed DBE firm for work as indicated by this form within (10) business days after receipt of the contract executed by the Authority. The undersigned will, if requested, provide the Small Business Program Office a copy of that agreement within three (3) business days of execution.

Prime Contractor:

Signature: _____ Date: _____

Print Name and Title of Authorized Representative: _____

Raleigh-Durham Airport Authority
MONTHLY PAYMENT SUMMARY

All primes are required to list payments to **each subcontractor (or consultant) and supplier** paid during the period. Reports should be submitted to the Project Manager with each application for payment. Use additional sheets as necessary.

Reporting Period	_____ to _____	**Invoice Date**	_____
Project Name	_____	**Prime Contractor**	_____
Contact Person	_____	**Telephone Number**	_____
DBE Goal	$ _____ (Dollar Value)	% (Percent of Total Contract)	

Subcontractor/ Subconsultant/ Supplier ✓ Indicates supplier		**DBE Status**		**Describe Work Performed/Goods Supplied**	**Contract Amount**	**Amount Paid in THIS Reporting Period**	**Amount Paid To Date**
		DBE	**Non-DBE**				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				
☐		☐	☐				

MONTHLY SUMMARY	
	Monthly ($)
Amount Paid to **DBE SUBCONTRACTORS** in THIS Period	$
Amount Paid to **DBE SUPPLIERS** in THIS Period*	$
Amount Paid to **Non-DBE Subcontractors/ Suppliers** in THIS Period	$
Amount Invoiced by Prime in THIS Period	$

CUMMULATIVE SUMMARY	
	Cumulatively ($)
Total Paid to **DBE SUBCONTRACTORS** Through this Period (Total Amount Paid to Date)	$
Total Paid to **DBE SUPPLIERS** Through this Period (Total Amount Paid to Date)	$
Total Paid to Prime Through this Period (Total Amount Paid to Date)	$

**Note: A contractor may count 60% of its expenditures to DBE suppliers.*

By affixing my signature below, I certify that the information contained on this form is true and correct. I understand that the willful provision of false information shall constitute a breach of the contract to which this information applies.

Signature: _____ **Date:** _____

Print Name and Title of Authorized Representative: _____

Raleigh-Durham Airport Authority
SCHEDULE OF DBE SUBCONTRACTORS
(FINAL)

Project/ Contract Name:			
Bidder/ Proposer Name:		☐DBE	☐NON-DBE
Bidder Contact Name:		**Bidder Phone Number:**	
Bidder E-mail Address:			
DBE Contract Goal:		**DBE Participation Proposed:**	

Instructions: Submit with first pay application. Attach additional sheets as necessary.

Name of Subcontractor (incl. service providers and associated equipment/ supplies)	**Description of Subcontract or Service to be Performed**	**Dollar Amount of DBE Participation**	**% of DBE Participation**

Name of Supplier (Materials/ Equipment Supplier Only)	**Description of Equipment or Materials Supplied**	**Dollar Amount of DBE Participation**	**% of DBE Participation** (60% of dollar value)

Dollar Amount of Work to be Completed by DBE Subcontractors or Service Providers	$
Dollar Amount of Supplies Provided by DBE Suppliers	$
Total Amount of Bid/Proposal	$

Prime Contractor's Certification

I further understand and agree that this certification shall be attached to and become a part of the Contract. Failure to provide accurate and complete information or exercise good faith efforts (as defined by the DBE Program) may result in being considered non-responsive to the solicitation. It is understood and agreed that the contractor will not make additions, deletions, or substitutions to the DBEs on this certified list without the written consent of the Authority. A request for approval to replace a DBE may only be made by submitting a Request for Approval of Change to Schedule of Subcontractors. It is understood that the Authority may audit any and/or all records of the Contract/vendor and conduct interviews of owners, principals, officers, employees and applicable subcontractors/Contractors participating on the Contract. The Authority reserves the right to ensure compliance with the DBE Program to include status reports and audit of submitted DBE information as deemed necessary.

Signature: _____ **Date:** _____

Print Name and Title of Authorized Representative: _____

In order to credit the participation of DBEs, firms must be certified as by a certification agency approved by the Authority as defined in the DBE Program.

Raleigh-Durham Airport Authority
DBE AFFIDAVIT OF TOTAL PAYMENT
(SUBCONTRACTORS/ PROFESSIONAL SERVICES)

Instructions: The Affidavit of Total Payment shall be completed and signed by the Prime Contractor and Subcontractor/ Subconsultant after all work contracted to be performed by DBEs has been satisfactorily completed and final payment has been made. Submit one sheet for each DBE listed in original bid/proposal.

Date

Project Name _____ **Prime Contractor** _____

Telephone Number **Contact Person**

_____ _____

DBE Subcontractor **DBE Contact Person**

_____ _____

DBE Telephone Number _____

DBE Contract Amount *(as listed in original bid)*	$
Current DBE Contract Amount *(If less than figure above, please provide additional information regarding the reason for the difference.)*	$
Cumulative Total Paid to DBE *(Final)*	$

Prime Contractor Certification

I hereby certify that the amounts shown above are true and correct and represent the amounts that have been paid to the above named DBE subcontractor.

Signature: _____ Date: _____

Print Name and Title of Authorized Representative: _____

DBE Subcontractor Certification

I hereby certify that we, the above named DBE, have received the cumulative total payments of $_____. This represents full and complete payment on the above named project or contract.

Signature: _____ Date: _____

Print Name and Title of Authorized Representative: _____

Raleigh-Durham Airport Authority
REQUEST TO CHANGE/REPLACE DBE SUBCONTRACTORS

Per the Authority's DBE Program, a Contractor may not terminate for convenience a DBE listed in the original schedule of subcontractors or proposal during the bid/proposal process. The Authority must be notified immediately of a DBE's inability to perform any or all of its work and the Contractor's intent to obtain a substitute DBE. Primes are required to make a good faith effort to replace a DBE that is unable to perform, with another DBE, to the extent necessary to achieve the DBE goal. The substitute DBE must be approved by the Authority. A Letter of Intent (Appendix 4 or 5) for any additional / substitute subcontractor(s)/supplier(s) must be submitted to the Authority for approval with this form.

Project Name _____ **Prime Contractor** _____

Contact Person **Telephone Number**

DBE Goal $ _____ (Dollar Value) _____ % (Percent of Total Contract)

Type of Change ☐ Add ☐ Delete

Company Name _____ **Dollar Amount** _____

Trade/ Activity/ Goods Supplied _____

DBE Status:	**Change DBE Participation?**	**Intent to Perform Attached?**
☐ DBE Certified ☐ Non-DBE	☐ Yes ☐ No	☐ Yes ☐ No

JUSTIFICATION (Please explain the reason for the change)

Type of Change ☐ Add ☐ Delete

Company Name _____ **Dollar Amount** _____

Trade/ Activity/ Goods Supplied _____

DBE Status:	**Change DBE Participation?**	**Intent to Perform Attached?**
☐ DBE Certified ☐ Non-DBE	☐ Yes ☐ No	☐ Yes ☐ No

JUSTIFICATION (Please explain the reason for the change)

CERTIFICATION OF AFFIDAVIT

The above named contractor/consultant requests approval of the following addition (s) and/or deletions (s) on the SCHEDULE OF DBE SUBCONTRACTORS (Appendix 1A), as originally submitted as part of the bid/proposal on the above named project. The above information is true and complete to the best of my knowledge and belief. I further understand and agree that this certification shall become a part of my contract with the Raleigh-Durham Airport Authority.

Signature: _____ **Date:** _____

Print Name and Title of Authorized Representative: _____

DRAFT

AIA® Document A132™ – 2009

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Raleigh-Durham Airport Authority (the "Authority" or "Owner")
1000 Trade Drive
PO Box 80001
RDU Airport, NC 27623

and the Contractor:
(Name, legal status, address and other information)

[Insert Contractor name and address.] ("Contractor")

for the following Project:
(Name, location and detailed description)

Project #211120 – Reconstruction of Taxiway B (north of Taxiway C).

The Construction Manager:
(Name, legal status, address and other information)

Parsons Transportation Group, Inc. ("Parsons" or "Construction Manager")
5540 Centerview Drive, Suite 217
Raleigh, NC 27606

The Architect:
(Name, legal status, address and other information)

W.K. Dickson & Co., Inc. ("Architect")
700 Corporate Center Drive
Raleigh, NC 27607

The Authority has retained an Architect and/or Engineer as appropriate to serve as the lead design professional for the Project. The term "Architect" as used in this Agreement shall refer to the design professional specified above, regardless of whether this design professional is licensed as an Architect, Engineer, or other type of design professional.

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2009, Standard Form of Agreement Between Owner and Construction Manager as Adviser. ^AIA Document A232™–2009 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Special, Supplemental and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, Notice to Bidders, Instructions to Bidders, Proposal (insofar as it conforms to the requirements of other Contract Documents), Performance Bond, Labor and Material Payment Bond, Bid Bond, Insurance Certificates and Endorsements, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract Documents represent the entire and integrated agreement between the parties hereto, which supersedes all prior negotiations, representations or agreements, whether written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. The intent of the Contract Documents is to include all labor, materials, equipment, and other items necessary for the proper execution of the Work. References to AIA Document A232–2017 or other form documents herein are meant to refer to such documents as revised by the parties for the purposes of this Agreement.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents (or reasonably inferable from the Contract Documents as necessary to produce the results intended by the Contract Documents), except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be fixed in a notice to proceed issued by the Owner.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

The Contractor shall achieve Substantial Completion of the entire Work in accordance with the schedule set forth in the Special Conditions. If portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall likewise achieve Substantial Completion of such portions in accordance with the schedule set forth in the Special Conditions.

§ 3.4 Time is of the essence of this Agreement. Owner and Contractor acknowledge and agree that if Contractor fails to achieve Substantial Completion of any portion of the Work or of the entire Work within the time set forth in in Section 3.3 and the schedule set forth in the Special Conditions, Owner will suffer substantial damages that will be difficult to calculate, including public inconvenience, obstruction to air traffic, interference with the use of existing facilities, and increased administrative costs for Owner. Accordingly, if the Contractor fails to achieve

Substantial Completion within the time set forth in in Section 3.3 and the schedule set forth in the Special Conditions, liquidated damages shall be assessed as set forth in the Special Conditions.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates, Allowances, and Unit Prices

§ 4.2.1 Alternates, allowances, and unit prices, if any, included in the Contract Sum, shall be as specified in Contractor's Proposal.

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment (including all supporting documentation) properly submitted to the Construction Manager by the Contractor, and upon Certificates for Payment issued by the Architect after review and approval by the Construction Manager and the Owner, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

§ 5.1.3 Provided that an Application for Payment (including all supporting documentation) is received by the Construction Manager not later than the 5th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the last business day of the same month. If an Application for Payment or any supporting documentation is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than the last business day of the month following the month in which the Application for Payment (including all supporting documentation) is received. No payment shall be deemed past due unless it remains unpaid for a period of 15 days after the dates specified herein.

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager, Owner, and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A232–2009, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** In accordance with the Special Conditions, add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Owner determines, in consultation with the Construction Manager and Architect, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2009;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect or Owner may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2009; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

Five percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

(a) If satisfactory progress is obtained, upon Contractor achieving fifty percent (50%) satisfactory completion of the Work, the Owner will discontinue retainage, subject to the exception described in paragraph (c) below. Owner nevertheless reserves the right to reinstate retaining of up to five percent (5%) of each progress payment if it determines, in its sole and absolute discretion, that Contractor's performance becomes unsatisfactory after such reduction of retainage.

(b) If satisfactory progress by Contractor is obtained, retainage related to portions of the Work performed by a subcontractor that reach 100% completion before Contractor is 50% complete with the Work as a whole shall be reduced to one half of one percent (0.5%) of the value of such subcontractor's subcontract with Contractor within 60 days following receipt of the subcontractor's request for final payment, or immediately upon the Owner's receipt of consent of surety, whichever occurs later. This reduction of retainage is contingent upon Owner's receipt of certification from the Architect that such subcontractor's work is acceptable and in accordance with the Contract Documents.

(c) To the extent Owner releases retainage to subcontractors as described in paragraph (b) above, Owner may thereafter withhold retainage from the Contractor such that the total retainage withheld on the Project equals 2.5% of the Contract Sum.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, as reasonably determined by the Owner, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232–2009.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor within 30 days after

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2009, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« 1 » % « per month »

ARTICLE 6 DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A232–2009, the method of binding dispute resolution shall be arbitration pursuant to Section 15.4 of AIA Document A232–2009.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2009. The Contractor shall not be entitled to recover anticipated overhead, profit, or fee on any portion of the Work not completed. The Contractor shall not be entitled to recover any consequential, incidental, or indirect damages as a result of any termination or suspension.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2009.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2009 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address and other information)

Vice President of Facility Asset Management
PO Box 80001
RDU Airport, NC 27623

§ 8.3 The Contractor's representative:
(Name, address and other information)

[Insert Contractor's Rep info]

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior written notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.6 Other provisions:

§ 8.6.1 If any term, covenant, or condition of the Contract Documents, or the application thereof to any persons or circumstances, is deemed to any extent to be invalid or unenforceable, the remainder of the Contract Documents or the application of the term, covenant, or condition to persons and circumstances other than those as to which it is held invalid or unenforceable shall not be affected thereby, and each term, covenant, and condition of the Contract Documents shall be valid and enforceable to the fullest extent permitted by law.

§ 8.6.2 Any indemnity, warranty, or guaranty given by Contractor to Owner under the Contract Documents shall survive the expiration or termination of this Contract and shall be binding upon Contractor until any action thereunder is barred by the applicable statute of limitations.

§ 8.6.3 The Contract Documents constitute the entire agreement between the parties hereto with respect to the matters covered thereby. All prior negotiations, representations, and agreements not incorporated into the Contract Documents are superseded by Contract Documents. This Agreement can be modified or amended only by a written document duly executed on behalf of the parties hereto.

§ 8.6.4 Contractor represents and warrants that it holds a license, permit, or other special license to perform the Work contemplated by the Contract Documents, as required by law. Contractor shall keep and maintain all such licenses, permits, and special licenses in good standing and in full force and effect at all times while the Contractor is performing Work under this Agreement.

§ 8.6.5 Notwithstanding any other provision of this Agreement to the contrary, no officer, board member or other representative of Owner (an "Individual") shall have any personal liability for the performance of any obligations, or in respect to any liability of Owner under this Agreement, and no monetary or other judgment shall be sought or enforced against any such Individual or their assets, all such personal liability being expressly waived by Contractor. Further, the covenants and obligations contained in this Agreement on the part of the Owner shall be covenants and obligations of the Owner only, and not of the Individuals.

§ 8.6.6 Owner and Contractor, respectively, bind themselves and their partners, successors, assigns, and legal representatives, to the other party to the Contract Documents and to the partners, successors, assigns, and legal representatives of such other party with respect to all covenants of the Contract Documents. The Contractor shall not assign, transfer, or sublet in whole or in part its interest under the Contract Documents without the prior, written consent of Owner.

§ 8.6.7 The Contractor represents and warrants that it possesses a high level of experience and expertise in the construction of projects of the size, complexity, and nature of this particular Project, and shall perform the Work with the care, skill, and diligence of such a contractor.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2009, Standard Form of Agreement Between Owner and Contractor

.2 Exhibit A, Insurance and Bonds

.3 AIA Document A232™–2009, General Conditions of the Contract for Construction (as revised in connection with this Agreement)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

[**« X »**] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
Supplemental General Conditions Special Conditions			

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232™–2009 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Supplemental General Conditions, Special Conditions, Notice to Bidders, Instructions to Bidders, Proposal (insofar as it conforms to the requirements of the other Contract Documents), Performance Bond, Labor and Material Payment Bond, Bid Bond, Insurance Certificates and Endorsements

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

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DRAFT

AIA® Document A232™ – 2009

General Conditions of the Contract for Construction,
Construction Manager as Adviser Edition

for the following PROJECT:
(Name, and location or address)

Project #211120 – Reconstruction of Taxiway B (north of Taxiway C).

THE CONSTRUCTION MANAGER:
(Name, legal status and address)

Parsons Transportation Group, Inc. ("Parsons" or "Construction Manager")
5540 Centerview Drive, Suite 217
Raleigh, NC 27606

THE OWNER:
(Name, legal status and address)

Raleigh-Durham Airport Authority (the "Authority" or "Owner")
1000 Trade Drive
PO Box 80001
RDU Airport, NC 27623

THE ARCHITECT:
(Name, legal status and address)

W.K. Dickson & Co., Inc. ("Architect")
700 Corporate Center Drive
Raleigh, NC 27607

The Authority has retained an Architect and/or Engineer as appropriate to serve as the lead design professional for the Project. The term "Architect" as used in these General Conditions shall refer to the design professional specified above, regardless of whether this design professional is licensed as an Architect, Engineer, or other type of design professional.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2009, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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TABLE OF ARTICLES

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(Topics and numbers in bold are section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents.

The Contract Documents are enumerated in the Agreement between the Owner and the Contractor (hereinafter the Agreement), and consist of the Agreement, Conditions of the Contract (General, Special, Supplemental, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, Notice to Bidders, Instructions to Bidders, Proposal (insofar as it conforms to the requirements of the other Contract Documents), Performance Bond, Labor and Material Payment Bond, Bid Bond, Insurance Certificates and Endorsements, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect and approved by the Owner. The intent of the Contract Documents is to include all labor, materials, equipment, and other items necessary for the proper execution of the Work. References to AIA Document A132–2017 or other form documents herein are meant to refer to such documents as revised by the parties for the purposes of this Agreement.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction ("the Contract"). The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. Except as set forth in Articles 5.3 and 5.4, the Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work.

The term "Work" means the 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. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project.

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors, including persons or entities under separate contracts not administered by the Construction Manager.

§ 1.1.5 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. The terms "knowledge," "knowing," "recognize," and "discover," their respective derivatives, and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize), and discovers (or should discover) in exercising the care, skill, and diligence which is normally expected of contractors working on similar projects under similar circumstances and conditions. The expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor familiar with the Project and exercising the care, skill, and diligence which is normally expected of contractors working on similar projects under similar circumstances and conditions.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, and (2) the titles of numbered articles.

§ 1.4 Interpretation

§ 1.4.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.4.2 Order of Interpretation: In interpreting the Contract Documents and resolving any conflicts, errors, or discrepancies, the documents shall be given preference in the following order:

.1 Agreement, with priority given to the most recent Addenda and/or Modifications.
.2 Special Conditions.
.3 General Conditions.
.4 Specifications (detailed specifications shall prevail over general specifications).
.5 Drawings (figure dimensions on drawings shall govern over scale dimensions, and detailed drawings shall govern over general drawings.
.6 Other Contract Documents.
.7 NOTWITHSTANDING THE FOREGOING, THE SUPPLEMENTAL GENERAL CONDITIONS SHALL HAVE FIRST PRIORITY WHEN IN CONFLICT WITH ANY OTHER DOCUMENT.

§ 1.4.3 Miscellaneous items, accessories, and work which are not specifically mentioned, but which are essential to produce complete and properly operating installation, or usable structure, or facility, providing the indicated function, shall be furnished and installed without change in the Contract Sum. Such miscellaneous items and accessories shall be of the same quality standards, including materials, style, finish, strength, class, weight, and other applicable characteristics, as may be specified for the major component of which the miscellaneous item or accessory is an essential part, and shall be approved by the Owner for installation. This requirement is not intended to include major components not covered by or inferable from the Drawings and Specifications.

§ 1.4.4 Standard specifications and manufacturers' manuals, instructions and other literature, when referenced, shall be the latest revision or printing unless otherwise stated, and are intended to establish the minimum requirements acceptable.

§ 1.4.5 Brand names, when used in the specifications, are intended to denote the standards or quality required for the particular material or product. The terms "equal" or "equivalent," when used in connection with brand names, shall be interpreted to mean a material or product that is similar and equal in type, quality, size, capacity, composition, finish, color, and other applicable characteristics to the material or products specified by trade name, and that it is suitable for the same use, capable of performing the same function, in the opinion of the Owner, as the material or product so specified. Proposed equivalent items must be approved by the Owner before the Contractor receives bids from Subcontractors in accordance with the Special Conditions. For materials specified without the use of brand names, the Contractor and/or Subcontractors may submit to the Owner for approval any product that meets the express requirements of the Specifications or Special Conditions. The Owner shall be the sole judge as to the acceptability of any other equipment or material. The burden of proof of quality rests with the Contractor.

§ 1.5 Ownership and Use of Drawings, Specifications and Other Instruments of Service

§ 1.5.1 Instruments of Service, including the Drawings and Specifications, are the materials through which the Work to be executed by the Contractor is described. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall be returned or suitably accounted for to the Owner on request, at the completion of Work. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.5.3 Regardless of whether clearly marked by Owner as confidential, or as "Sensitive Security Information" as that term is defined in 49 C.F.R. § 1520, all of Owner's information shall be maintained in the strictest confidence by the Contractor. Such information is not to be used for any purpose other than the performance of the Work on the Project and shall not be disseminated to anyone not executing a portion of the Work. The Contractor shall not communicate or disclose at any time to any person or entity any information in connection with the Work or the Project, except (i) with the prior written consent of the Owner, (ii) information that was in the public domain prior to the date of the Agreement, (iii) information that becomes part of the public domain not due to any unauthorized act or omission of the Contractor, or (iv) as may be required to perform the Work or by any applicable law. The Contractor shall cause all Subcontractors or any other person or entity performing any services, or furnishing any materials or equipment, for the Work to comply with all items set forth in this Section, and the obligations of the Contractor contained in this Section shall survive the complete performance of the Work or earlier termination of the Agreement.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered by personal delivery, nationally recognized overnight courier, certified mail, regular U.S. mail, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties may agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties may use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model by Contractor or Subcontractors without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data

Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's risk and without liability to the Owner.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Article 4, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.2 Information and Services Required of the Owner

§ 2.2.1.1 The Owner has retained or shall retain an architect or engineer, as appropriate, lawfully licensed to practice or lawfully practicing, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.2.1.2 The Owner has retained or shall retain a construction manager lawfully licensed to practice construction management or an entity lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.2.2 Upon receipt of a written request from the Contractor, the Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness.

§ 2.2.3 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. Contractor shall not be entitled to a change in the Contract Sum or Contract Time for such work stoppages caused or necessitated, in whole or in part, by Contractor.

§ 2.4 Owner's Right to Carry Out the Work

If the Contractor fails to fully, timely or properly carry out the Work in accordance with the Contract Documents and fails within a seven (7) day period (or such shorter period as required if the Owner determines that a seven-day period would cause undue scope, financial, or other burden for the Owner or the traveling public, or if the Work required to be carried out presents immediate hazard or risk if not completed earlier than seven days) after receipt of notice from the Owner to commence and continue correction of such deficiency with diligence and promptness to Owner's satisfaction, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiency by whatever means the Owner deems, in its discretion, necessary. The Architect and/or Owner may, pursuant to Section 9.5.1, apply a deduction to, withhold or nullify a Certificate for Payment, in whole or in part, to the extent necessary to reimburse the Owner for the cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their consultants' additional services made necessary by such default, neglect, or failure by Contractor. If current and future payments are not sufficient to cover such amounts due Owner, then the Contractor shall immediately pay the difference to the Owner upon written demand.

§ 2.5 At all times prior to the completion of the Work, the Owner, the Architect, the Construction Manager, and their employees and agents shall have the right to have full access to the Work Site. This right shall include, without limitation, making inspections of the Work, stationing a person or entity employed by Owner at the Work site, showing the Work to prospective concessionaires, tenants, and other interested persons, and performing any Work undertaken by the Owner or other contractors of the Owner. Such access to and use of the Site shall not constitute acceptance of the Work or any part thereof, or waive any of Owner's rights under the Contract Documents.

§ 2.6 Owner shall not be responsible for and will not have control of or charge over construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and Owner will not be responsible for Contractor's failure to carry out the Work in accordance with the Contract Documents and applicable laws, rules and regulations. Owner shall not be responsible for or have control or charge over the acts or omissions of Contractor, Subcontractors, or any of their agents or employees, or any other person performing the Work.

§ 2.7 The Owner, the Construction Manager, and the Architect shall have the authority to reject Work which does not conform to the Contract Documents. Whenever, in the opinion of the Owner, the Construction Manager, or the Architect it is considered necessary or advisable for implementation of the intent of their Contract Documents, Owner, the Construction Manager, and the Architect shall have the authority to require special inspection or testing of the Work in accordance with Section 13.4. However, neither the authority of the Owner, the Construction Manager, and the Architect to act under this Paragraph, nor any decision made by the Owner, the Construction Manager, or the Architect either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Owner, the Construction Manager, or the Architect to the Contractor or its Subcontractors, or any other person performing any of the Work.

§ 2.8 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner granted in the Contract Documents, at law or in equity.

§ 2.9 Independent Contractor

(a) In the performance of this Agreement, it is agreed by and between the parties hereto that the Contractor shall be acting as an independent contractor and not as an employee of the Owner. Contractor shall have no authority (and shall not hold itself out as having authority) to bind the Owner and shall not make any agreements or representations on the Owner's behalf without the Owner's prior written consent.

(b) The Contractor shall be solely responsible for, and have control over the means, methods, techniques, sequences or procedures for the Work and services to be performed and for coordinating all portions of the Work and services unless the Owner gives specific instructions concerning these matters. The Contractor is solely responsible for all hiring and management responsibilities for its agents, employees and independent contractors, including but not limited to recruiting, interviewing, selecting, setting the terms and conditions of employment, disciplining and terminating. The Contractor shall enforce strict discipline and good order among its agents, employees and independent contractors, and shall ensure their compliance with all applicable work rules. Neither the Contractor's agents, employees or independent contractors, nor its Subcontractors and/or their agents, employees or independent contractors shall, by reason of their assignment to assist in the Work or services to be performed by the Contractor, become or be deemed to be employees, agents, or independent contractors of the Owner. The Contractor shall at all times have the right to perform work for other individuals and/or entities as long as it fulfills its obligations to the Owner under the terms of this Agreement, and as long as such Services do not conflict with its obligations under this Agreement or create a conflict of interest with the Owner.

(c) The Contractor acknowledges and agrees that it is exclusively responsible and liable for withholding, reporting and forwarding to the appropriate authority all applicable withholdings and payments required by law with respect to any compensation received by its agents, employees or independent contractors, including but not limited to applicable state and federal income taxes, state and federal unemployment taxes, FICA, workers compensation, and any other taxes measured upon the payroll of, or required to be withheld from, its employees, agents or independent contractors, and the Contractor shall indemnify the Owner and its officers, directors, agents and employees and defend and hold them harmless from and against all claims, damages and losses relating to any obligation imposed by law to pay or withhold any such amounts in connection with compensation received by the Contractor or its employees, agents or independent contractors pursuant to this Agreement.

(d) None of the Contractor's agents, employees or independent contractors shall be eligible for or entitled to participate in any of the Owner's employee benefit plans, programs, policies or practices which may now or in the future be in effect, including, without limitation, any pension, retirement, or 401(k) plan; any profit sharing, stock option, bonus or incentive compensation plan; workers compensation benefits; any life or health insurance plan; any vacation or holiday pay plan; or any separation payment plan. The Contractor shall defend, indemnify, and hold harmless the Owner and its officers, directors, agents and employees from and against any and all claims, damages, losses, penalties, fines, costs and expenses, including attorneys' fees, arising out of or resulting from any claim, proceeding or decision claiming that an agent, employee or independent contractor of the Contractor is eligible for or entitled to any such employee benefit or compensation or payment from the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor acknowledges that its representations concerning its previous experience performing projects of similar scope, complexity, pricing and schedule form part of the consideration for this Agreement and are representations upon which the Owner has relied. The Contractor shall be lawfully licensed and shall ensure all aspects of the Work are performed by authorized and lawfully licensed parties, in full compliance with the rules and regulations applicable to the Project and the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or the Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 The Contract Documents shall be signed by the Owner and Contractor. Execution of the Contract Documents by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. The Contractor shall evaluate and satisfy itself as to the conditions and limitations under which the Work is to be performed, including, without limitation: (1) the location, condition, layout, nature of the Project site and surrounding areas; (2) generally prevailing climatic conditions; (3) anticipated labor supply and cost; (4) availability and cost of materials, tools, and necessary equipment; (5) availability of transportation to and from the Project; (6) availability of facilities for disposal, handling, and storage of materials; (7) availability of water and electrical power; and (8) status of water table, subsurface rock and other ground conditions, or any other physical conditions of the site which might conceivably affect the performance of the work. **The Contractor specifically acknowledges that it has investigated to its complete satisfaction the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered, and the Contractor assumes all risks regarding same.**

§ 3.2.1.1 Prior to commencement of the Work, the Contractor shall make itself and its Subcontractors familiar with all federal, state and local laws, ordinances and regulations which may in any manner affect the performance of the Work. If the Contractor shall discover any provision of the Contract Documents which may be contrary to or inconsistent with any such law, ordinance, or regulation, it shall immediately report such findings to the Owner's Representative in writing.

§ 3.2.1.2 The Contractor acknowledges that it has become familiar with the cable systems and facilities that are installed on the airport property. These systems include, without limitation, ASR, UHF, and VHF receivers and transmitters, and electric cables and controls relating to NAVAIDS; National Weather Service facilities; and utility services and related facilities and cables (hereinafter all of the above are collectively referred to as "facilities and cables.") Such facilities and cables must be fully protected by the Contractor during the entire Project.

All known facilities and cables will be located and marked in the field by the owners of the facility or cable for the information of the Contractor. The Contractor is solely responsible for contacting owners (i.e., utility company and others) of facilities and cables and requesting field locations of facilities and cables before any Work in the general vicinity is commenced by the Contractor. The Contractor is responsible for complying with Article 8A, Chapter 87, of the North Carolina General Statutes entitled "The Underground Utility Safety and Damage Prevention Act." To the extent that owners of facilities and cables fail to identify such facilities and cables during field location requested by the Contractor, and the Contractor has complied with the Act, the Contractor shall not be liable for damage caused to such unidentified facilities and cables caused during normal and reasonable construction activities. Therefore, through the entire Project, all facilities and cables identified in accordance with this section shall be protected by the Contractor from any possible damage, including crossing with unauthorized equipment.

This Article 3.2.1.2 is intended to make perfectly clear the need for protection of all facilities and cables by the Contractor at all times. It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing facilities and cables that may be shown on the plans or encountered in the Work. Any inaccuracy or omission in such information shall not relieve the Contractor of its responsibility to locate and protect such facilities and cables from damage or unscheduled interruption of service.

If any facilities or cables are damaged by the Contractor, the Contractor shall immediately notify the Owner of the facilities or cables and shall be financially responsible for the costs for repair of such damage; directions for execution of repairs shall be determined by the owner of the facilities as to materials, workers, time of day or night for the performance of work, and method of repair.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, and shall cause its Subcontractors to, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. Notwithstanding the foregoing, the exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contractors, is not guaranteed by the Architect or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any adjustment in the Contract Sum or Contract Time.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner, the Construction Manager, and the Architect, and shall not proceed with that portion of the Work without further written instructions from the Owner and/or Architect, through the Construction Manager. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences, or procedures without acceptance of changes proposed by the Contractor, the Contractor shall not be responsible for any loss or damage arising solely from those Owner required means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors, suppliers and their respective agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors and suppliers.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are compliant with the Contract Documents and in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect through the Construction Manager in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive. Substitutions may be accepted or rejected in the sole and absolute discretion of the Owner and pursuant to the terms of the Special Conditions. The Contractor will reimburse the Owner for any fees or expenses charged by the Architect or other consultants to evaluate a proposed substitute, irrespective of whether such substitute is accepted or rejected.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees, Subcontractors and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Owner shall have the right to require the Contractor to remove any person from the job site, on a temporary or permanent basis.

§ 3.4.5 After bid and prior to contract award and execution, the Contractor shall submit to the Owner and Construction Manager, for approval, not to be unreasonably withheld, a list of the names of every Subcontractor and major equipment, material or item or component supplier or vendor, and other persons or organizations proposed to perform or supply any portion of the Work. The Owner or Construction Manager will advise the Contractor in writing of any objection to such person or entity within fifteen (15) days after the Contractor has furnished said list. Failure of the Owner or Construction Manager to reply within fifteen (15) days shall constitute notice of no objection. In the event any objection is made, the Contractor shall not contract with any such proposed person or entity.

§ 3.4.6 If any portion of the Work is to be performed by any trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage, or cost to the Owner and without recourse to the Architect, Construction Manager, or Owner, any conflict between the Contract Documents and any agreements or regulations of any kind at any time in force among members or councils that regulate or distinguish the activities that shall not be included in the work of any particular trade. In case the progress of the Work is affected by any undue delay in furnishing or installing any items, materials or equipment required under the Contract Documents because of such conflict involving any such labor agreement or regulation, the Owner may require that non-union laborers, Subcontractors or other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Contractor shall immediately evaluate

any warranty requests by Owner or Construction Manager and commence repairs within ten (10) days of Owner's or Construction Manager's written request (or such other time as reasonably required by Owner based upon the condition and circumstances), and diligently pursue completion of any required repairs. Contractor shall immediately respond to emergencies relating to the Work raised by the Owner or Construction Manager which arise during the warranty period. In the event of Contractor's failure to initiate repairs to the Work within the time required or failure to complete the repairs to the Work in not less than thirty (30) days (unless Owner agrees in writing to such additional time as may be reasonably required due to the circumstances) Owner shall have the right, but not the obligation, to engage a third party to correct such defects or deficiencies in the Work, and Owner may deduct any costs incurred by Owner from amounts due or which may become due to the Contractor. If insufficient amounts are owed to Contractor, then Contractor shall immediately reimburse Owner, upon written demand, for all costs and damages incurred by Owner arising from the correction of such Work.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4. The Contractor shall perform the Work consistent with and in such a manner so to fully preserve any and all manufacturer warranties relating to materials and equipment used on or installed in the Project and shall assign to the Owner no later than the time of final completion of the Work any and all such manufacturer warranties, not issued in the name of the Owner. Such assignment shall not relieve the Contractor of any warranty obligations, and the Contractor may retain the right to enforce directly any such manufacturer warranties.

§ 3.6 Taxes

Contractor shall be responsible for, and shall pay directly, any and all sales, consumer, use, import, privilege, payroll or similar duties or taxes that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect, related to or arising from the Work and those that are measured by net income, profit or gross receipts imposed by any government authority on Contractor due to the execution of the Contract or the performance of or payment for the Work. The Contract Sum includes all applicable foreign, federal, state and local taxes imposed on Contractor or anyone working for or on behalf of Contractor by a government authority with respect to the Work or this Contract. Contractor shall, and shall cause the Subcontractors and suppliers to, supply such information requested by Owner or Construction Manager to verify the payment of all applicable taxes. Contractor shall indemnify, defend and hold Owner harmless for all claims or liabilities arising from or related to Contractor's obligation to pay such taxes.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 The Contractor shall secure, pay for, maintain in good standing, and, as soon as practicable, furnish the Owner with copies or certificates of all permits and fees, licenses, and inspections necessary for the proper execution and completion of the Work, including, without limitation, all utility connections, building permits and other governmental approvals. All connection charges, assessments, or inspection fees as may be imposed by any municipal agency or utility company are included in the Contract Sum and are the Contractor's responsibility.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders and all other requirements of public authorities applicable to performance of the Work. It is the Contractor's responsibility to ascertain that the Work is in accordance with applicable laws, ordinances, codes, rules, and regulations.

§ 3.7.3 If the Contractor observes that any portion of the Contract Documents are at variance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall promptly notify the Owner and the Architect in writing, and necessary changes shall be accomplished by appropriate Modifications. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall be responsible for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions.

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, the Construction Manager, and the Architect before conditions are disturbed and in no event later than 7 days after first observance of the conditions. The Architect and Construction Manager will

promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, provided, however, that there shall be no adjustment of the Contract Sum for delays arising in connection with the unknown condition. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent project manager and/or superintendent, to be approved in advance by Owner and Construction Manager, and necessary assistants who shall be in attendance at the Project site during performance of the Work. The project manager and/or superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, within seven (7) days after award of the Contract, shall furnish in writing to the Owner and Architect through the Construction Manager the name and qualifications of a proposed project manager and/or superintendent. Within 14 days of receipt of the information, the Construction Manager may reply to the Contractor, stating whether the Owner, Construction Manager, or Architect (1) has reasonable objection to the proposed project manager and/or superintendent or (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed project manager and/or superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the project manager and/or superintendent without the Owner's advanced written consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction Schedules

§ 3.10.1 The Contractor, within fourteen (14) days of Contract award, shall prepare and submit for the Owner's, Construction Manager's, and Architect's review and approval a Contractor's Construction Schedule for the Work, which upon approval by Owner shall be attached hereto and incorporated herein by reference as Exhibit __. The

Construction Schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, Interim Contract Times as specified in the Special Conditions, and the date of Substantial Completion and the date of Final Completion as required by the Contract; (2) an apportionment of the Work by construction activity to ensure achievement of all Interim Contract Times and other Contract dates; and (3) the time required for completion of each portion of the Work. The Construction Schedule shall provide for the orderly progression of the Work to completion and shall not exceed any time limits under the Contract Documents. The Construction Schedule shall be reviewed and revised at appropriate intervals (at least once every calendar month) as required by the conditions of the Work and Project or as otherwise directed by the Construction Manager, Architect, or Owner. Contractor is not authorized to adjust any Interim Contract Times (as defined herein below) or the Substantial or Final Completion dates without Owner, Construction Manager, and Architect approval.

§ 3.10.1.1 The Construction Schedule shall be prepared in coordination with Contractor's major Subcontractors and suppliers and shall detail to a degree which will permit proper and complete coordination of all trades and contractors in each portion of the Work, including adequate time for start-up of equipment, testing, commissioning, reviews and necessary correction of deficiencies.

§ 3.10.1.2 The Construction Schedule shall incorporate the Interim Contract Times and completion dates and shall incorporate information solicited by Contractor and received from all vendors, Subcontractors, and other parties.

§ 3.10.2 The Contractor, within fourteen (14) days after being awarded the Contract, shall submit a submittal schedule for the Owner's, Construction Manager's, and Architect's approval. The Owner's, Construction Manager's, and Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall be coordinated with the construction schedule, require all submittals to be complete and provided to Owner, Construction Manager, and Architect no later than one hundred eighty (180) days from Contract award unless otherwise agreed in writing by Owner, and in any event in such time and manner within said period to allow the Owner, the Construction Manager, and the Architect reasonable time to review submittals and not result in any delay. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for reviewing submittals and such may be considered a default pursuant to Article 14.2.

§ 3.10.3 The form and level of detail of the Construction Schedule shall be satisfactory to the Owner, Construction Manager, and Architect. The Construction Schedule shall incorporate all Interim Contract Times and contain a clear delineation of the Project's critical path, along with all associated logic, and other interim completion dates with respect to phases that are critical in ensuring the timely and orderly completion of the Work ("Interim Contract Times"). Contractor shall perform the Work according to the Construction Schedule, including meeting the Interim Contract Times. Time is of the essence in completing the Work according to the Construction Schedule. In the event Contractor falls behind in completing the Work according to the Construction Schedule, subject to the Owner's rights set forth in Section 3.10.4, Contractor shall propose a plan to correct the delay and shall have the responsibility for accelerating the construction to correct the delay unless the Owner agrees, in writing, to a revision of the Construction Schedule. Revisions to the Construction Schedule shall not constitute an adjustment in the Contract Time unless such adjustment is specifically agreed to in writing by the Owner and authorized pursuant to Change Order.

§ 3.10.4 In the event the Owner determines that the performance of the Work, as of an Intermediate Contract Time, has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the Construction Schedule. Except as set forth in Section 8.3, the Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner. The Owner may exercise the rights furnished the Owner under or pursuant to this Section 3.10.4 as frequently as the Owner deems necessary to insure that the Contractor's performance of the Work will comply with any Interim Contract Time or completion date set forth in the Contract Documents, in Owner's sole discretion.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect, Construction Manager, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Section 4.2.7. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Construction Manager Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the Project submittal schedule approved by the Owner, Construction Manager, and Architect, or in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples and similar submittals with related documents submitted by any Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner, the Construction Manager, and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed and experienced design professional who meets the reasonable requirements of the Owner with respect to qualifications and insurance, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Construction Manager, and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the design criteria specified in the Contract Documents; provided, however, to the extent the Contractor knows, or should know, of any defect or deficiency in any design criteria, Contractor shall remain obligated to report such defect or deficiency to the Owner, the Construction Manager, and the Architect.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall comply with all Special Conditions and other requirements in the Contract Documents related to access and use of the Project site and operations of the airport, and shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, the Contract Documents or as otherwise directed and authorized by the Architect or Owner and shall not unreasonably encumber the site with materials or equipment. Prior to commencing the Work, Contractor shall submit its proposed site layout plan to and for the approval of Owner, Construction Manager, and Architect. Contractor shall not materially deviate from the approved site layout plan without written notice to and approval from Construction Manager. As part of Contractor's site layout plan, Contractor shall provide for Owner and Construction Manager approval of its proposed Project-site construction office location and area for equipment and material laydown and storage.

Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor, and the Contractor shall comply with the Owner's requirements regarding such storage. After equipment is no longer required for the Work, it shall be removed from the Project site. Protection of construction materials and equipment stored on the Project site from weather, theft, damage or other casualty is the sole responsibility of Contractor, including, without limitation the responsibility for deductibles associated with risk coverages held by the Owner for losses due to Contractor's failure to maintain such protection.

The Contractor shall maintain reasonable and safe pedestrian and vehicle access to the Project site. The Contractor shall keep public areas and other lands adjacent to the site free from all debris, building materials, and any equipment. The Contractor shall not to disrupt or interfere with the uses or operations of properties adjacent to or near the Project site.

Except as otherwise provided in the Contract Documents, the Project site shall be accessible Monday through Friday, except designated public holidays, during the hours approved by Owner, Construction Manager, or Architect.

Neither the Contractor nor any party for whom the Contractor is responsible shall erect any sign on the Project site without the prior written consent of Owner, which may be withheld in the sole discretion of Owner.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 At all times during the performance of Work, the Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project or the surrounding area.

§ 3.15.2 If the Contractor fails to clean up or to maintain the premises and surrounding area as provided in the Contract Documents, the Owner (or the Construction Manager with Owner's approval) may do so as it deems most appropriate in its sole discretion. Owner may deduct all costs for such clean-up from amounts presently due or which may become due to Contractor or Contractor shall reimburse the Owner for the costs of such clean-up immediately upon receipt of Owner's demand for such costs.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect, and any other third-parties as the Owner may direct, with access to the Work in preparation and progress wherever located. Such access shall include Owner's, Construction Manager's, and Architect's right to visit offsite locations where portions of the Work are being fabricated, manufactured, or stored.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify, defend, and hold harmless the Owner, Construction Manager, Architect, Construction Manager and Architect's consultants, and the directors, officers, agents, and employees of any of them (collectively, the "Indemnitees") from and against claims, bond claims, damages, losses, fines, penalties, liens and expenses, including but not limited to attorneys' fees, to the extent arising out of or resulting from the following:

(i) performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable

(ii) infringement of any third-party intellectual property by Contractor,

(iii) any breach by Contractor of its obligations under this Agreement;

(iv) claims against Owner or Construction Manager from Contractor's personnel with respect to Contractor's obligation for the payment of wages or other compensation, insurance coverage, taxes or expenses as provided hereunder; or

(v) Contractor's negligence or willful misconduct or that of its employees, Subcontractors, suppliers, consultants, representatives, or agents, except to the extent of the Indemnitees' negligence.

Such indemnity obligations exist regardless of whether or not such claim, damage, loss, fine, penalty, lien or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18. This Article is intended to fully comply with North Carolina General Statutes Section 22B-1 and any applicable federal regulations and should be interpreted consistently and in conformity therewith.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.18.3 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless all of the Indemnitees from and against any costs and expenses (including reasonable attorneys' fees) incurred by any of the Indemnitees in enforcing any of the Contractor's defense, indemnity, and hold-harmless obligations under the Contract.

§ 3.18.4 All indemnity provisions in the Contract Documents should be interpreted to comply with applicable law. No indemnity obligation herein is intended to extend beyond the limits of permissible indemnities under that applicable law.

§ 3.19 Other Contractor Obligations

§3.19.1 The Contractor will provide competent, suitably qualified personnel, equipment and supplies to survey and lay out the Work, to be supervised by a North Carolina Land Surveyor. If applicable and required by the Contract Documents, the Contractor will be provided horizontal and vertical control points by the Owner, Construction Manager, or Architect, which control points shall be validated and confirmed by Contractor when Owner specifies such. The Contractor must furnish all additional stakes and materials for layout and construction of the Work.

§3.19.2 The Contractor will furnish all materials (other than Owner-furnished materials, if any), equipment, labor, transportation, construction, equipment, machinery, tools, appliances, fuel, light, heat, and all other facilities and incidentals necessary for the execution, maintenance, initial operation, and completion of the Work.

§3.19.3 If any materials or equipment are to be furnished by the Owner under terms of the Contract Documents, such materials or equipment shall be made available to the Contractor at the location specified in the Contract Documents. All costs of handling, transportation from the specified location to the job site, job site storage, and installation of Owner-furnished materials and equipment shall be included in the Contract Sum. The Contractor shall be responsible for demurrage, damage, loss, or other deficiencies which may occur during the Contractor's handling, storage, or use of such Owner-furnished materials or equipment.

§3.19.4 The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, or a utility service of another governmental agency at any time during the progress of the Work. The Contractor shall not permit any person or entity to excavate or otherwise disturb such utility services and facilities located within the limits of the Work without the written permission of the Owner. Should the owner of any public or private utility service, or a utility service of another governmental agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the Work, the Contractor shall cooperate with such owners by arranging the Work in this Contract so as to facilitate such construction, reconstruction, or maintenance by others.

§3.19.5 Contractor shall comply with all legal load restrictions in the hauling of materials on public and private roads in connection with performing the Work. Contractor shall be responsible for all damage done by its hauling equipment and shall correct such damage at its own expense.

§3.19.6 Testing of materials may be required in the Contract Documents. Any Work in which untested materials are used without the written approval of the Owner shall be performed at the Contractor's sole risk and expense. Any such Work found to be unacceptable or unauthorized will not be paid for and, if directed by the Owner, shall be

removed at the Contractor's expense. Unless otherwise designated, tests in accordance with the cited standard methods of ASTM which are current on the date of advertisement for bids will be made by and at the expense of Owner; provided, however, in the event that after such initial testing, any Work is not accepted by the Owner, the cost of retesting such Work and the cost of all further inspection services shall be paid by the Contractor. All materials being used are subject to inspection, tests, or rejection, at any time up to final completion of the Work. Copies of all tests will be furnished to the Contractor upon its written request. Any such tests performed by the Owner to determine compliance with the Work shall neither be a substitute for nor replacement of the requirement of the Contractor to conform its Work to the Contract Documents.

§3.19.7 When the Contract Documents require the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the Contract Documents, including plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall furnish, erect and maintain barricades, warning signs, flagmen, and other traffic control devices in reasonable conformity with the manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office), and in accordance with all North Carolina Department of Transportation requirements, unless otherwise specified herein. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

The Contractor shall make its own estimate of all labor, materials, equipment, and incidentals necessary for providing the maintenance of vehicular traffic as specified in this subsection.

§3.19.8 Barricades, Warning Signs, and Hazard Markings.
The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the Work prior to commencing work which requires such erection and shall maintain the barricades, warning signs, and markings for hazards in accordance with the Special Conditions until their dismantling is directed by the Owner or the Architect. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices for Street and Highways (published by the United States Government Printing Office), and in accordance with the Special Conditions and all North Carolina Department of Transportation requirements, unless otherwise specified herein.

§3.20 Contractor shall comply with all other Obligations set forth in the Special Conditions and other Contract Documents. To the extent of any alleged conflict, discrepancies, or inconsistency in application of provisions of this AIA Document A232-2009 or the AIA Document A132-2009 as applicable (each as modified herein by the parties), such provisions shall be interpreted in a manner to be complementary when plausible, consistent with the order of precedence set forth in Section 1.4.2 of these General Conditions, and the more specific and stringent provision and requirement(s) shall apply to the Contractor.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 As used in these Contract Documents, the terms "Construction Manager" and "Architect" or "Engineer" shall refer to the firms so designated in the Agreement or said firms' respective authorized representatives.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction. The Construction Manager's and Architect's administrative duties during construction, as defined in the Contract Documents, continue through the date the of the issuance of the final Certificate of Payment, and during the period for correction of Work described in

Section 12.2. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Construction Manager, except to the extent required by Section 4.2.3.2, and the Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report in writing to the Owner and Construction Manager any (1) known deviations from the Contract Documents, (2) known deviations from the most recent approved Project schedule, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.3.1 The Construction Manager will provide a staffing plan to include one or more representatives who will be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner reasonably informed of the progress of the Work, and will report to the Owner and Architect (1) known deviations from the Contract Documents and the most recent Project schedule, and (2) defects and deficiencies observed in the Work.

§ 4.2.3.2 The Construction Manager will schedule and coordinate the activities of the Contractor and any Separate Contractors in accordance with the latest approved Project Schedule.

§ 4.2.4 Communications

The Owner and Contractor shall endeavor communicate with each other through the Construction Manager, and to contemporaneously provide the same communications to the Architect to the extent such communications are material to the Architect's services or professional responsibilities. Communications by and with Subcontractors and suppliers typically shall be through the Contractor. Communications by and with Separate Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect if the communications arise out of or relate to the Contract Documents. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's and Construction Manager's evaluations of the Contractor's Applications for Payment, the Architect and Construction Manager will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect and the Construction Manager have authority to reject Work that does not conform to the Contract Documents and will notify each other about any such rejection. The Construction Manager will determine in general whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor, and Architect of defects and deficiencies in the Work. Whenever the Architect or Construction Manager considers it necessary or advisable, and the Owner approves, the Architect or Construction Manager will have authority to require inspection or testing of the Work in accordance with Section 13.4, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.12 through 4.2.14 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority under this Section 4.2.8 nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7.1 The Construction Manager will receive, and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. The Construction Manager shall transmit to the Owner and the Architect those submittals that are recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the approved Project submittal schedule, or in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.7.2 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the approved submittal schedule or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completion of its review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.7.3 Review of the Contractor's submittals by the Construction Manager and the Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager's and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12 and the Contract Documents. The Construction Manager's and Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Construction Manager and Architect, of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. This provision shall not be construed to relieve Architect of any of its contractual or other obligations to the Owner.

§ 4.2.8 The Construction Manager will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work.

§ 4.2.8.1 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7 and the Architect will have authority to order minor changes in the Work as provided in Section 7.4.

§ 4.2.8.2 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Show Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.9 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion and will recommend said dates for approval by Owner; will issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and will receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment upon Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner or Construction Manager shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning whether performance by the Contractor meets the technical, architectural and engineering requirements of the Contract Documents on written request of either the Construction Manager, Owner, or Contractor. The Architect's response to such requests will be made in writing through the Construction Manager within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect pursuant to Section 4.2.11 will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Construction Manager will receive and review requests for information from the Contractor, and will forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review requests for information about the Contract Documents and will respond in writing to the Construction Manager. The Construction Manager's recommendation and the Architect's response to such requests will be made in writing within ten (10) days of submission, or any time limits agreed upon or otherwise with reasonable promptness so as to avoid delay to the construction of the Project. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

§ 4.2.15 Visits to the site by the Construction Manager, Architect, or Owner shall not be construed to create an obligation on the part of the Owner to make on-site inspections to check the quality or quantity of the Work.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Construction Manager for review by the Owner, Construction Manager and Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager, or the Architect has reasonable objection to any such proposed person or entity or, (2) that the Construction Manager, Architect, or Owner requires additional time for review. Failure of the Construction Manager, Owner, or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor without written consent of the Owner. All subcontracts issued by Contractor shall conform to the requirements of the Contract Documents. Upon request, the Contractor shall deliver to the Owner or Construction Manager copies of any or all subcontracts after execution thereof.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of the Contract Documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Each subcontract shall specifically provide that the Owner shall be responsible for only those obligations of the Contractor that arose subsequent to the Owner's exercise of any rights under this conditional assignment.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements, if any. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces and/or with Separate Contractors, which include persons or entities under separate contracts not administered by Construction Manager.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner–Contractor Agreement.

§ 6.1.3 The Contractor, in conjunction with the Construction Manager, shall provide the coordination of any Separate Contractors retained by the Owner as identified in the Special Conditions and otherwise in the Contract Documents. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement among the Owner, the Construction Manager, the Contractor, and any Separate Contractors. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, the Construction Manager, and the Owner until subsequently revised.

§ 6.1.3.1 Contractor shall cooperate fully with Owner, Architect and Separate Contractors to provide and maintain safe and open access to the Project site. If at any time Contractor believes its performance of the Work is hindered

by Owner, Separate Contractors or others working on the Project, if any, and that such hindrance will impact Contractor's ability to perform the Work or maintain the Construction Schedule, Contractor must notify Owner in writing within three (3) business days of such events. Failure to do so will result in Contractor accepting such conditions and waiving any right to claim an adjustment of the Contract Sum or Contract Time.

§ 6.1.5 The Contractor accepts assignment of, and liability for, all purchase orders and other agreements for procurement of materials and equipment that are identified as part of the Contract Documents. The Contractor shall be responsible for such pre-ordered and/or pre-purchased items, if any, as if the Contractor were the original purchaser. The Contract Sum includes, without limitation, all costs and expenses in connection with delivery, storage, insurance, installation, and testing of items covered in any assigned purchase orders or agreements. All warranty and correction of the Work obligations under the Contract Documents shall also apply to any pre-purchased items, unless the Contract Documents specifically provide otherwise.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and any Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and Architect any apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to so report shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor; a Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.1.4 The Owner or Construction Manager may request or order pricing for changes in the Work by giving the Contractor a Change Order Request. The Contractor shall, as soon as reasonably possible, but not later than fourteen (14) days following receipt of a Change Order Request, furnish to the Owner, Construction Manager, and Architect a statement setting forth in detail, with a suitable breakdown by trades and work classifications, the requested changes, if any, in the Contract Sum and Contract Time attributable to the changes set forth in such

Change Order Request. If the Owner, in consultation with the Construction Manager and Architect, approves of such changes in pricing and time, a Change Order shall be executed and the Contract Sum and Contract Time shall be adjusted as set forth therein. Agreement on any Change Order shall constitute a final settlement on all items covered therein, subject to performance thereof and payment therefor pursuant to the terms of the Contract Documents. If the Owner and Contractor fail to agree on the price and/or time for a Change Order in response to a Change Order Request, the Owner may, in its sole discretion, issue or authorize the Construction Manager to issue a Construction Change Directive pursuant to Section 7.3. Under such circumstances, the Contractor may object to the method of determining any adjustment to Contract Sum and/or Contract Time in such Construction Change Directive in accordance with the provisions of Section 7.3.5. If, thereafter, the parties cannot agree on a method of determining adjustments to Contract Sum and/or Contract Time for the changes in the Work set forth in the Construction Change Directive, the method of adjustment of Contract Sum and/or Contract Time will be as set forth in Section 7.3.

§ 7.1.5 No change in the Work by way of alteration or addition, shall be the basis for an addition to the Contract Sum or a change in the Contract Time unless and until such alteration or addition has been authorized by a written Change Order or a Construction Change Directive executed and issued in accordance with and in strict compliance with the requirements of the Contract Documents. This requirement is of the essence of the Contract Documents. Accordingly, no course of conduct or dealing between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is any such unjust enrichment, shall be the basis for any claim to an increase in the Contract Sum or a change in the Contract Time, or that the Contractor is entitled to additional compensation due to an alleged cardinal change.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work which is the subject of the Change Order, including, but not limited to, all actual costs (as defined and limited in Subparagraphs 7.3.4.1 through 7.3.4.4) associated with such change and any and all adjustments to the Contract Sum and the Contract Time, subject to performance of the changed Work and payment therefor. In the event a Change Order increases the Contract Sum, Contractor shall include the Work covered by such Change Orders in Applications for Payment as if such Work were originally part of the Contract Documents. Except for Change Order Work which is priced per unit prices stated in the Contract Documents or unit prices subsequently agreed upon, all Change Order Work shall be performed by the Contractor and billed to Owner at Contractor's actual cost. On Change Order Work that is performed by Subcontractors, the Subcontractor may charge a markup (which includes all Subcontractors' overhead and profits) of no more than 10% of its actual cost, and the Contractor may charge the Owner an additional fee (which includes all Contractor's overhead and profit) of no more than 5% of the Subcontractor's actual cost for such work. On Change Order Work that is self-performed by the Contractor, the Contractor may charge a markup (which includes all Contractor's overhead and profit) of no more than 15% of its actual cost. In addition to credit for the actual cost of all Work deleted by Change Order, Owner shall be entitled to credit for all Subcontractor and Contractor markups (including all overhead and profit) for the actual cost of the Work deleted by Change Order.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the method and adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data, and a statement setting forth in detail, with suitable breakdown by trade and work classifications, the changes to the Contract Sum and/or Contract Time it contends result from the Construction Change Directive. Unless otherwise provided in the Contract Documents, actual costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others; and

.4 Costs of premiums for any bonds and insurance, permit fees, and sales, use, or similar taxes, directly attributable to the change.

Costs under Section 7.3.4 shall not exceed the reasonable costs for such items which are available for other projects of similar nature, scope and location as the Project.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager and Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change. Also, if changes in the Work reduce the Cost of the Work, the amount of the Contractor's Fee and the Contract Sum will be calculated based on such reduced Cost of the Work.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for amounts not in dispute for changes to the Work completed under the Construction Change Directive in Applications for Payment. For any portion of the cost of a Construction Change Directive that remains in dispute, the Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those disputed costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified for the disputed costs. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect, with Owner's approval, may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect, Construction Manager, and Owner and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect and Owner that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

§ 7.5 Overhead and Profit Rates

§7.5.1 Overtime, when specifically authorized by the Owner as to any change work, shall be paid for by the Owner on the basis of a premium rate schedule agreed upon in advance and in writing by the Owner and the Contractor, plus the cost of additional insurance and taxes, if any, based on the premium payment period.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work. The Contract Time will not be adjusted except as expressly provided in the Agreement.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date the Work, and each component part thereof, is deemed complete and accepted by the Owner and certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms it has closely studied all relevant job site and other conditions and confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed in performance of the Work by any act or neglect of Owner, Construction Manager, or Architect (or by employees, agents, or representatives thereof), or by changes ordered in the Work (not caused by or resulting from failure to properly perform the Work in accordance with the Contract Documents on the part of Contractor), or if Contractor is delayed by separate contractors, or by fire, unavoidable casualty, Acts of God, or national emergency, the Contractor may request an extension of the Contract Time for a period equal to the length of such delay. If the Contractor wishes to make a claim for an increase in the Contract Time, written notice of intent to make such Claim, fully describing the event giving rise to delay, shall be provided to the Construction Manager and Owner within three (3) days after the commencement of any delay, or else any Claim thereupon shall be deemed **waived**. In the case of a delay lasting less than ten (10) days, it shall be the duty of the Contractor to submit a Claim for additional time along with a CPM analysis (as defined in the Special Conditions) justifying such Claim, within twenty-one (21) days after the date of written notice to the Owner and Construction Manager, or else such Claim

shall be deemed **waived** by the Contractor. If the delay shall continue for ten (10) days or longer, it shall be the duty of the Contractor to submit a revised Claim to the Owner and Construction Manager within every thirty (30) day period following the date of the initial Claim, with each revised Claim accompanied by an updated CPM analysis supporting the requested time extension. If Contractor shall fail to timely provide such updated Claim and CPM analysis, any ongoing Claim shall be deemed **waived**. The Owner will consult with the Construction Manager and Architect and shall make a final decision on the Claim within fifteen (15) days following receipt of all information required by this paragraph and/or requested by the Owner or Construction Manager.

8.3.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time. No such Claim shall be granted unless the number of days lost due to adverse weather conditions exceeds the number of planned "lost" days, as specified in the Special Conditions. Any extension of Contract Time due to adverse weather conditions, strikes, acts of God, or acts of public enemies shall be non-compensable. Such extensions of the Contract Time will only serve to allow extended performance of the Work and to relieve the Contractor from imposition of liquidated damages during the time extension period, and no damages, costs, or other compensation or reimbursement will be recoverable in connection with any such delays.

§ 8.3.3 If the Contractor is delayed in performing activities on the critical path as identified on the Project Schedule through no fault of its own or a party for which it is responsible, Contractor shall have the right to recover his actual and reasonable costs incurred by reason of such delay. If the Contractor wishes to make a claim for an increase in the Contract Sum resulting from such delay, written notice of intent to make such Claim, fully describing the event giving rise to delay, shall be made to the Owner and Construction Manager within three (3) days after the commencement of any delay, or else any Claim thereupon shall be deemed **waived**. In the case of a delay lasting less than ten (10) days, it shall be the duty of the Contractor to submit a Claim, for additional compensation along with a CPM analysis and supporting documents justifying such Claim, within twenty-one (21) days after the date of written notice to the Owner and Construction Manager, or else such Claim shall be deemed **waived** by the Contractor. If the delay shall continue for ten (10) days or longer, it shall be the duty of the Contractor to submit a revised Claim to the Owner and Construction Manager within every thirty (30) day period following the date of the initial Claim, with each revised Claim accompanied by an updated CPM analysis and supporting documents justifying additional compensation. If Contractor shall fail to timely provide such updated Claim, CPM analysis and supporting documents, any ongoing Claim shall be deemed **waived**. The Owner shall make a final decision on the claim, in consultation with the Construction Manager and the Architect, within fifteen (15) days following receipt of all information required by this paragraph and/or requested by the Owner or Construction Manager.
Notwithstanding the foregoing, any exercise of Owner's rights under the Contract Documents to order changes in the Work, regardless of the extent or number of such changes, or Owner's exercise of any of its remedies of suspension of the Work, or requirement of correction or re-execution of any defective Work, shall not under any circumstances be construed as interference with Contractor's performance of the Work, nor shall it entitle Contractor to any claim for additional compensation beyond rights as otherwise may be provided in this Agreement.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are changed so that application of such unit prices to the actual quantities causes an increase or decrease of twenty-five percent (25%) or more to the quantities affected, then the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Within fourteen (14) consecutive days after receiving the Notice to Proceed, the Contractor shall submit a schedule of values to the Construction Manager and Owner, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form required by Construction Manager and Owner, and supported by the data to substantiate its accuracy as required by the Construction Manager and Owner and in a manner consistent with the Special Conditions and other Contract Documents. The Contractor and each Subcontractor shall prepare a trade payment breakdown for the Work for which each is responsible, such breakdown being submitted on a form approved by the Construction Manager and Owner. The form shall be divided in detail sufficient to exhibit areas, and/or sections of the Work, and/or by convenient units and shall be updated as required

by either the Owner or the Construction Manager as necessary to reflect (i) description of Work (listing labor and material separately), (ii) total value, (iii) percent of the Work completed to date. This schedule, unless objected to by the Construction Manager or Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any proposed changes by the Contractor to the schedule of values shall be submitted to the Construction Manager and Owner and supported by such data to substantiate its accuracy as the Construction Manager or Owner may require, and unless objected to by the Construction Manager and Owner, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 Not later than the fifth day of the month, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, Special Conditions and other Contract Documents for completed portions of the Work on a form approved by the Owner and Construction Manager. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager, or Architect may require, and shall reflect retainage as provided in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier (a "backcharge"), unless such Work has been performed by others whom the Contractor intends to pay. The Contractor shall maintain, and make available for the Owner's and Construction Manager's inspection, a log of all amounts for which Contractor backcharges, or intends to backcharge, each Subcontractor and material supplier as the Work proceeds, along with information sufficient to reasonably identify the reason or event giving rise to each such backcharge.

§ 9.3.1.3 Each Application for Payment shall be accompanied by at least the following, all in form and substance satisfactory to the Owner and Construction Manager: (i) Contractor's duly executed and acknowledged sworn statement listing all Subcontractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any Subcontractor and material supplier in the requested progress payment, a copy of the backcharge log (if applicable) for each such Subcontractor and material supplier, and the amount to be paid to the Contractor from such progress payment, together with similar sworn statements from all such Subcontractors and material suppliers; (ii) duly executed waivers of bond and lien claims from the Contractor and all Subcontractors and, when appropriate, from material suppliers and lower tier Sub-subcontractors; and (iii) all information and materials required to comply with the requirements of the Contract Documents or reasonably requested by the Owner, the Construction Manager, or the Architect.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, in accordance with the Special Conditions, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

The Contractor shall also comply with the following specific requirements:

.1 Upon payment, title to such materials shall be vested in the Owner, as evidenced by documentation satisfactory in form and substance to the Owner.

.2 With each Application for Payment, the Contractor shall submit to the Owner and Construction Manager a written list identifying each location where materials are stored off the Project site and the value of materials at each location. The Contractor shall procure insurance satisfactory to the Owner for materials stored off the Project site in an amount not less than the total value thereof.

.3 The consent of any surety shall be obtained to the extent required prior to payment for any materials stored off the Project site.

.4 Representatives of the Owner shall have the right to make inspections of the storage areas at any time.

.5 Contractor shall (i) protect such materials from destruction, theft, and damage to the satisfaction of the Owner, (ii) mark such materials for use on the Project, and (iii) segregate such materials from other materials at the storage facility or area.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

.1 The Contractor further expressly undertakes to defend the Owner, at the Contractor's sole expense, against any actions, lawsuits, or proceedings brought against Owner as a result of liens or bond claims filed against the Work, the site of any of the Work, the Project site and any improvements thereon, (except when the same are the result of the Owner failing to make payments due the Contractor), or any portion of the property.

.2 The Contractor agrees to bond-off or otherwise extinguish within 10 days of filing or recording any claim of lien filed against the Project or Project site. If permissible under applicable law and if such action will not subject Owner to direct personal liability, the Owner shall release any payments withheld due to a lien or claim of lien if the Contractor obtains security acceptable to the Owner or a lien bond that is (i) issued by a surety acceptable to the Owner, (ii) in form and substance satisfactory to the Owner, (iii) in an amount not less than that required by applicable law. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of any responsibilities or obligations under this Section 9.3.3, including, without limitation, the duty to defend and indemnify the Owner. The cost of any premiums incurred in connection with such bonds and security shall be the responsibility of the Contractor and shall not be part of, or cause any adjustment to, the Contract Sum. If following the ten (10) day period, any lien which has been filed of record has not been canceled and no bond has been posted to discharge the same of record, the Owner shall also have the right, at its option and in its sole discretion, to withhold an amount equal to the greater of 1.25 times the amount of the lien from any payment otherwise due to the Contractor, and/or pay or otherwise discharge the lien at the Contractor's sole expense, and all costs and damages incurred by the Owner, including reasonable attorneys' fees and disbursements, shall be paid by the Contractor to the Owner upon written demand, or offset and withheld from any amounts otherwise due or that may become due to the Contractor under the Agreement.

§ 9.4 Certificates for Payment

§ 9.4.1 The Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either issue to the Owner a Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 The Construction Manager's certification of an Application for Payment shall be based upon the Construction Manager's evaluation of the Work and the information provided as part of the Application for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information and belief, the Work has progressed to the point indicated and the quality of the Work is in accordance with the Contract Documents. The certification will also constitute a recommendation to the Architect and Owner that the Contractor be paid the amount certified.

§ 9.4.3 The Architect's issuance of a Certificate for Payment shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and information provided as part of the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the

best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated, that the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified.

§ 9.4.4 The representations made pursuant to Sections 9.4.2 and 9.4.3 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.7 The issuance of a separate Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed the Contractor's construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors, material suppliers, and vendors and other data requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.4 and 9.4.5 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.3. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** Contractor's failure to carry out the Work in accordance with the Contract Documents.
- **.8** failure of the Contractor to be working in accordance with an approved Construction Schedule.

§ 9.5.2 When Contractor disputes the Architect's or Construction Manager's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, it may submit a Claim in accordance with Article 15.

§ 9.5.3 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option but without obligation to do so, issue direct payment to any Subcontractor, supplier or vendor, or issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven (7) days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money, to a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

§ 9.7.1 If the Owner fails to make payment to the Contractor with respect to any amounts which are not in dispute between Owner and Contractor within the time periods for payment as set forth in the Contract Documents, Contractor may, upon twenty-five (25) days prior written notice to the Owner and Construction Manager, stop the Work and thereby terminate the Contract, unless within twenty-five (25) days after such prior written notice payment is made to Contractor of all undisputed amounts and Owner's good faith basis for contesting any disputed amounts is delivered to Contractor. If Contractor so terminates the Contract, Contractor's exclusive remedies will be governed by Section 14.1.3, below.

§ 9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can permanently and continuously occupy or utilize the Work for its intended use and a temporary Certificate of Occupancy (or its functional equivalent) has been issued by the appropriate governmental agencies. If the temporary Certificate of Occupancy expires or is revoked, Substantial Completion shall not be deemed to have occurred.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment (the "Punchlist"). Failure to include an item on the Punchlist does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Punchlist, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the requirements of the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work or designated portion thereof is substantially complete to the Architect's, Construction Manager's, and Owner's satisfaction, the Construction Manager will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated in the Contract Documents, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final

Contractor's Application for Payment. Upon receipt, the Construction Manager will evaluate the completion of Work of the Contractor and then forward the notice and Application, with the Construction Manager's recommendations, to the Architect (and Owner, at its option), who will promptly make such inspection. When the Architect (and Owner, at its option), finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable, including any retainage. The Construction Manager's and Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to Owner and Construction Manager, with a copy to the Architect, (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety to final payment and (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, (6) all warranties, guarantees, Record Drawings for the Project (including all those documents listed in Section 3.11) and all other required close-out documents, (7) a final Certificate of Occupancy (or its functional equivalent) has been issued by the appropriate governmental agency, (8) all Identification Badges issued by Owner to employees of the Contractor or Subcontractors have been returned, (9) all required sales tax and use tax reports have been submitted; and (10) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

9.10.2.1 The final payment due the Contractor shall not become due until the Contractor has, in addition to satisfying all other requirements of the Special Conditions and other Contract Documents, furnished to the Owner Affidavits from each Subcontractor and supplier signed, sworn, and notarized to the effect that each Subcontractor or supplier has been paid in full by the Contractor for all Work performed and/or materials supplied by him in connection with the Project and that all payments due for materials, services, and for any other reason in connection with the subcontract or supply contract have been satisfied and that no claims or liens exist against the Subcontractor or supplier in connection therewith.

In the event that the Contractor cannot obtain such affidavits from Subcontractors or suppliers, the Contractor shall state in his affidavit that no claims or liens exist against any Subcontractor or supplier to the best of Contractor's knowledge, and that if any appear afterwards, the Contractor shall indemnify and save the Owner harmless on account thereof. Owner in its sole discretion may require Contractor to provide an additional surety or other bond covering the Owner's reasonable financial or other potential bond claim liability or other exposure in the absence of said affidavits.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment.

§ 9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee in writing to the Construction Manager and Owner as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for complying with all safety-related requirements of the Special Conditions and other Contract Documents and for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of any Separate Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors;
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and
- **.4** construction or operations by the Owner or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by the Contract Documents (including the Special Conditions), applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety and security of persons or property or their protection from damage, injury, or loss. Contractor acknowledges that the Project site and airport grounds, including airfield and land side areas, is a highly controlled and regulated site requiring strict compliance with all such rules and regulations.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall give the Architect, the Construction Manager, and the Owner reasonable advance notice and shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3, and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager, or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager, and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

In addition to any other reporting requirements in the Contract Documents, if either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party as required by applicable law and within a reasonable time not exceeding ten (10) days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to, asbestos or polychlorinated biphenyl (PCB),encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner, Construction Manager and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the hazardous material or substance reported by the Contractor and, in the event such material or substance is found to be present and Owner does not elect to terminate the Contract, to cause it to be remediated and verify that it no longer poses a threat to human health or safety. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager, and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager, and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager, or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager, and the Architect have no reasonable objection. The Work in the affected area shall be resumed immediately following the occurrence of any of the following events: (i) the Owner causes remedial work to be performed that results in the absence of hazardous materials or substances; (ii) the Owner and the Contractor, by written agreement, decide to resume performance of the Work; or (iii) the Work may safely and lawfully proceed, as determined by an appropriate governmental authority or as evidenced by a written report to both the Owner and the Contractor, which is prepared by an environmental engineer reasonably satisfactory to both the Owner and the Contractor. The Contract Time and/or the Contract Sum shall be adjusted as appropriate as provided in Article 7 for any additional costs of shutdown, delay, and start-up. In no event shall the Owner have any responsibility for any substance or material that is brought to the Project site by the Contractor, any Subcontractor, any Sub-subcontractor, any material supplier or any entity for whom any of them is responsible. The Contractor agrees not to use any fill or other materials to be incorporated into the Work that are hazardous, toxic, or made up of any items that are hazardous or toxic.

§ 10.3.3 The Owner shall be responsible for any Hazardous Materials existing on the Project Site prior to the commencement of construction and shall indemnify the Contractor for any cost or expense: (1) incurred as a result of remediation of such pre-existing Hazardous Materials; or (2) attributable to bodily injury, sickness, disease, death, or damage to tangible property (other than the Work itself) resulting from exposure to such Hazardous Materials except to the extent such costs or expenses are attributable to the Contractor's fault or negligence.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances not disposed of or released on the Project by the Owner, or for such substances the Contractor brings to the site. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 Contractor shall not cause or permit any "Hazardous Materials" (as defined herein) to be brought upon, kept or used in or about the job site except to the extent such Hazardous Materials: (i) are necessary for the prosecution of the Work; (ii) are required pursuant to the Contract Documents; and (iii) have been approved in writing by Owner. Any Hazardous Materials allowed to be used on the job site shall be used, stored and disposed of in compliance with all applicable federal, state and local laws relating to such Hazardous Materials. Any unused or surplus Hazardous Materials, as well as any other Hazardous Materials which have been placed, released or discharged on the job site by Contractor or any of its Subcontractors, employees, agents, suppliers, or Sub-Subcontractors, shall be removed from the job site at the earlier of (i) the completion of the Work requiring the use of such Hazardous Materials; (ii) the completion of the Work as a whole; or (iii) within twenty-four (24) hours following Owner's or Construction Manager's demand for such removal. Such removal shall be undertaken by Contractor at its sole cost and expense, and shall be performed in accordance with all applicable laws. Any damage to the Work, the job site or any adjacent property resulting from the improper use, or any discharge or release, of Hazardous Materials shall be remedied by Contractor in accordance with all applicable laws. Contractor shall immediately notify Owner and Construction Manager of any release or discharge of any Hazardous Materials on the job. Contractor shall be responsible for ensuring that any authorized Hazardous Materials which Contractor or any of its Subcontractors or Sub-subcontractors will be using in connection with the Work shall be properly labeled, and Contractor shall be responsible for making any and all disclosures required under applicable "Community Right-to-Know" laws. Contractor shall not clean or service any tools, equipment, vehicles, materials or other items in such a manner as to cause a violation of any laws or regulations relating to Hazardous Materials. All residue and waste materials resulting from any such cleaning or servicing shall be collected and removed from the job site in accordance with all applicable laws and regulations. Contractor shall immediately notify Owner and Construction Manager of any citations, orders or warnings issued to or received by Contractor, or of which Contractor otherwise becomes aware, which relate to any Hazardous Materials on the job site. Without limiting any other indemnification provisions pursuant to laws or specified in the Contract Documents, Contractor shall indemnify, defend (at Contractor's sole cost, and with legal counsel approved by Owner) and hold the Owner harmless from and against any and all claims, demands, losses, damages, disbursements, liabilities, obligations, fines, penalties, costs and expenses in removing or remediating the effect of any Hazardous Materials on, under, from or about the job site, arising out of or relating to, directly or indirectly, Contractor's failure to comply with any of the requirements of this Section 10.3.6. As used herein, the term "Hazardous Materials" means any hazardous or toxic substances, materials and wastes listed in the United States Department of Transportation Hazardous Materials Table (49 CFR 172.101) or listed by the Environmental Protection Agency as hazardous substances (40 CRA Part 302, and any amendments thereto), and any substances, materials or wastes that are or become regulated under federal, state or local law.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Liability Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in Exhibit A (Insurance and Bonds), or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, and as acceptable to the Owner consistent with the requirements of Exhibit A (Insurance and Bonds). The Owner, Construction Manager, Architect, and the Construction Manager's and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's, Owner's, or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Construction Manager, Owner, or Architect, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered which the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager, Owner, or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall at its own expense, diligently commence repairs within seven (7) days and correct it within thirty (30) days after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4. If the Owner corrects nonconforming Work, then Owner may recover all resulting costs and damages from the Contractor immediately upon written demand.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 . Upon completion of any Work under or pursuant to this Section 12.2, the one year correction period in connection with the Work requiring correction shall be renewed and recommence. The obligations under Section 12.2 shall cover any repairs and replacement to any part of the Work or other property that is damaged by the defective Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the State of North Carolina.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, or as set forth otherwise in the Contract Documents neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

§ 13.3.3 Notwithstanding any other provisions to the contrary contained in the Contract Documents, provided that the Owner continues to make payments of amounts not in dispute in accordance with the provisions of the Contract Documents, during all disputes, actions, claims, and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, the Contractor shall carry on the Work and maintain the Construction Schedule, unless otherwise agreed between the Contractor and Owner in writing.

§ 13.3.4 Audit Rights

§ 13.3.4 The Contractor shall maintain Project records pursuant to an established accounting system that complies with generally accepted accounting principles. The Contractor's records shall be open to inspection and audit and reproduction by the Owner and Construction Manager to the extent necessary to adequately permit evaluation and verification of the Cost of the Work, and any invoices, Change Orders, Construction Change Directives, or claims submitted by the Contractor or any of its payees pursuant to the execution of the Contract and shall include but not be limited to the following: accounting records (hard copy, as well as computer readable data), subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, subcontracts, etc.); original estimates; estimating work sheets; correspondence; change order files (including documentation covering negotiated settlements); backcharge logs and supporting documentation; general ledger entries detailing cash and trade discounts earned; insurance rebates and dividends; and any other supporting evidence deemed necessary by the Owner to substantiate charges, changes or claims related to this Contract (all of the foregoing hereinafter referred to as "Contractor's Records"). Contractor's records described above shall be maintained and made available to the Owner, Construction Manager, or Owner's Agent for not less than five (5) years after date of Final Completion. The Contractor shall require all Subcontractors, insurance agents, and material suppliers (payees) to comply with the provisions of this article by insertion of the requirements hereof in a written contract agreement between the Contractor and payee. If an audit, inspection or examination in accordance with this Article discloses overcharges of any nature by the Contractor to the Owner, then the Contractor shall pay to the Owner the amount of the overcharges disclosed by the audit inspection or examination in addition to Owner's costs associated with identifying and recovering such overcharge. The payment to the Owner by the Contractor shall be made within a reasonable amount of time (not to exceed 60 days) from presentation of the Owner's finding to the Contractor.

§ 13.3.4.1 Sales Tax and Reporting Requirements

Contractor hereby agrees that all materials to be purchased by Contractor (or any Subcontractors) in connection with the Work, and which are annexed to, affixed to or become part of the building or structures to be constructed by Contractor, shall be purchased in the State of North Carolina or else, wherever possible, purchased so that North Carolina sales and use tax and applicable local sales and use taxes shall be paid with respect to all such purchases. Contractor shall keep, maintain and provide to the Owner and Construction Manager on a monthly basis, as a part of its Application for Payment, certified statements of all materials purchased (whether by Contractor or Subcontractors) for the Project and which are annexed to, affixed to or become part of the building or structures to be constructed by Contractor including, without limitation, the date of purchase, a description of the materials purchased, invoice number, name and location (including County) of the seller, the County to which the materials

were delivered, the purchase price amount, the amount of North Carolina and/or local sales and use taxes paid, together with all receipts and all other written evidence and/or acknowledgements of payment of North Carolina sales and use taxes and local sales and use taxes (all such records described herein, together with all other records reasonably required by the Owner to be kept, maintained and provided by the Contractor, hereinafter collectively referred to as the "Tax Records"). Contractor shall keep, maintain, and provide when requested all Tax Records throughout the term of the Project and for a period of five (5) years following substantial completion of the Project. The failure to keep, maintain, and provide such Tax Records to the Owner and Construction Manager on a monthly basis or following Substantial Completion of the Project shall be a basis for withholding payment to the Contractor for the amount which the Owner may reasonably estimate to be the sales and use taxes applicable to materials purchased for the Project. The Owner or Construction Manager may supply to Contractor a standard form to be used for monthly reporting of sales and use taxes paid. The Contract Sum shall be deemed to include North Carolina sales and use taxes and local sales and use taxes for all materials specified in the Contract Documents.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses shall be at the Contractor's expense. The Contractor also agrees that the cost of testing services required for the convenience of the Contractor in the scheduling and performance of Work, and the cost of testing services related to remedial operations performed to correct deficiencies in the Work, shall be borne by the Contractor.

§ 13.4.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Federal Requirements

§ 13.5.1 General Civil Rights Provisions

The Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance. This provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

§ 13.5.2 Civil Rights – Title VI Assurance – Compliance with Nondiscrimination Requirements.
During the performance of this Contract, the Contractor, for itself, its assignees, and successors in interest (referred to collectively as "Contractor" for the purposes of this Section 13.5.1), agrees as follows:

(a) Compliance with Regulations. The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this Contract.

(b) Nondiscrimination. The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

(c) Solicitations for Subcontracts, including Procurements of Materials and Equipment. In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.

(d) Information and Reports. The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance. In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to (1) withholding payments to the Contractor under the contract until the Contractor complies; and/or (2) cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions. The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

§ 13.5.3 Other Mandatory Federal Contract Provisions
If federal funds are being used for this Project, additional mandatory federal contract provisions are set out in the Supplemental General Conditions, which are hereby referenced and incorporated herein and are included in the Contract Documents and binding on the parties.

§ 13.7 Time Limits on Claims
The Owner and the Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and the Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor
§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped; or

.3 Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than one hundred percent (100%) of the total number of days scheduled for completion, or one hundred twenty (120) days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists for the applicable period of time, the Contractor may, upon seven (7) days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed.

§ 14.1.4 If the Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill, after notice and an opportunity to cure the Owner's breach of, the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven (7) additional days' written notice to the Owner, the Construction Manager, and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 If Contractor shall fail to commence the Work in accordance with the provisions of the Contract Documents or fail to diligently prosecute the Work to completion thereof in a diligent, efficient, timely, workmanlike, skillful and careful manner and in strict accordance with the provisions of the Contract Documents (including the Contract Time), fail to use an adequate amount or quality of personnel or equipment to complete the Work without undue delay, fail to provide timely notice of cancellation of insurance or fail to provide an Insurance Report as addressed in Exhibit A attached hereto, fail to perform any of its obligations under the Contract Documents, or fail to make prompt payments to its Subcontractors, materialmen or laborers, the Owner shall have the right, if Contractor shall not cure any such default after seven (7) days written notice thereof to (i) terminate Contractor hereunder and Contractor shall not be entitled to further compensation for any Work undertaken, (ii) take possession of and use all or any part of Contractor's materials, equipment, supplies, and other property of every kind used by Contractor in the performance of the Work and to use such property in the completion of the Work, and (iii) complete the Work in any manner it deems desirable, including engaging the services of other parties therefor. Any such act by Owner shall not be deemed a waiver of any other right or remedy of Owner. If after exercising any such remedy the cost to Owner of the performance of the balance of the Work is in excess of that part of the Contract Sum (including amounts retained from Contractor) which has not theretofore been paid to Contractor hereunder, Contractor shall be liable for and shall reimburse Owner for such excess within ten (10) days of receipt of Owner's demand for reimbursement, and any other damages incurred by Owner due to Contractor's breach.

§ 14.2.2 It is recognized that if Contractor is adjudged a bankrupt, or makes a general assignment for the benefit of creditors, or if a receiver is appointed for the benefit of its creditors, or if a receiver is appointed on account of its insolvency, such could impair or frustrate Contractor's performance of this Contract. Accordingly, it is agreed that upon the occurrence of any such event, Owner shall be entitled to request Contractor or its successor in interest to provide adequate assurance of future performance in accordance with the terms and conditions hereof. Failure to comply with such request within seven (7) days of delivery of the request shall entitle Owner to terminate this Contract and to the accompanying rights set forth above in Subparagraph 14.2.1 In all events pending receipt of adequate assurance of performance and actual performance in accordance therewith, Owner shall be entitled to proceed with the Work with its own forces or with other contractors on a time and material, or other appropriate, basis the cost of which will be backcharged against the Contractor.

§ 14.2.3 Termination for Convenience: In the event Owner determines, in its sole and absolute discretion, to abandon the Project or otherwise to discontinue the Work thereon, then Owner may terminate this Contract without regard to fault or breach upon written notice to Contractor, effective immediately unless otherwise provided in said notice.

The Owner may also, at any time, terminate the Contract for the Owner's sole convenience and without cause. In the event of such termination, and concurrently with the receipt by Owner of satisfactory lien, bond claim, and claim releases from Contractor and its Subcontractors of every tier, Owner shall pay (including retainage sums) as the sole amount due to Contractor in connection with the Project that portion of the Contract Sum due for work performed to the date of termination, less any sums already received by Contractor. In no event shall Owner be responsible for Contractor's lost profits. Upon such termination of the Contract by Owner for convenience, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits. The Owner shall be credited for (i) payments previously made to the Contractor for the terminated portion of the Work, (ii) claims that the Owner has against the Contractor under the Contract, and (iii) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

§ 14.2.4 Upon a determination by a court that any termination of Contractor for cause was wrongful, Contractor's remedy for wrongful termination shall be limited to the recovery of the payments permitted set forth in Subparagraph 14.2.3.

§ 14.2.5 Upon termination of this Contract for any reason, Contractor shall:

§ 14.2.5.1 Immediately, withdraw its employees, workmen, machinery and equipment from the Project in an orderly manner, as directed by the Owner; take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;

§ 14.2.5.2 Within thirty (30) days after such termination, furnish Owner's Representative with a complete accounting showing how Contractor utilized all payments it received as part of the Contract Sum up to the date of termination together with a final status report updating the progress of the Work up to the date of termination;

§ 14.2.5.3 Within five (5) days after said termination, deliver to Owner's Representative all of those items enumerated in Subparagraph 9.10.2 above, to the extent that said items are available, all Shop Drawings, Project Data and Samples available, and all of Contractor's other engineering, procurement, accounting and construction documents and records relating to the Work performed under this Contract; and

§ 14.2.5.4 Within five (5) days after said termination, assign to Owner all Contractor's interest in any Subcontracts and purchase orders that Owner so designates in writing.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition.

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other

disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The term "Claim" does not include a claim by the Contractor that it is entitled to renegotiate the Contract Sum due to an alleged cardinal change in the Scope of Work, and the Contractor hereby waives any right it may have to make such a claim. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by written notice to the other party with a copy sent to the Construction Manager and Architect. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Architect is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Architect's decision, subject to the right of either party to proceed in accordance with this Article 15.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation or final decision from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Owner or Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, a Claim may be filed in strict accordance with this Section, Article 7 as to changes, and the Contract Documents. All Claims by Contractor shall be delivered in writing to the Owner and Architect. Each Claim shall describe in detail the basis for the Claim including specific reference to any provisions of the Contract Documents by paragraph, drawing number, and/or other specific identification and shall state the amount claimed and exactly how it is calculated. If the Contractor, at the time the Claim is made, is unable to state the amount claimed with accuracy, it shall state the estimated amount and the basis on which the estimated amount is calculated. At the earliest date possible thereafter, the Contractor shall supplement its Claim with an accurate statement of the amount claimed and exactly how it has been calculated. The Contractor shall provide in the submission of a Claim all information in support of its Claim, including all such explanations, arguments, data, receipts, timesheets, invoices, expert opinions, photographs, or any other documents or information that will be relied upon in support of its Claim. If the Contractor is unable to submit any such supporting documents or information at the time of submission of a Claim, it shall state so in its Claim and provide justification as to the absence of such information and provide a schedule for its future submission. A Claim may be properly rejected by the Owner by reason of the Contractor's failure or unwillingness to submit adequate or accurate documentation or information as noted herein, except that within seven (7) days after being given notice that the Claim has been rejected on this basis, the Contractor may provide additional documentation and information.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to the Contract Documents, except to the extent such damages are covered by applicable insurance required thereunder. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.3 Mediation

§ 15.3.1 When the Architect issues a written decision under Section 15.2, a demand for mediation must be made within thirty (30) days after the date on which the party making the demand receives the final written decision. Failure to make such demand within said thirty (30) day period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. Mediation is a precondition to further dispute resolution by the parties, and the dispute resolution procedures set forth herein below shall only be available following a Declaration of Impasse by the mediator, or else by the mutual agreement of the parties. Mediation, unless the parties mutually agree otherwise, shall be administered in accordance with the Construction Industry Arbitration Rules and Mediation Procedures of the American Arbitration Association ("AAA") in effect on the date of this Agreement. A request for mediation shall be made in writing, and delivered to the other party. The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in a mutually-agreed upon location in Wake County, North Carolina. Any agreement reached in mediation shall be memorialized in writing by the parties and shall be enforceable as a settlement agreement in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 Any dispute not resolved by mediation shall be subject to arbitration. A demand for arbitration shall be made in writing and delivered to the other party. Unless otherwise agreed by the parties, the Construction Industry Arbitration Rules and Mediation Procedures of the AAA shall apply. A demand for arbitration shall be filed within a reasonable time after the claim, dispute, or other matter in question has arisen. In no event shall the demand for arbitration be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations. At the Owner's sole option, an arbitration pursuant to this Article (and/or any claims asserted therein) may be joined with an arbitration involving common issues of law or fact between the Owner and any person or entity with whom the Owner has a contractual obligation to arbitrate disputes. Notwithstanding any other provisions of this Agreement, in any arbitration proceeding between the parties related to this Agreement, the Owner shall have the right to include, by consolidation, joinder or in any other manner, any person or entity whom the Owner believes to be substantially involved in a common question of fact or law with respect to such arbitration proceeding. The Owner, Project Manager, Construction Manager(s), Designer, Architect, Engineer, design and/or other project consultants, Contractor, Subcontractors, suppliers, and their respective bonding companies and insurers, and all other parties concerned with the Project, are bound by these dispute-resolution provisions to the greatest extent permitted by law. This provision shall be incorporated by reference into all subcontracts, supply agreements, bonds, and design contracts. All such parties consent and agree to participate and be bound in this dispute resolution process insofar as claims may be made against them. A motion to add or consolidate any other party in connection with this Project may be made by any interested party and, for good cause shown, shall be granted by the arbitrator(s). Except as otherwise agreed by Owner and Contractor, the parties shall mutually agree on a single arbitrator for all disputes in which the claimed amount is less than $500,000. Such arbitrator shall be a North Carolina licensed attorney with at least ten years of experience in construction-related legal matters, or a retired state or federal judge with construction case experience who resides in the State of North Carolina. Disputes in which the claimed amount is $500,000 or more shall be decided by a panel of three (3) experienced construction industry professionals to include: (a) one engineer or architect; (b) one North Carolina licensed attorney with at least ten years of experience in construction-related legal matters, or a retired state or federal judge with construction case experience who resides in the State of North Carolina; and (c) a senior staff representative of a public entity managing a facility or facilities. Arbitration proceedings shall be heard and resolved in Wake County, North Carolina. The party filing a notice of demand for arbitration must assert in the demand all claims, disputes or other matters in question then known to that party on which arbitration is permitted to be demanded. During mediation, arbitration, or court proceedings, the Contractor shall proceed diligently with the performance of the Scope of Services.

§ 15.4.2 All fees and expenses associated with the mediation and arbitration procedures set out above shall be borne equally by the parties. Each party shall bear its own expenses for attorneys' fees, expert fees, witness fees, and related expenses. Notwithstanding the previous sentence, if the arbitrator(s) determine(s) that either party is guilty of abusing the arbitration process, the arbitrator(s) may assess any such costs, expenses, and attorneys' fees among the parties in such manner as the arbitrator(s) deem(s) appropriate.

§ 15.4.3 The dispute-resolution procedures set forth in this Article 15 shall be the exclusive remedies available to the parties to this Agreement. The final award rendered in arbitration proceedings shall be deemed final and binding upon the parties, and judgment may be entered upon it in any court having jurisdiction.

§ 15.4.4 Any arbitration claim or counterclaim initiated after substantial completion of any Project shall include claims regarding the Project known to the claimant at the time the arbitration claim or counterclaim is made. Any claim known to the claimant at the time an arbitration claim or counterclaim is made but not included shall be deemed waived.

§ 15.4.5 Upon the written request by a party made prior to the initial evidentiary hearing in arbitration, the arbitrator(s)'s award shall be in writing and shall include findings of fact and conclusions of law which support the award.

§ 15.4.6 Either party may appeal the arbitration award to appellate arbitration by filing with the AAA within twenty (20) days after receipt of the notice of arbitration award, a written brief not to exceed twenty (20) pages, stating the reason(s) why the arbitrator(s)'s decision should be reversed or modified. The opposing party shall have twenty (20) days thereafter to file a responsive brief, which brief shall not exceed twenty (20) pages. An appellate arbitrator shall be appointed by the AAA and shall be a retired North Carolina or federal judge, residing in the State of North Carolina. Either party may request oral argument, which must be held within thirty (30) days following the submission of the final brief, unless extended by mutual agreement of the parties and the appellate arbitrator. No additional evidentiary material may be introduced in the appellate arbitration. The appellate arbitrator shall render a written decision affirming, reversing, modifying, or remanding the arbitrator(s)'s decision within thirty (30) days after oral argument or receipt of the final appellate brief, whichever shall come later. The appellate arbitrator may make his or her decision only on one of the following grounds:

.1 Any grounds specified in 9 U.S.C. Section 10 or 11;
.2 A material error of applicable law by the arbitrator(s);
.3 A determination that the award was partially or wholly arbitrary or capricious.

The appellate arbitrator may render a final decision on appeal or may remand the matter for further proceeding by the arbitrator(s).

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EXHIBIT A
to
AIA Documents A132/A232 - 2009 – INSURANCE AND BONDS

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the _____ day of _____ in the year _____ for the following:

PROJECT:
Taxiway B Rehabilitation (north of Taxiway D), 211120

THE OWNER:
Raleigh-Durham Airport Authority
1000 Trade Drive, PO Box 80001
RDU Airport, NC 27623

THE CONTRACTOR:
[Insert Contractor name, legal status, and address]

THE ARCHITECT
W.K. Dickson & Co., Inc.
700 Corporate Center Drive
Raleigh, NC 27607

ARTICLE 1. GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit.

ARTICLE 2. OWNER'S INSURANCE

2.1 General. The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability and property insurance.

ARTICLE 3. CONTRACTOR'S INSURANCE AND BONDS
3.1 Contractor's Required Insurance Coverage. The Contractor shall purchase and maintain the following types and limits of insurance.

3.1.2. Commercial General Liability
3.1.2.1 Commercial General Liability insurance for the Project (with coverage no more restrictive than the latest edition of the ISO Occurrence Form GC 00 01) with policy limits of not less than One Million Dollars ($1,000,000) each occurrence, Two Million Dollars ($2,000,000) general aggregate, and Two Million Dollars ($2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including, but not limited to, the following:

a. damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

b. personal injury and advertising injury;
c. damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
d. bodily injury or property damage arising out of completed operations; and
e. the Contractor's indemnity obligations under Section 3.18 of the General Conditions.
f. Per Project Aggregate Endorsement

3.1.2.2 The Contractor's Commercial General Liability policy under this Section 3.1.2 shall not contain an exclusion or restriction of coverage for the following:

a. Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
b. Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
c. Claims for bodily injury other than to employees of the insured.
d. Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
e. Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
f. Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
g. Claims related to roofing, if the Work involves roofing.
h. Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
i. Claims related to earth subsidence or movement, where the Work involves such hazards.
j. Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

3.1.2.3 The Contractor's Commercial General Liability policy under this Section 3.1.2 shall not contain an amendment to the definition of an insured contract.

3.1.2.3 The Contractor's Commercial General Liability insurance shall include coverage for claims against the Owner for injuries to employees of Contractor or any Subcontractors.

3.1.3 Automobile Liability. Automobile Liability coverage (including coverage for claims against Owner for injuries to employees of Contractor or any Subcontractors) covering vehicles owned, and non-owned vehicles used, scheduled, or hired by the Contractor, with policy limits of not less than One Million Dollars ($1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

3.1.4 Workers' Compensation. Workers' Compensation insurance that meets statutory limits and requirements.

3.1.5 Employers Liability. Employers' Liability with policy limits not less than $1,000,000 each accident, $1,000,000, disease each employee, and $1,000,000 disease policy limit.

3.1.6 Excess or Umbrella Liability. Excess or Umbrella liability insurance coverage (including coverage for claims against Owner for injuries to employees of Contractor) with a limit of not less than (Airside): Ten Million Dollars **($10,000,000)**; (Landside): Five Million Dollars **($5,000,000)**] per occurrence. These limits apply in excess of each of the above mentioned policies. The Excess or Umbrella coverage should be form following and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The Excess or Umbrella policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers. Any self-insured retention above $25,000 shall require Owners approval prior to project commencement. At a minimum the Excess or Umbrella liability policy will remain in force over the General Liability, Automobile Liability and Employers Liability policies.

3.1.7 Property insurance.

3.1.7.1 Unless otherwise provided, the Contractor shall purchase and maintain property insurance written on a builder's risk "Special Form" or equivalent policy in the amount of the initial Contract Sum, plus the value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising the total value of the entire Project at the site on a replacement cost basis with deductibles not exceeding $10,000 without prior approval from Owner. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Owner has an insurable interest in the property required by this Section to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project. The property or builder's risk insurance purchased by the Contractor shall not exclude damages from collapse or tunneling.

§3.1.7.2 Property insurance shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, equipment breakdown, falsework, testing and startup, temporary building and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Owner's, Architect's and Contractor's services and expenses required as a result of such insured loss. Owner shall be listed as a Loss Payee under any such Installation or Builders Risk policy obtained by the Contractor and any subsequent subcontractor.

§3.1.7.3 If the property insurance requires deductibles, the Contractor shall pay costs not covered because of such deductibles.

§3.1.7.4 This property insurance shall cover portions of the Work stored off the site, also portions of the Work in transit and any equipment during the process of installation.

§ 3.1.7.5 Partial occupancy or use of the Project or Work shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall reasonable steps to obtain consent of the insurance company or companies and, absent mutual written consent, shall take no action with respect to partial occupancy or use that would cause cancellation, lapse or any reduction in insurance coverage.

3.1.7.6 Contractor shall, at its own cost, maintain insurance to cover its construction equipment, including any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, and other similar items. The Contractor's policy shall include a waiver of subrogation in accordance with the requirements of Section 3.4.14.

3.1.7.7 A loss insured under the Contractor's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 3.1.9. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

3.1.8 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the procedures for dispute resolution set forth in Article 15 of the General Conditions. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7 of the General Conditions.

3.1.9 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in accordance with the procedures for dispute resolution set forth in Article 15 of the General Conditions. Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

3.2 Contractor's Potential Additional Required Insurance Coverage

When the scope of work outlines the need, the contractor shall purchase and maintain the following types and limits of insurance, if limits are provided below: **[Limits in brackets on all lines for review purposes]**

3.2.1 Professional Services Liability. If this Agreement involves or includes Contractor providing or performing design, engineering, consulting, or any professional service, professional liability insurance with a combined single limit of not less than {Five Million Dollars ($5,000,000)} per claim and annual aggregate. The professional liability insurance shall cover the liability of Contractor for any and all errors or omissions committed by Contractor or its subcontractors, in the performance of the Work, regardless of the type of damages. Policy shall

contain an endorsement or sub-limit for "Mitigation of Damage" coverage. The policy shall not include a deductible or self-insured retention in excess of Two Hundred Fifty Thousand Dollars ($250,000), and any deductible or self-insured retention is the sole responsibility of the Contractor, and no portion of such deductible is the responsibility of the Owner.

3.2.2 Pollution Liability. If the Work involves or includes Contractor handling, transporting, disposing, or performing work or operations with hazardous substances, contaminants, waste, toxic materials, or any potential pollutants, Contractor's pollution liability insurance applicable to bodily injury, property damage, including loss of use of damaged property or of property that has not been physically injured or destroyed, cleanup costs, and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims, with a combined single limit of not less than {Five Million ($5,000,000)} per occurrence, automobile pollution liability coverage at least as broad as that provided under the ISO pollution liability – broadened coverage for covered auto endorsement (CA 99 42) shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached.

3.2.3 Coverage under Sections 3.2.1 and 3.2.2 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than {Five Million ($5,000,000)} per claim and {Ten Million ($10,000,000)} in the aggregate.

3.2.4 Aircraft Operation. Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than {Five Million ($5,000,000)}per claim and {Five Million ($5,000,000)} in the aggregate.

3.2.5 Asbestos Abatement Liability Insurance, with policy limits of not less than {Five Million ($5,000,000)} per claim and {Five Million ($5,000,000)} in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials. Policy shall contain a per project endorsement in favor of the Owner.

3.3 Other Insurance

[List below any other insurance coverage, such as cybersecurity or environmental, to be provided by the Contractor and any applicable limits.]

Coverage	**Limits**

3.4 Insurance Obligations.

3.4.1 Insurance selected and described in this Article 3 shall be purchased from an insurance company or insurance companies acceptable to Owner and lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance for five (5) years from the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated herein.

3.4.2 Ratings. All insurance coverage shall be provided by insurance companies acceptable to Owner and having ratings of A-VII or better in Best's Key Rating Insurance Guide (latest edition in effect at the latest date stated on the Certificate of Insurance).

3.4.3 Certificates of Insurance. The Contractor shall provide certificates of insurance and copies of all policies and endorsements acceptable to the Owner evidencing compliance with the requirements in this Article 3 at the following times: (1) prior to commencement of the Work; (2) upon renewal, or replacement, or modification of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including required coverages for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section 3.4. The certificates shall comply with all applicable Articles of this Exhibit.

3.4.4 In no event shall any failure of the Owner to receive certified copies of policies or certificates of insurance required under this Section 3 or to demand receipt of such certified copies or certificates prior to the Contractor's commencing the Work be construed as a waiver by the Owner of the Contractor's obligations to obtain insurance pursuant to this Section 3. The obligation to procure and maintain any insurance required by this Section is a separate responsibility of the Contractor and independent of the duty to furnish a certified copy or certificate of such insurance policies.

3.4.5 Deductibles and Self-Insured Retentions. Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor. Contactor shall be responsible for satisfying any deductibles or self-insured retention(s) applicable to any claims.

3.4.6 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect (as defined), and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 04 13, CG 20 37 04 13, and, with respect to the Architect and the Architect's consultants, CG 20 32 04 13.

3.4.7 In addition to all other requirements set forth in this Exhibit, insurance coverage provided by Contractor under this Agreement shall not include any of the following: any claims-made insurance policies; any endorsement limiting coverage available to Owner which is otherwise required by this Agreement; and any policy or endorsement language that (1) limits the duty to defend Owner under the policy, (2) provides coverage to Owner only if Contractor is negligent, (3) permits the recovery of defense costs from any additional insured, or (4) limits the scope of coverage for liability assumed under a contract. Nothing herein is intended to require the Contractor to provide insurance coverage to the Owner for Owner's own negligence.

3.4.8 To the extent permitted by applicable Laws, all above-mentioned insurance policies shall comply with the following:

3.4.8.1 Be primary and non-contributory to any other insurance carried by Owner;
3.4.8.2 Contain cross-liability coverage as provided under ISO Forms' separation of insureds clause;
3.4.8.3 Provide for a waiver of all rights of subrogation, which Contractor's insurance carrier might exercise against Owner; and
3.4.8.4 Any Excess or Umbrella liability coverage will not require contribution before it will apply.

3.4.9 Non-Waiver. Failure of Contractor to provide insurance as herein required or failure of Owner to require evidence of insurance or to notify Contractor of any breach by the Contractor of the requirements of this Agreement shall not be deemed to be a waiver by the Owner of any other terms and conditions of this Agreement, nor shall they be deemed to be a waiver of any obligation of Contractor to defend, indemnify, or hold harmless Owner. The obligation to procure and maintain any insurance required is a separate responsibility of Contractor and independent of the duty to furnish a copy or certificate of such insurance policies.

3.4.10 Contractor's Commencement of Work Without Insurance. Commencement of Work by Contractor without the required Certificates of Insurance, or without compliance with any other provision of this Agreement, shall not constitute a waiver by Owner of any rights under this Agreement.

3.4.11 Contractor Obligations Not Limited. None of the requirements contained herein as to types, limits, or Owner's approval of insurance coverage to be maintained by Contractor are intended to and shall not in any manner limit, qualify, or quantify the liabilities and obligations assumed by Contractor under this Agreement, any other agreement with Owner, or otherwise provided by law.

3.4.12 Breach of Agreement. Failure to obtain and maintain the required insurance shall constitute a breach of this Agreement and the Contractor will be liable for any and all costs, liabilities, damages, and penalties (including attorneys' fees, court, and settlement expense) resulting to Owner from such breach.

3.4.13 Additional Coverages. Owner reserves the right to require Contractor to provide and maintain additional coverages upon request.

3.4.14 Waiver of Subrogation. Contractor shall waive all rights of subrogation against Owner under those policies procured in accordance with this Agreement.

3.4.15 Claim Reporting. Owner has the right but not the obligation to directly report any claims to any and all insurance carriers.

3.5 Duty of Cancellation Notification and Insurance Reporting

3.5.1 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

3.5.2 Upon receipt of any notice of cancellation or alteration of the policies of insurance required hereunder by Contractor or any of the Subcontractors, Contractor shall within ten (10) business days procure or cause to be procured other policies of insurance, similar in all respects to the policy and policies about to be cancelled or altered; and, if the Contractor fails to provide, procure and deliver acceptable policies of insurance in accordance with the terms hereof, then at Owner's option, Owner may obtain such insurance at the cost and expense of Contractor (and such cost shall not be deemed a part of the Contract Sum), without the need of any notice to the Contractor.

3.5.3 Upon receipt of a notice of cancellation of insurance the Owner shall have the right, but not the obligation, to pay any delinquent premium or fee in order to continue or reinstate coverage under the policy or policies that are the subject of such notice, and shall be allowed to offset any such amounts paid against amounts due or to be paid to Contractor pursuant to the Contract Documents.

3.5.4 When any required insurance, due to the attainment of a normal expiration date or renewal date, shall expire, the Contractor shall supply the Owner with Certificates of Insurance and amendatory riders or endorsements that clearly evidence the continuation of all coverage in the same manner, limits of protection, and scope of coverage as was provided by the previous policy. In the event any renewal or replacement policy, for whatever reason obtained or required, is written by a carrier other than that with whom the coverage was previously placed, or the subsequent policy differs in any way from the previous policy, the Contractor shall also furnish the Owner with a certified copy of the renewal or replacement policy unless the Owner provides the Contractor with prior written consent to submit only a Certificate of Insurance for any such policy. All renewal and replacement policies shall be in form and substance satisfactory to the Owner and written by carriers acceptable to the Owner.

3.5.5 Insurance Report. Upon execution of this contract, and on a monthly basis thereafter, Contractor shall provide Owner with a written report summarizing the status of each insurance policy required by the Contract Documents, including any and all insurance policies required of Contractor's subcontractors (the "Insurance Report"). The Insurance Report shall include, but not be limited to, the dates on which premiums are due to be paid, and the date each such policy shall terminate or be eligible for renewal. The Insurance Report shall be due within five (5) days of the of the first of every month of the calendar year in which this agreement is executed, with subsequent Insurance Reports being due within five (5) days of the first of every month thereafter for as long as this contract is in place.

3.5.6 Contractor's failure to provide a notice of cancellation or an Insurance Report as provided in this Section 4 may constitute an event of default under the Contract Documents.

3.6 Contractor's Suppliers of Equipment and Subcontractors

Contractor shall require that all suppliers of equipment or materials to be incorporated into the Work or the project that is the subject of the Agreement, and all Subcontractors, provide evidence of insurance as follows

3.6.1 General Liability: $1,000,000 per occurrence/$2,000,000 Aggregate; Personal Injury $2,000,000 Aggregate

3.6.2 Automobile: $1,000,000 per occurrence

3.6.3 Worker's Compensation: Statutory Limits
$1,000,000 Each Accident
$1,000,000 Disease - Policy Limit
$1,000,000 Disease - Each Employee

Contractor and Owner must be named as additional insured for ongoing and completed operations. Policies held by subcontractors or suppliers shall be Primary and Non-Contributory to policies held by both Contractor and Owner and shall contain a Waiver of Subrogation in favor of the Contractor and Owner.

Contractor shall not allow any Subcontractor to commence Work until such Subcontractor has obtained and provided insurance of the types, coverages and limits specified in this Exhibit A. Failure of the Contractor to validate insurance coverage of the sub-contractor prior to commencement of work shall constitute a breach of this Agreement and the Contractor will be liable for any and all costs, liabilities, damages, and penalties (including attorneys' fees, court, and settlement expense) resulting to Owner from such breach.

3.7 Performance Bond and Payment Bond

3.7.1 The Contractor shall provide payment and performance bonds with a penal sum of 100% of the contract amount. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located. The bonds shall be in a form acceptable to Owner.

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SUPPLEMENTAL GENERAL CONDITIONS
FOR AIP FUNDED PROJECTS

CIVIL RIGHTS ACT OF 1964, TITLE VI - CONTRACTOR CONTRACTUAL REQUIREMENTS

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations.** The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Nondiscrimination.** The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment.** In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.

4. **Information and Reports.** The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance.** In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the sponsor shall impose such contract sanctions as it or the FAA may determine to be appropriate, including, but not limited to:

   a. Withholding of payments to the contractor under the contract until the contractor complies, and/or

   b. Cancellation, termination, or suspension of the contract, in whole or in part.

6. **Incorporation of Provisions.** The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, SECTION 520 - GENERAL CIVIL RIGHTS PROVISIONS

The Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

DISADVANTAGED BUSINESS ENTERPRISES

1. **Contract Assurance.** The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of Department of Transportation-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Owner deems appropriate, which may include, but is not limited to:

1) Withholding monthly progress payments;

2) Assessing sanctions;

3) Liquidated damages; and/or

4) Disqualifying the Contractor from future bidding as non-responsible.

2. **Prompt Payment.** The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than seven days from the receipt of each payment the prime contractor receives from the Sponsor. The prime contractor agrees further to return retainage payments to each subcontractor within 7 days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only

for good cause following written approval of the Sponsor. This clause applies to both DBE and non-DBE subcontractors.

LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

1. No Federal appropriated funds shall be paid, by or on behalf of the contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the making of any Federal grant and the amendment or modification of any Federal grant.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any Federal grant, the contractor shall complete and submit Standard Form-LLL, "Disclosure of Lobby Activities," in accordance with its instructions.

ACCESS TO RECORDS AND REPORTS

The Contractor shall maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration and the Comptroller General of the United States or any of their duly authorized representatives, access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

BREACH OF CONTRACT TERMS

For all contracts that exceed the simplified acquisition threshold, presently set at $150,000.

Any violation or breach of terms of this contract on the part of the Contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Owner will provide Contractor written notice that describes the nature of the breach and corrective actions the Contractor must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the Contractor must correct the breach. Owner may proceed with termination of the contract if the Contractor fails to correct the breach by the deadline indicated in the Owner's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

RIGHTS TO INVENTIONS

Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Owner in any resulting invention as established by 37 CFR part 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract incorporates by reference the patent and inventions rights as specified within 37 CFR §401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental, or research work.

TRADE RESTRICTION CLAUSE

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –

1) is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);

2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and

3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

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

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to an Offeror or subcontractor:

1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR or
2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list or
3) who incorporates in the public works project any product of a foreign country on such USTR list.

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

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

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

TERMINATION OF CONTRACT

1. The Sponsor may, by written notice, terminate this contract in whole or in part at any time, either for the Sponsor's convenience or because of failure to fulfill the contract obligations. Upon receipt of such notice services shall be immediately discontinued (unless the notice directs otherwise) and all materials as may have been accumulated in performing this contract, whether completed or in progress, delivered to the Sponsor.

2. If the termination is for the convenience of the Sponsor, an equitable adjustment in the contract price shall be made, but no amount shall be allowed for anticipated profit on unperformed services.

3. If the termination is due to failure to fulfill the contractor's obligations, the Sponsor may take over the work and prosecute the same to completion by contract or otherwise. In such case, the contractor shall be liable to the Sponsor for any additional cost occasioned to the Sponsor thereby.

4. If, after notice of termination for failure to fulfill contract obligations, it is determined that the contractor had not so failed, the termination shall be deemed to have been effected for the convenience of the Sponsor. In such event, adjustment in the contract price shall be made as provided in paragraph 2 of this clause.

5. The rights and remedies of the sponsor provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

For all contracts that exceed $25,000, and funded under the AIP, the bidder/offeror certifies, by submission of this proposal or acceptance of this contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this proposal that it will

include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder/offeror/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this solicitation/proposal.

ENERGY CONSERVATION REQUIREMENTS

The contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 USC 6201*et seq*).

VETERAN'S PREFERENCE

In the employment of labor (except in executive, administrative, and supervisory positions), preference shall be given to Veterans of the Vietnam, Persian Gulf and Afghanistan-Iraq war era and small business concerns owned and controlled by disabled veterans as defined in Title 49 United States Code, Section 47112. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

COPELAND "ANTI-KICKBACK" ACT

Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 USC 874 and 40 USC 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

DAVIS BACON REQUIREMENTS

1. Minimum Wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more

than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: *Provided* that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

General Decision Number: NC180103 01/05/2018 NC103

Superseded General Decision Number: NC20170103

State: North Carolina

Construction Type: Highway

Counties: Brunswick, Cumberland, Currituck, Edgecombe, Franklin, Greene, Hoke, Johnston, Nash, New Hanover, Onslow, Pender, Pitt, Wake and Wayne Counties in North Carolina.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2018

* SUNC2014-005 11/17/2014

	Rates	Fringes
BLASTER	$ 21.04	
CARPENTER	$ 13.72	
CEMENT MASON/CONCRETE FINISHER	$ 14.48	
ELECTRICIAN		
Electrician	$ 17.97	
Telecommunications		

Technician	$ 16.79	.63
IRONWORKER	$ 16.02	
LABORER		
Asphalt Raker and Spreader	$ 12.46	
Asphalt Screed/Jackman	$ 14.33	
Carpenter Tender	$ 12.88	
Cement Mason/Concrete Finisher Tender	$ 12.54	
Common or General	$ 10.20	
Guardrail/Fence Installer	$ 12.87	
Pipelayer	$ 12.17	
Traffic Signal/Lighting Installer	$ 14.89	
PAINTER		
Bridge	$ 24.57	
POWER EQUIPMENT OPERATOR		
Asphalt Broom Tractor	$ 11.85	
Bulldozer Fine	$ 17.04	
Bulldozer Rough	$ 14.34	
Concrete Grinder/Groover	$ 20.34	2.30
Crane Boom Trucks	$ 20.54	
Crane Other	$ 20.08	
Crane Rough/All Terrain	$ 20.67	
Drill Operator Rock	$ 14.38	
Drill Operator Structure	$ 21.14	
Excavator Fine	$ 16.60	
Excavator Rough	$ 14.00	
Grader/Blade Fine	$ 18.47	
Grader/Blade Rough	$ 14.62	
Loader 2 Cubic Yards or Less	$ 13.76	
Loader Greater Than 2 Cubic Yards	$ 14.14	
Material Transfer Vehicle (Shuttle Buggy)	$ 15.18	
Mechanic	$ 17.55	
Milling Machine	$ 15.36	
Off-Road Hauler/Water Tanker	$ 11.36	
Oiler/Greaser	$ 13.55	
Pavement Marking Equipment	$ 12.11	
Paver Asphalt	$ 15.59	
Paver Concrete	$ 18.20	
Roller Asphalt Breakdown	$ 12.45	
Roller Asphalt Finish	$ 13.85	
Roller Other	$ 11.36	
Scraper Finish	$ 12.71	
Scraper Rough	$ 11.35	
Slip Form Machine	$ 16.50	
Tack Truck/Distributor		

Operator.....$ 14.52

TRUCK DRIVER
GVWR of 26,000 or Less.....$ 11.12
GVWR of 26,001 Lbs or
Greater.....$ 12.37

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of

the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

2. Withholding.

The Federal Aviation Administration or the sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and that show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (*e.g.* the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at *www.dol.gov/whd/forms/wh347instr.htm* or its successor site. The

prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) The payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i), and that such information is correct and complete;

(2) Each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) Each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the sponsor, the Federal Aviation Administration, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, Sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination that provides for less than full fringe benefits for

apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements.

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor’s firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 USC 1001.

EQUAL EMPLOYMENT OPPORTUNITY - 41 CFR PART 60-1.4(b)

During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

3. The contractor will send to each labor union or representative of workers with which s/he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedure authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering

agency may direct as a means of enforcing such provision, including sanctions for noncompliance: *Provided, however,* that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

CERTIFICATION OF NONSEGREGATED FACILITIES - 41 CFR PART 60-1.8

Notice to Prospective Federally Assisted Construction Contractors

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a federally-assisted construction contract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving federally-assisted construction contract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Notice to Prospective Subcontractors of Requirements for Certification of Non-Segregated Facilities

1. A Certification of Non-segregated Facilities shall be submitted prior to the award of a subcontract exceeding $10,000, which is not exempt from the provisions of the Equal Opportunity Clause.

2. Contractors receiving subcontract awards exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed $10,000 and are not exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

CERTIFICATION OF NONSEGREGATED FACILITIES

The federally-assisted construction contractor certifies that she or he does not maintain or provide, for his employees, any segregated facilities at any of his establishments and that she or he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally-assisted construction contractor certifies that she or he will not maintain or provide, for his employees, segregated facilities at any of his establishments and that she or he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The federally-assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract.

As used in this certification, the term “segregated facilities” means any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason. The federally-assisted construction contractor agrees that (except where she or he has

obtained identical certifications from proposed subcontractors for specific time periods) she or he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause and that she or he will retain such certifications in his files.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS - 41 CFR Part 60.4.3

1. As used in these specifications:

   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

   b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

   c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

   d. "Minority" includes:

      (1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

      (2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);

      (3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

      (4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR part 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has

employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the Contractor during the training period and the Contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or female sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions, including specific review of these items, with onsite supervisory personnel such superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other contractors and subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the Contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally), the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR part 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION to ENSURE EQUAL EMPLOYMENT OPPORTUNITY

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

Timetables	
Goals for minority participation in each trade	Goals for female participation in each trade
22.8%	**6.9%**

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

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

2. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

3. As used in this notice and in the contract resulting from this solicitation, the "covered area" is **Wake County, North Carolina.**

CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.
No contractor or subcontractor contracting for any part of the contract work which may require or involve

the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.
In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.
The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.
The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs 1 through 4 and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1 through 4 of this section.

CLEAN AIR AND WATER POLLUTION CONTROL

Contractors and subcontractors agree:

a. That any facility to be used in the performance of the contract or subcontract or to benefit from the contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

b. To comply with all the requirements of Section 114 of the Clean Air Act, as amended, 42 U.S.C. 1857 et seq. and Section 308 of the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in Section 114 and Section 308 of the Acts, respectively, and all other regulations and guidelines issued thereunder;

c. That, as a condition for the award of this contract, the contractor or subcontractor will notify the awarding official of the receipt of any communication from the EPA indicating that a facility to be used for the performance of or benefit from the contract is under consideration to be listed on the EPA List of Violating Facilities;

d. To include or cause to be included in any construction contract or subcontract which exceeds

$150,000 the aforementioned criteria and requirements.

OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

(Reference 20 CFR part 1910)

All contracts and subcontracts that result from this solicitation incorporate the following provisions by reference, with the same force and effect as if given in full text. The contractor has full responsibility to monitor compliance to the referenced statute or regulation. The contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

Requirement	**Federal Agency with Enforcement Responsibilities**
Occupational Safety and Health Act of 1970 (20 CFR Part 1910)	U.S. Department of Labor – Occupational Safety and Health Administration

TEXTING WHEN DRIVING

(References: Executive Order 13513, and DOT Order 3902.10)

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving", (10/1/2009) and DOT Order 3902.10, "Text Messaging While Driving", (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding $3,500 that involve driving a motor vehicle in performance of work activities associated with the project.

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SPECIAL CONDITIONS
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SPECIAL CONDITIONS

A. SCOPE OF WORK

The Taxiway B Rehabilitation project includes the following scope of work:

- Full depth removal and replacement of the concrete pavement on Taxiway B just north of Taxiway T7 to south of Taxiway B9, including a portion of the north holding pad.
- Full depth removal and replacement of Taxiways B5, B6, B7, B8, and Taxiway C, from the Runway 5L-23R Runway Safety Area to the edge of Taxiway F.
- Addition of thirty-foot wide asphalt paved taxiway shoulders to meet current FAA AC 150/5300-13A Airport Design, Change 1 standards throughout the project area.
- Airfield subsurface drainage improvements in the Taxiway B subgrade and shoulders.
- Airfield Electrical Improvements
- Pavement Marking

Estimated quantities are shown in the Proposal and the work is defined on the plans and in the technical specifications.

B. CONTRACT TIME AND LIQUIDATED DAMAGES

All work to be performed under this contract shall commence as set forth in Article 3 of the Standard Form of Agreement (A132, as modified) (the "Agreement").

1. All work on the project shall be completed within **510 consecutive calendar days** from the date of commencement listed in the Notice to Proceed ("contract time").

   For calculation purposes the date of the Notice to Proceed shall be counted as day one (1) of the contract period.

   In addition to the overall time to complete, the following intermediate completion times apply to specific areas of work.

   a. Time to complete Phase 1A work: 235 consecutive calendar days

   b. Time to complete Phase 1C work: 72 consecutive calendar days

   c. Time to complete Phase 2A work: 80 consecutive calendar days

   d. Time to complete Phase 2C work: 35 consecutive calendar days

   e. Time to complete Phase 3A work: 63 consecutive calendar days

f. Time to complete Phase 3C work: 25 consecutive calendar days

Note – All work shall be completed, accepted, and phase re-opened before Contractor can close and begin work on the next phase of work except as noted on the Phasing Drawing Plans. Construction phases are not required to be completed in numerical order

The relation of these work items to each other is noted on the plans.

2. The number of days denoted in the Agreement (A132, as modified) for contract time includes all weekend days and holidays, but does not include days in the Holiday Moratoriums in paragraph 4 below.

3. For the purposes of this contract, weather shall be factored into the time(s) of performance as follows:

   a. A day will be considered as "lost" for scheduling purposes if more than 0.1 inch of rainfall (or equivalent frozen precipitation) is recorded as having fallen in a day by the NOAA weather station at Raleigh-Durham International Airport. A "day" means a calendar day including weekdays, weekend days and holidays, and begins at 12:01 A.M. and ends at the following 12:00 P.M.

   b. A day will be considered as "lost" for scheduling purposes even if Work is done on the Project during the lost day. A day will be considered "worked" even if no Work is done in days when less than 0.1 inch of rainfall is recorded.

   c. The Contractor shall assume the following number of "lost" days when developing the project schedule:

Month	Planned "lost" days	Month	Planned "lost" days
January	10 days	July	5 days
February	8 days	August	5 days
March	10 days	September	10 days
April	10 days	October	10 days
May	8 days	November	8 days
June	5 days	December	8 days

   These days will be considered as planned lost days in developing the schedule(s) for completing the Work within the Contract Time including Intermediate Contract Times and should be shown in the schedule.

   d. Time will be adjusted for days lost beyond the planned days on a monthly basis. The adjusted time will be immediately reflected on the Contractor's project schedule. Extensions of Contract Time, including Intermediate Contract Times for lost days due to weather will be non-compensable.

e. Time for planned lost time weather days that are not used as outlined in paragraph c above will be adjusted on a monthly basis and will be considered added accumulative float time that belongs to the Owner.

f. For purposes of establishing weather delays, weekdays, weekend days and holidays are all considered as equal.

4. No work which, in the opinion of the Owner, impairs the operation of the Airport, shall be performed during the Holiday Moratorium periods, which are as follows:

From	To	AND	From	To
11/19/18	11/26/18		12/20/18	1/3/19
11/25/19	12/2/19		12/23/19	1/3/20
11/23/20	11/30/20		12/21/20	1/3/21

Days in these periods will not count toward the Contract Time.

5. Liquidated damages for failure to complete Work shall be assessed in accordance with Article 3 of the Agreement.

6. Liquidated damages shall be the sole remedy for the Owner for Contractor's failure to complete Work by the Contract Times set forth in Article 3 of the Agreement but will be in addition to any other damages, penalties or retainages that may be assessed or withheld under other provisions of the Contract Documents. Liquidated damages will be assessed for each calendar day by which the date of actual completion exceeds the end day of the specified Contract Time. These damages will be assessed separately for each date not met and the total amount assessed will be cumulative.

7. Time is of the essence for completion of this Agreement. Owner and Contractor acknowledge and agree that if Contractor fails to achieve Substantial Completion of the Work (overall project in paragraph B.1 above) within the Contract Time, Owner will suffer substantial damages which will be difficult to specifically calculate. These damages would include interference with the maintenance and operation of the Airport, interference with the use of existing facilities, and increased administrative costs for the Owner. Owner and Contractor agree that liquidated damages in the amount of **$3,000** for each calendar day are fair and reasonable and that such liquidated damages shall be assessed against the Contractor for every day by which Substantial Completion is delayed beyond the Contract Time.

8. Intermediate liquidated damages shall be assessed the Contractor for not meeting the project scope of work as defined in the contract documents for each of the specific areas of work listed in this article. Related to paragraph B.1 above, the liquidated damages for each specific area of work are stipulated below.

a. Phase 1A work: **$1,000** per day the Contractor works past the duration of Phase 1A, as determined solely by the Owner.

b. Phase 1B night work: **$100** per minute the work prevents one of either Taxiway B or Taxiway F from re-opening, as determined by the Owner.

c. Phase 1C work: **$1,000** per day the Contractor works past the duration of Phase 1C, as determined solely by the Owner.

d. Phase 2A work: **$1,000** per day the Contractor works past the duration of Phase 2A, as determined solely by the Owner.

e. Phase 2B night work: **$100** per minute the work prevents one of either Taxiway B or Taxiway F from re-opening, as determined by the Owner.

f. Phase 2C work: **$1,000** per day the Contractor works past the duration of Phase 2C, as determined solely by the Owner.

g. Phase 3A work: **$1,000** per day the Contractor works past the duration of Phase 3A, as determined solely by the Owner.

h. Phase 3B night work: **$100** per minute the work prevents one of either Taxiway B or Taxiway F from re-opening, as determined by the Owner.

i. Phase 3C work: **$1,000** per day the Contractor works past the duration of Phase 3C, as determined solely by the Owner.

C. SUBSTITUTIONS

1. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of Contract.

2. Substitution Request Submittal: Requests for substitution will be considered or rejected at the discretion of the Owner only if received within fourteen (14) calendar days after the commencement date established in the Notice to Proceed. Requests beyond this deadline will be considered only if the specified product is no longer available.

   a. Submit 5 copies of each request for substitution for consideration. Submit requests on the "Request for Substitution" and "Vendor Qualification Forms" included at end of this Section.

   b. Identify product, or fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with requirements for substitutions, and the following information, as appropriate:

(i) Product Data, including Drawings and descriptions of products, fabrication and installation procedures.

(ii) Samples, where applicable or requested.

(iii) Detailed comparison of significant qualities of proposed substitution with those of Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

(iv) Coordination information, including list of changes or modifications needed to other parts of Work and to construction performed by Owner and separate Contractors that will become necessary to accommodate proposed substitution.

(v) Statement indicating substitution's effect on Contractor's Construction Schedule compared to schedule without approval of substitution. Indicate effect of proposed substitution on milestones and on overall Contract Time.

(vi) Cost information, including proposal of net change, if any, in Contract Sum.

(vii) Certification by Contractor that substitution proposed is equal-to or better in every significant respect to that required by Contract Documents, and that it will perform adequately in application indicated. Include Contractor's waiver of rights to additional payment or time, which may subsequently become necessary because of failure of substitution to perform adequately.

(viii) If the request for substitution is made later than 14 days after issuance of the NTP, a statement of the circumstances beyond Contractor's control that justify the substitution.

3. Conditions: Contractor's substitution request will be received and considered by the Owner when one or more of following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.

a. Extensive revisions to Contract Documents are not required.

b. Proposed changes are in keeping with general intent of Contract Documents.

c. Request is timely, fully documented and properly submitted.

d. Request is directly related to an "or equal" clause or similar language in Contract Documents.

e. Specified product or method of construction cannot be provided within Contract Time. Request will not be considered if product or method cannot be provided as result of failure to pursue Work promptly or coordinate activities properly.

f. Specified product or method of construction cannot receive necessary approval by governing authority, and requested substitution can be approved.

g. Substantial advantage is offered the Owner, in terms of cost, time, energy, conservation or to considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner or separate contractors, and similar considerations.

h. Specified product or method of construction cannot be provided in manner that is compatible with other materials, and where Contractor certifies that substitution will overcome incompatibility.

i. Specified product or method of construction cannot be coordinated with other materials, and where Contractor certifies that proposed substitution can be coordinated.

j. Specified product or method of construction cannot provide warranty required by Contract Documents and where Contractor certifies that proposed substitution provides required warranty.

4. Contractor’s submittal and the Engineer's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with Contract Documents do not constitute an acceptable or valid request for substitution, nor does it constitute approval.

5. Decision of the Owner regarding acceptance or rejection of proposed substitution will be based, at least in part, on information supplied in the attached explanations and product data.

REQUEST FOR SUBSTITUTION

To: _____

Attention: _____

From: _____
Name of Company

_____
Address

_____
City, State, Zip Code

_____
Phone

Fully answer all information requested below. Failure to answer any item may cause rejection of request for substitution. If requested by the Engineer, submit information about manufacturer and vendor history, financial stability, distribution and support systems. Use one form for each product requested. Only first product listed will be considered on forms with more than one product listed.

Specification Section Number_____ Drawing Number _____
Paragraph Number _____ Detail Number _____

Specified Product _____

Proposed Substitution _____

Answer the following questions. Attach an explanation sheet on your company's letterhead when required.

Does the proposed substitution affect dimensions indicated on Drawings?

No_____ Yes_____ (If yes, explain below).

_____

Does the proposed substitution require changes in Drawings and/or design or installation changes?
No_____ Yes_____

If yes, is the cost of these changes included in the proposed amount? No_____ Yes_____

Does the proposed substitution affect other trades? No_____ Yes_____

(If yes, explain who and how)_____

_____

If the proposed product does affect the work of other trades, has the cost impact on their work been included in the price of the proposed substitution? No_____ Yes_____

Does the proposed product's guarantee differ from that of the specified products?
No_____ Yes_____(If yes, explain how) _____

Why is this proposal for substitution being submitted? List reasons below:

_____

Attach a listing of 3 projects using proposed substitution completed within the past 5 years in geographic and climatic region of Project. One of the applications shall have been in service for at least 3 years.

Attach product data/brochures and Vendor Qualification Form for the specified and substitute product.

Undersigned has examined Contract Documents, is familiar with specified product, understands indicated application of product, and understands design intent of Engineer. Undersigned states that proposed substitution complies with Contract Documents and will perform at least equally to specified product within limitations stated above. Undersigned accepts responsibility for coordinating application and installation of proposed substitution and waives all claims for additional costs resulting from incorporation of proposed substitution into Project or its subsequent failure to perform according to specified requirements.

Submitted By _____/_____
Print Name Signature

Date: _____

VENDOR QUALIFICATION FORM

1. Statement of Confidentiality:

The Engineer will treat any information as confidential, which is clearly labeled so. A "clear label" is defined as the word "Confidential" marked in red ink on each and every page desired confidential in letters no less than one half inch high.

2. Vendor's Organization:

For the product being considered, list the number of employees in:

_____ Product manufacture

_____ Product sales

_____ Product marketing

_____ Product R & D

_____ Product technical service

_____ TOTAL

3. Financial Stability:

Provide past five years sales history and current audited financial statement or equivalent documentation of financial stability.

4. Safety and Environment:

Define vendor policies.

5. Sales/Service Offices:

List all locations.

6. Geographic Markets:

List all areas served.

7. Products:

On (a) separate sheet(s) for each product, list product name, uses, length of time in service, test data. Provide Material Safety Data Sheet(s). Provide case history data of product use in five major projects within the last two years.

8. Quality Assurance:

Define manufacturing program. Define installation program.

9. Installation:

By manufacturer?	_____	Y	_____	N
By certified applicators?	_____	Y	_____	N
By approved applicators?	_____	Y	_____	N
By any applicator?	_____	Y	_____	N

10. Comments:

_____

_____

11. Standard Warranty:

Provide copy of terms.

12. References:

Provide three.

_____

_____

_____

Signature: _____

Print Name: _____

Title: _____

Date: _____

Being duly sworn deposes that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of _____.

Notary Public: _____

My Commission Expires: _____

D. METHOD OF MEASUREMENT AND PAYMENT OF UNIT PRICE WORK

For unit price work, payment for work under this Contract shall be only for the actual work performed or materials furnished in accordance with the plans and specifications, and will be based on the values indicated in the Proposal form. The price for each item shall include all labor, equipment, materials, tools, appliances, transportation, services, incidentals, taxes, and any associated construction expense for the complete installation of each unit of said item in full conformance with the Contract Documents for this Project. No payments for unit price work under this Contract will be made other than for those line items listed in the values indicated in the Proposal form. **To the extent there are any adjustments in the quantities of unit price work to be supplied for the Project, the unit prices bid for those items will be the prices used to calculate any change orders. The Authority will not allow modification of the unit prices (except as set forth in Paragraph 9.1.2 of the General Conditions, AIA Document A232-2009, as modified) when calculating changes to the Contract Sum of the Project due to adjustment in quantities.**

E. PAYMENT FOR STORED MATERIALS

1. When payment is made on account of Stored Materials, such materials must be paid for by the Contractor and stored on the Owner's property or at such places and in such manner as may be designated by the Engineer. However, at the sole discretion of the Engineer, with the permission in writing from the Engineer, and under such circumstances as may be determined by the Engineer, such materials may be stored in a bonded warehouse within the continental United States. The location and conditions for storage of such materials away from the Owner's property in a bonded warehouse shall be within the sole discretion of the Engineer. To the extent the Contractor elects to store materials at a location other than on Owner's property, and the Engineer approves such location, all costs for the Engineer, or other representative designated by the Owner, to approve said location and/or inspect materials stored in such locations shall be the responsibility of the Contractor. Requests for payment on account of stored materials shall be accompanied by paid invoices, bills of sale, documentary evidence establishing Owner's title to such materials, evidence that the stored materials are insured against loss and damage, completed form entitled Affidavit and Undertaking for Stored Materials as follows and such other documentation as required by the Engineer. Responsibility for such stored materials, whether stored on the Owner's property or away from the Owner's property, shall remain with the Contractor regardless of ownership or title. No payment shall be made on account of materials stored in a bonded warehouse unless the Contractor has acquired written permission from the Engineer for such storage of materials and has complied with all conditions set forth by the Engineer regarding such storage of materials in a bonded warehouse. The maximum payment that will be made for stored materials, once all other conditions are met, shall be 100% of the invoice price for the materials, subject to the deduction for retainage.

2. The following materials shall be eligible for payment as a Stored Material under this paragraph:

The Contractor shall not be entitled to payment for any other materials until they are installed on the Project and approved for payment in accordance with the Contract Documents.

3. In this project, the Owner agrees to compensate the Contractor for ONLY the following stored materials, at a time supported by the approved project schedule.

    - Underdrain pipe
    - Airfield electrical materials and equipment

4. At or before the Preconstruction Conference, for the purposes of the applicable Stored Materials payment, the Contractor shall propose a breakdown of contract bid unit prices into components of Labor and Materials. Materials pricing shall be based upon documented vendor pricing that can be reduced to a per unit basis. Once an agreement is reached with the Owner on this breakdown, the appropriate Materials component unit price will be used to compensate the Contractor for Stored Materials in all applications for payment. In the absence of extenuating circumstances, in the opinion of the Owner, the agreed upon unit price components will not be re-negotiated.

AFFIDAVIT AND UNDERTAKING FOR STORED MATERIALS

Project Name:_____
Project Number: _____
Pay Application Number: _____ Pay Application Period: _____ to _____

The undersigned for and in consideration of payment in the amount of $_____ to be made to it by the Raleigh-Durham Airport Authority for stored materials to be permanently incorporated into the Work for the construction of the above referenced project, hereby certifies as follows:

1. The undersigned warrants that all suppliers or material vendors from which it has acquired materials to be permanently incorporated into the Work of the project and for which payment as stored materials has been requested have been paid in full. The undersigned has attached the following required documents:
   a. Paid invoices from each supplier or vendor verifying the cost of the materials,
   b. Bills of sale from the undersigned to the Raleigh-Durham Airport Authority establishing the Authority's title and ownership of such materials,
   c. Written consent of the undersigned's surety to make such partial payments, and
   d. Evidence the stored materials are insured against loss and damage.
2. The stored materials for which payment is being requested have been inspected and approved by the Engineer.
3. The undersigned does transfer and assign to the Raleigh-Durham Airport Authority all rights, title and claim that it may have, or which may hereafter accrue to it, in and to the stored materials for which payment is hereby requested, free of any and all claims of any contractor or of any supplier, material vendor, or other person claiming through the undersigned.
4. No security interest has been given or executed by the undersigned for or in connection with any materials stored upon the project that are to be permanently incorporated into said project.
5. This affidavit and undertaking shall be an independent covenant of the undersigned and shall operate and be effective with respect to materials furnished and for which payment is requested as stored materials to be permanently incorporated into the Work of the project.
6. Payment for stored materials is made on the conditional basis that the materials meet the requirements of the contract plans and specifications and shall be permanently incorporated into the Work of the project. The undersigned shall reimburse the Raleigh-Durham Airport Authority for all payment for stored materials paid for but not permanently incorporated into the project.
7. The undersigned individual has the right, power, and authority to execute this affidavit and undertaking on behalf of _____.
   (Contractor Name)

IN WITNESS WHEREOF, this Affidavit and Undertaking has been executed on the _____ day of _____ in the year of _____.

Contractor Name: _____

Contractor Address: _____

By:_____
Authorized Individual and Title

(Notary Seal)
Subscribed and Sworn to me this _____ day of _____, _____.

_____
Notary Public

F. APPLICATIONS AND CERTIFICATIONS FOR PAYMENT

1. This Section specifies administrative and procedural requirements governing Contractor's Applications for Payment.

2. Coordinate preparation of Schedule of Values with preparation of Contractor's Construction Schedule.

    a. Correlate line items in Schedule of Values with other required administrative schedules and forms, including:

        (i) Contractor's construction schedule.
        (ii) Application for Payment form and Affidavit and Undertaking for Stored Materials Form.
        (iii) List of subcontractors (if not submitted with Bid).
        (iv) Schedule of allowances.
        (v) Schedule of alternates.
        (vi) List of products.
        (vii) List of principal suppliers and fabricators (if not submitted with Bid).
        (viii) Schedule of submittals.

    b. Submit Schedule of Values to the Engineer at earliest feasible date, but in no case later than 14 days after the commencement date established in the Notice to Proceed.

    c. Sub-Schedules: Where Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

3. Format and Content of Schedule of Values.

    a. Identification: Include the following Project identification on Schedule of Values:

        (i) Project name and location.
        (ii) Name of the Engineer.
        (iii) Project number.
        (iv) Contractor's name and address.
        (v) Date of submittal.

    b. Arrange Schedule of Values in tabular form with separate columns to indicate the following for each item listed,

        (i) Generic name.
        (ii) Related Specification Section.
        (iii) Name of subcontractor.
        (iv) Name of manufacturer or fabricator.
        (v) Name of supplier.

(vi) Change Orders (numbers) that have affected the dollar value.
(vii) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

c. Provide breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts into several line items.

d. Round amounts to nearest whole dollar; total shall equal Contract Sum.

e. For each part of Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of Work. An Affidavit and Undertaking of Stored Materials form must be included with each application for payment that includes stored materials.

f. Unit Cost Allowances: Show line item value of unit cost allowances as product of unit cost times measured quantity as estimated from Contract Documents.

g. Schedule Updating: Update and resubmit Schedule of Values when Change Orders or Construction Change Directives result in a change in Contract Sum.

4. Each Application for Payment shall be consistent with previous applications and payments as reviewed by Engineer and paid for by Owner.

   a. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements identified below.

5. Payment Application Times: Each progress payment date is as indicated in the Agreement. Period of construction Work covered by each Application or Payment is period indicated in the Agreement.

6. Payment Application Forms: Use the Payment Application Form and Affidavit and Undertaking for Stored Materials Form provided by the Owner.

7. Application Preparation: Complete every entry on required forms, including notarization and execution by person authorized to sign legal documents on behalf of Contractor. Incomplete applications will be returned without action.

   a. Entries shall match data on Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

   b. Include amounts of Change Orders and Construction Change Directives issued prior to last day of construction period covered by application.

8. Transmittal: Submit two (2) executed copies of each Application for Payment to the Engineer by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien, affidavits, DBE reporting forms, and similar attachments, when required.

    a. Transmit each copy with transmittal form listing attachments, and recording appropriate information related to application in manner acceptable to Engineer.

9. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment for each Phase of the Project include following:

    a. List of subcontractors.
    b. List of principal suppliers and fabricators.
    c. Schedule of Values.
    d. Contractor's current Construction Schedule.
    e. Schedule of principal products.
    f. Schedule of unit prices.
    g. Submittal Schedule (preliminary if not final).
    h. List of Contractor's staff assignments.
    i. Copies of building permits.
    j. Copies of authorizations and licenses from governing authorities for performance of the Work.
    k. Initial progress report.
    l. Executed Affidavit and Undertaking for Stored Materials Form.
    m. DBE Reporting Forms (reporting online or in paper format is acceptable)
        (i) Monthly Payment Summary Form

        (ii) Schedule of Subcontractors Form

        (iii) Request to Change/Replace DBE Subcontractors (if applicable)

    n. Sales Tax Reporting Form (NC purchases, sales and use taxes) – The Sales and Use Tax Affidavit is used to certify that the Supplier/Contractor has paid all applicable sales and use tax for goods or services purchased for the Owner

        (i) Submit monthly with each Application for Payment (Prime & Subs)

        (ii) Attach all supplier invoice copies to support data on the Sales Tax Report

        (iii) Maintain Records for Three (3) Years

        (iv) For taxable purchases made by a Contractor or Sub in a County other than Wake or Durham, adjust the form accordingly or make it clear which county the purchase was made

        (v) RDU Sales and Use Tax Report/Affidavit (Signed by Corporate Officer /

CFO)

10. Interim Applications for Payment: Following the Initial Payment up to Substantial Completion must include the following:

    a. Schedule of Values.
    b. Contractor's current Construction Schedule.
    c. DBE Reporting Forms (reporting online or in paper format is acceptable)
        (i) Monthly Payment Summary Form

        (ii) Schedule of Subcontractors Form

        (iii) Request to Change/Replace DBE Subcontractors (if applicable)

    d. Sales Tax Reporting Form (NC purchases, sales and use taxes) – The Sales and Use Tax Affidavit is used to certify that the Supplier/Contractor has paid all applicable sales and use tax for goods or services purchased for the Owner

        (i) Submit monthly with each Application for Payment (Prime & Subs)

        (ii) Attach all supplier invoice copies to support data on the Sales Tax Report

        (iii) Maintain Records for Three (3) Years

        (iv) For taxable purchases made by a Contractor or Sub in a County other than Wake or Durham, adjust the form accordingly or make it clear which county the purchase was made

        (v) RDU Sales and Use Tax Report/Affidavit (Signed by Corporate Officer / CFO)

11. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Completion issued previously for Owner occupancy of designated portions of Work.

    a. Warranties (guarantees) and maintenance agreements.
    b. Maintenance instructions.
    c. Meter readings.
    d. Start-up performance reports.
    e. Change-over information related to Owner's occupancy, use, operation and maintenance.
    f. Final cleaning.
    g. Application for reduction of retainage, and consent of surety.
    h. Final progress photographs.

i. List of incomplete Work, recognized as exceptions to Engineer's Certificate of Substantial Completion.
j. Executed Affidavit and Undertaking for Stored Materials Form.
k. DBE Reporting Forms (reporting online or in paper format is acceptable)
    (i) Monthly Payment Summary Form

    (ii) Schedule of Subcontractors Form

    (iii) Request to Change/Replace DBE Subcontractors (if applicable)

l. Sales Tax Reporting Form (NC purchases, sales and use taxes) – The Sales and Use Tax Affidavit is used to certify that the Supplier/Contractor has paid all applicable sales and use tax for goods or services purchased for the Owner

    (i) Submit monthly with each Application for Payment (Prime & Subs)

    (ii) Attach all supplier invoice copies to support data on the Sales Tax Report

    (iii) Maintain Records for Three (3) Years

    (iv) For taxable purchases made by a Contractor or Sub in a County other than Wake or Durham, adjust the form accordingly or make it clear which county the purchase was made

    (v) RDU Sales and Use Tax Report/Affidavit (Signed by Corporate Officer / CFO)

12. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of final payment Application for Payment include following:

a. All requirements for Section JJ-Closeout Inspection Procedures
b. All RDU ID badges, airside vehicle passes, and keys must be returned to the Owner.
c. Warranties (guarantees) and maintenance agreements.
d. Completion of SOW closeout requirements.
e. Completion of items specified for completion after Completion.
f. Assurance that unsettled claims will be settled.
g. Assurance that Work not complete and accepted will be completed without undue delay.
h. Transmittal of required Project construction records to Owner.
i. Removal of temporary facilities and services.
j. Removal of surplus materials, rubbish and similar elements.
k. Change of door locks to Owner’s access.
l. Executed Affidavit and Undertaking for Stored Materials Form.
m. DBE Reporting Forms (reporting online or in paper format is acceptable)
    (i) Monthly Payment Summary Form

(ii) Schedule of Subcontractors Form

(iii) DBE Affidavit of Total Payment Form

n. Sales Tax Reporting Form (NC purchases, sales and use taxes) – The Sales and Use Tax Affidavit is used to certify that the Supplier/Contractor has paid all applicable sales and use tax for goods or services purchased for the Owner

(i) Submit monthly with each Application for Payment (Prime & Subs)

(ii) Attach all supplier invoice copies to support data on the Sales Tax Report

(iii) Maintain Records for Three (3) Years

(iv) For taxable purchases made by a Contractor or Sub in a County other than Wake or Durham, adjust the form accordingly or make it clear which county the purchase was made

(v) RDU Sales and Use Tax Report/Affidavit (Signed by Corporate Officer / CFO)

G. EXTENSIONS OF CONTRACT TIMES DUE TO STRIKES, ACTS OF GOD, OR ACTS OF PUBLIC ENEMIES

Extension of Contract Time including Intermediate Contract Times due to strikes, acts of God, or acts of public enemies will be considered by the Engineer based on written requests for extension of Contract Times submitted by the Contractor. Extension of Contract Time including Intermediate Contract Time due to strikes, acts of God, or acts of public enemies will be non-compensable. Such extensions of Contract Time will extend the allowed performance period(s) of the Contract and will relieve the Contractor from Liquidated Damages during the time extension period, but no monetary compensation will be granted to the Contractor as a result of extensions of Contract Time due to strikes, acts of God, or acts of public enemies.

H. CONTRACT SCHEDULE AND PROGRESS MEETINGS

This Section specifies administrative and procedural requirements for scheduling and reporting progress of the Work. During times of inactivity these activities can be suspended with approval of the Owner.

1. Work Schedule
   a) Scheduling Responsibility: The Contractor shall submit to the Owner and maintain a coordinated schedule for the Work, including the Preliminary Contract Schedule, a Baseline Schedule and monthly updates to the Baseline Schedule. Submission of the schedule shall not relieve the Contractor of its overall responsibility for scheduling,

sequencing and coordinating the work to comply with the requirements of the Contract Documents.

b) Schedules shall be produced utilizing the critical path method (CPM).

2. Preliminary Contract Schedule: The Contractor shall submit for approval a preliminary contract schedule to the Owner within 14 days of the date established for Notice to Proceed (NTP) and prior to commencement of the Work. The Preliminary Contract Schedule shall include a list of all activities for the Project and an outline of the schedule of activities for the first 60 days of the Project. Include a skeleton diagram for the remainder of the Work with the Preliminary Contract Schedule.
   a) Indicate completion of the Work on the date established for Substantial Completion, unless the Owner agrees otherwise.
   b) Tabulation of Submittals: List those required to maintain orderly progress of the Work and those required early because of long lead-time for manufacture or fabrication.

3. Submittal of the Baseline Schedule: The Contractor shall prepare and submit for approval a CPM schedule that will form the baseline of the Project Work ("Baseline Schedule") from the preliminary contract schedule, the phasing plans and the comments received from the Owner. The Contractor shall identify critical activities in sufficient detail to allow progress to be easily identified on not less than a monthly basis. The Baseline Schedule shall be submitted within 14 days of NTP in printed form and electronic form on a CD.

4. Initial Report: Within fourteen (14) days following the Contractor's receipt of written NTP, the Contractor shall submit to Owner and obtain approval of the following:
   a) An organization chart showing the Contractor's key personnel and their reporting relationships.
   b) A Key Material Quantities Schedule for the duration of the Contract period indicating materials required in each category, by month.

5. Monthly Schedule Updates: The Contractor shall provide monthly updates to the Baseline Schedule based upon actual progress of the Work to show progress against the approved baseline. The monthly updates, submitted in paper and electronic format, shall be accompanied by a report indicating the following:
   a) Written narrative reflecting progress to date, description of any changes to the critical path and the current amount of total float.
   b) Any delays experienced by the Contractor during the report period.
   c) Any potential delays, hindrances, disruptions that are anticipated for the coming month.

6. Pre-Construction Conference: The Owner will schedule a Pre-Construction Conference before the start of Work, at a time convenient to Engineer and Contractor at a location acceptable to Owner.
   a) Attendees: Authorized representatives of the Engineer, Contractor, major subcontractors, suppliers, and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Work and authorized to conclude matters relating to the Work.
   b) Minutes: Engineer will record and distribute meeting minutes.

7. Progress Meetings: After the initial Pre-Construction Conference, regular weekly meetings shall be scheduled and conducted by the Construction Project Manager at the job site for the purpose of reviewing the progress to date, projecting the work to be performed, and discussing any other issues pertinent to the successful completion of the Work. The Contractor shall require every entity involved with the status of this Project to be properly represented at these meetings and be informed of comprehensive work efforts necessary to complete the Work. The Contractor shall submit to the Engineer at each Progress Meeting a detailed list of the work items to be accomplished in the two week period following the date of the meeting. More frequent progress meetings may be called by the Engineer as may be required. The Engineer will prepare and distribute minutes following each progress meeting.

I. DAILY ON SITE COORDINATION MEETING AND ACTIVITIES REPORT

1. Due to the necessity of close coordination between trades of work on this project, the Contractor will be required to conduct periodic site coordination meetings in which, at a minimum, the following topics will be addressed:
   - Safety
   - Security
   - Daily work plan
   - Division of responsibilities
   - Protection of utilities in the area.

It is intended that this on-site meeting include all workers. The Owner and Engineer shall have the option of attending the meetings and addressing the work force.

2. Commencing with the date of the Notice to Proceed, which shall be considered as Contract Day No. 1, the Contractor shall prepare and submit to the Engineer a Daily Activity Report in a format approved by the Engineer.

3. This report shall contain the following data information:

   a) Contractor.
   b) Contract name and number.
   c) Contract day, date and shift.
   d) All personnel engaged in the Contract, including management, supervisory, clerical, engineering and manual.
   e) An exact count of personnel hours by trade, craft, duties, Contractor or Subcontractor.
   f) An exact equipment account on the project, identified as working or idle.

4. The reports shall be submitted to the Engineer by 10:00 a.m. on the first business day following.

J. SHOP DRAWINGS

1. The Contractor is responsible for the preparation of detailed shop drawings necessary for the fabrication, erection and construction of all parts of the work in conformity with the Contract Documents. Two copies of shop drawings shall be submitted to the Engineer in accordance with the procedures herein described.

2. "Shop Drawings," wherever referred to, shall be defined as drawings, reinforcement bar lists, diagrams, illustrations, schedules, catalog cuts, performance charts, brochures, and other submittal data prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the work shall be fabricated and/or installed.

3. The Contractor shall submit a detailed listing of all shop drawings required by the technical specifications. The listing will be developed in a spreadsheet format and shall include:

    a. Unique submittal number, consisting of
        (i) Specification section number
        (ii) Paragraph number
        (iii) Contractor assigned number
    b. Description of Submittal
    c. Scheduled date of submittal.

4. All submissions of shop drawings, brochures and catalog cuts shall be accompanied by a transmittal letter listing the drawings submitted by number and title. A minimum of one (1) PDF and three (3) hard copies shall be submitted for drawings. A minimum of four (4) copies of brochures or catalog cuts shall be submitted. The Engineer will retain three (3) copies.

5. Each shop drawing shall contain a title block with the following information provided:

    a. Number and title of drawing, including contract number;
    b. Date of drawing or revisions;
    c. Name of Contractor or subcontractor submitting drawings;
    d. RDU Project number;
    e. Specification section title and number and pay item number;
    f. Space above the title block for Engineer's stamp; and
    g. Submission number (whether first, second, third, etc.)
    h. Sheets, on which details of submittals shall be indicated, shall be not smaller than 22 by 34 inches.
    i. Detail references, drawing number references.

Each shop drawing shall have listed on it all contract references, drawing numbers, plus shop drawing numbers on related work by other sub contractors, if available.

6. The Contractor shall check and approve all shop drawings to make sure that they conform to the drawings, specifications, and other contract requirements, and correct the drawings found to be inaccurate or otherwise in error. The Contractor shall verify all field dimensions and criteria and shall be responsible for the coordination of work by all sub contractors. Shop drawings, at the time of submission, shall bear the signature of the Contractor's checker, date and stamp of approval for submission to the Engineer as evidence that such drawings and/or details have been reviewed, checked and approved by the Contractor. Drawings submitted without such stamp of approval will be returned to the Contractor unapproved and will require resubmission. In such event, it will be deemed that the Contractor has not complied with the requirements of this subsection and shall bear the risks of delays as if no drawings or details had been submitted. Hard copies must bear Contractor's stamp. The Contractor, by approving and submitting shop drawings, represents that it has determined and verified all field measurements and quantities, field construction criteria, materials, catalog numbers, and similar data, and that it has reviewed and coordinated the information in the shop drawings with the requirements of the work and the Contract Documents. At the time of submission, the Contractor shall inform the Engineer in writing of any deviation in the shop drawings or samples from the requirements of the Contract Documents.

7. The Engineer will review all shop drawings and samples within fourteen (14) calendar days unless otherwise stated in the Contract Documents, but only for conformance with the design concept of the contract and with the information given in the Contract Documents. Unless otherwise indicated, the Contractor shall transmit submittals in sufficient advance time to permit review and acceptance not less than 21 days before work represented by the submittals is scheduled to begin. The Engineer assumes no responsibility for delays caused by review of a re-submittal of a previously rejected submittal. Should a shop drawing not be approved after two submissions, the Contractor will be liable for the costs of further reviews by the Engineer. The Engineer's approval of a separate item shall not indicate approval of an assembly in which the item functions. The Engineer will return one shop drawing to the Contractor for its use and distribution.

8. Review stamp will be affixed by the Engineer, and will be marked, signed and dated. The marks have the following meanings:

    a. The mark, **No Exceptions Taken**, is an acceptance, and means that every illustration and description appears to conform to the requirements of the Contract Documents; that fabrication, assembly, manufacture, installation, application, and erection of illustrated and described product may proceed; and re-submittal is not required.

    b. The mark, **Make Corrections Noted**, is an acceptance, and means that every illustration and description will appear to conform to the respective requirements of the construction documents upon incorporation of reviewer’s corrections, and that fabrication, assembly, manufacture, installation, application, and erection of illustrated and described product may proceed. Submittal so marked need not be resubmitted before prosecution of the work unless Contractor challenges reviewer’s exception.

c. The mark, **Revise and Resubmit**, is a rejection, and means that submittal is deficient to the degree that reviewer cannot correct submittal with a reasonable degree of effort, that submittal shall be revised, and that revised submittal shall be submitted.

d. The mark, **Rejected**, is a rejection, and means that submittal is deficient to the degree that reviewer has not made a thorough review of submittal, that submittal shall be revised, and that revised submittal shall be submitted correct and complete.

Transmit re-submittals promptly. Re-submittal caused time delays will not be recognized. The Engineer's approval of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written approval to the specific deviation, nor shall the Engineer's approval relieve the Contractor from responsibility for errors or omissions in the shop drawings or samples.

10. No materials shall be ordered and no portion of the work requiring shop drawings or sample submission shall be commenced until the Engineer has approved the submission. All such materials and portions of work shall be in accordance with approved shop drawings and samples.

11. The Contractor shall, when requested by the Engineer in writing, submit shop drawings in additional to those required by the Contract Documents.

12. Shop drawings submitted by the Contractor and approved by the Engineer become part of the Contract Documents.

13. The Contractor is advised that certain substitutions of "equal" items may not be permitted under the individual specification sections.

14. Only approved shop drawings, with Engineer's stamp, are to be used for ordering materials, fabrication and erection of work.

15. Within 21 days after completion of work defined by a shop drawing, submit a final, corrected, shop drawing showing work as actually installed, placed, erected, and applied. If further As-Built corrections are made, resubmit shop drawing showing these corrections. Final corrected shop drawing shall be submitted before final acceptance of the project.

K. PROCESSING OF REQUESTS FOR INFORMATION (RFIs)

1. Where clarification is necessary on the Contract Documents the Contractor shall submit a Request for Information (RFI) to the Engineer. Each RFI shall be limited to a single subject. Where possible, only one question shall be submitted with each RFI.

2. Contractor shall allow a minimum of five (5) calendar days to receive a response on each RFI. However, allowance must be given for extended time to formulate a response for RFIs that are complex and require additional research by the Engineer. Any RFI submitted to the Engineer after 4:00pm will be considered as received the next business day whereupon the time for processing will commence.

L. FIELD OFFICE REQUIREMENTS

1. See Section 01 50 00 Temporary Facilities and Controls for Engineer's Field Office requirements.

M. CONTRACTOR QUALITY CONTROL PROGRAM

1. General: The Contractor shall establish, provide, and maintain an effective Quality Control Program that details the methods and procedures that will be taken to assure that all materials and completed construction required by this Contract conform to Contract Plans, Technical Specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors and/or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the Contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose. There shall be no separate payment for this program. All costs associated with this program shall be incidental to items included in the work requiring Quality Control by the Contractor.

   The intent of this section is to enable the Contractor to establish a necessary level of control that will:

   a. Adequately provide for the production of acceptable quality materials.

   b. Provide sufficient information to assure both the Contractor and the Engineer that the specification requirements can be met.

   c. Allow the Contractor as much latitude as possible to develop his or her own standard of control.

   The Contractor shall be prepared to discuss and present, at the pre-construction conference, his understanding of the quality control requirements. **The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and approved by the Engineer.** No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed.

   The quality control requirements contained in this section and elsewhere in the Contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

2. Description of Program:

   a. Comply with the Quality Control provisions as specified herein. Perform quality control tests and inspection required by this contract unless specifically designated to be performed by the Owner or Owner's representative.

   b. Contractor Quality Control (QC) shall consist of plans, procedures, and organization necessary to provide materials, equipment, workmanship, software, and operations that comply with the requirements of the Contract Documents. Contractor QC shall cover construction. Installation and implementation operations, including both on-site and off-site work, and shall be keyed to the Project schedule.

   c. The Owner will utilize assigned Owner and Engineer staff and selected Independent Consultants to perform inspections and participate in system tests. The Contractor shall provide notice of inspections and testing to the Engineer prior to execution of tests.

   d. Coordination Meeting: As part of the early coordination meetings the Contractor shall meet with the Engineer to discuss the Contractor's Quality Control System. Items for discussion shall include, but may not be limited to:

      (i) Identification of the Contractor's QC Representative (CQCR) and Configuration Management Representative. These tasks can be done by the same person.
      (ii) Persons responsible for shop drawing and document review
      (iii) Forms of recording the Contractor's QC program
      (iii) Testing administration
      (iv) Interrelationship of the Contractor and Engineer.

3. Contractor Quality Control Requirements

   a. Quality Control Administration: Identify a Contractor QC Representative, who shall work on-site at times during progress of the Work to track and administer the Quality Control processes. This person shall have complete authority to take action necessary to ensure compliance with the Contract Documents. Staff the Contractor's QC organization at a level sufficient to perform the activities outlined in this section for a Project of the scope and size indicated in the Contract Documents.

   b. Qualifications of Contractor QC Representative (CQCR): The CQCR must have prior experience as a Construction Foreman, Lead System Installation Technician, Project Construction Manager, Systems Construction Manager, on site quality representative or inspector on a project of comparable complexity to this project. The CQCR must be approved by the Owner before work on this Contract can begin. The CQCR's performance will be judged principally on the timelines, accuracy and completeness of the CQCR's assessment of the condition of the elements of the work. The Engineer will monitor the performance of the CQCR and if the CQCR fails to perform in accordance with the requirements of this specification, the CQCR will be replaced. If

the CQCR fails to perform to the satisfaction of the Engineer or Owner, he / she will be removed or replaced.

c. Submittals: Identify persons responsible for review and approval of shop drawings, samples, certificates, and other submittals. Approval action will not relieve the Contractor of his responsibility for compliance with the contract, but will indicate only that the general method of construction and detailing is satisfactory. See Section, Submittals, Product Data, and Samples.

d. Quality Control Reports: CQCR shall maintain a log related to Quality Control (QC) and provide reports when requested by the Engineer. QC Reports shall be factual records containing numerical data of the Work and quality control activities. Submit requested QC Reports on approved forms by the next workday following the day of the request.

e. The CQCR shall verify and sign all reports. Verification shall contain the statement that all supplies and materials incorporated in the work are in compliance with the terms of the contract except as noted.

f. Control of On-Site and Off-Site Implementation: Contractor's Quality Control system shall include the following phases of control and management for definable features of work:

(i) Pre-installation Meeting and Inspection Phase: A Preinstallation Meeting will be held prior to beginning work on each definable feature of work in Divisions 2 through 17.

(ii) Process Inspection Phase: The follow-up phase shall be performed continuously to verify that quality standards are maintained throughout the project. Adjustment to control procedures may be required based upon the results of this phase and control testing. Report the results of the inspection in the Contractor QC log for tracking and reporting.

(iii) Final Inspections: Final Inspections will be scheduled by the Engineer after the CQCR notifies the Engineer that the facility and its systems are complete and satisfactory.

4. Quality Control Plan: Submit a job specific quality control plan subject to approval of the Engineer 14 calendar days prior to the start of work on the job site. This plan shall include, as a minimum:

a. Statement of company QC philosophy and policy.
b. Company organization and designation of responsibility of QC activity at both corporate and job site level.
c. Qualifications of QC personnel.
d. Employee QC awareness.

e. Procedure for incorporating sub contractors' QC plans into Contractor QC plan.
f. Description of routine daily and periodic QC activities.
g. Description of examination, testing or inspection activities, including certifications and reports.
h. Procedure to control design changes and revisions.
i. Submittal and shop drawing control procedures.
j. Procedure for nonconformance reporting and disposition.
k. Procedure for control at off-site fabrication or production shops.
l. List of publications or references governing work on this job site.
m. Exhibits of any QC forms or checklists routinely used.

5. Preparation Meetings

a. The Contractor will conduct a meeting with sub contractors, Engineer, and Owner assigned team, Contractor quality control and safety personnel, and any appropriate material suppliers at the beginning of each phase of the work. Preparation meetings will be required for every specification section and as required by the Engineer. The intent of this meeting is to review submitted and approved materials, sequence of field activities, contract details, and potential safety hazards before any problems occur in the field. Field work shall not commence prior to this meeting.

b. The Contractor shall submit a list of preparation meetings which will be held during the project and an anticipated schedule for these meetings. This list shall be submitted for approval by the Engineer no later than 20 calendar days after Notice To Proceed. Preparation meeting agenda should cover:
(i) Introduction of responsible parties.
(ii) Discussion of submitted and approved materials.
(iii) Status of material and equipment delivery.
(iv) Preview of areas where work will begin.
(v) Brief outline of the construction procedures and interface with existing work.
(vi) Quality control tests scheduled for this phase.
(vii) Job hazard analysis.
(viii) Checklist for quality control activities during the phase.

N. QUALITY CONTROL AND QUALITY ASSURANCE

1. This Section specifies administrative and procedural requirements for quality assurance and control services.

Quality control services include inspections and tests and related actions including reports, performed by independent testing and inspection agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Engineer.

Owner quality assurance inspection and testing services will be used to verify compliance with requirements specified or indicated in the Construction Documents. These services

do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

2. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

   a. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

   b. Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

   c. Requirements for the Contractor to provide quality control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

3. Contractor Responsibilities:

   a. The Contractor is required to perform all quality control testing for the project to ensure compliance with the requirements of the Construction Documents.

   b. Retesting: Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction. When owner performed quality assurance testing results in unsatisfactory results, the Contractor shall bring unsatisfactory work into compliance and assume responsibility for all costs associated with retesting of the work.

   c. Associated Services: Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

      (i) Provide access to the Work.
      (ii) Furnish incidental labor and facilities necessary to facilitate inspections and tests.
      (iii) Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
      (iv) Provide facilities for storage and curing of test samples.
      (v) Deliver samples to testing laboratories.
      (vi) Provide the agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.

(vii) Provide security and protection of samples and test equipment at the Project Site.

d. Detailed requirements for the Contractor's Quality Control work are defined in the following Section titled "Contractor Quality Control Program".

4. Owner Responsibilities: The Owner will provide inspections, tests and similar quality assurance services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.

   a. Owner will employ and pay for the services of an independent testing and inspection agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.

5. Coordination: Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

   a. Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

6. If Contractor is responsible for the service, the Contractor's Testing Agency is to submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate to the Engineer.

   a. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

   b. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

      (i) Date of issue.
      (ii) Project title and number.
      (iii) Name, address and telephone number of testing agency.
      (iv) Dates and locations of samples and tests or inspections.
      (v) Names of individuals making the inspection or test.
      (vi) Designation of the Work and test method.
      (vii) Identification of product and Specification Section.
      (viii) Complete inspection or test data.
      (ix) Test results and interpretations of test results.
      (x) Ambient conditions at the time of sample-taking and testing.
      (xi) Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.

(xii) Name and signature of laboratory inspector.
(xiii) Recommendations on retesting.

7. Qualification for Testing Agencies: Contractor shall engage testing agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed. Each independent testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

8. Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Documentation applicable to the repair. Protect construction exposed by or for quality control service activities, and protect repaired construction. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

O. CONTRACTOR SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)

1. Introduction- In accordance with the requirements of the Federal Aviation Administration, a Safety Plan Compliance Document (SPCD) must be created by the Contractor, approved by the Owner, and followed during the Project. The SPCD details how the Contractor will comply with the Owner's Construction Safety Phasing Plan (CSPP). The following requirements outline the document.

a. Airport Operator's Responsibilities
   (i) Provide Contractor with project specific CSPP
   (ii) Require Contractors to submit SPCD
   (iii) Convene preconstruction meeting
   (iv) Coordinate CSPP requirements and construction activities among airport users.
   (v) Obtain and distribute project emergency contact list.
   (vi) Notify airport users (NOTAM, ATIS).
   (vii) Train Contractor personnel on airport procedures and how to maintain security (access control) and communicate while operating vehicles in the restricted and movement areas of the airport.
   (viii) Inspect construction area frequently and resolve any deficiencies noted.
   (ix) Promptly submit 7460-1 for anticipated Contractor equipment (Contractor required to submit if different than anticipated)
   (x) Promptly notify FAA of any changes to the CSPP for review and approval.

b. Contractor Responsibilities (comply with FAA AC 150/5370-2G)
   (i)Comply with the Owner's Construction Safety Phasing Plan (CSPP)

(ii) Prepare and submit a Safety Plan Compliance Document (SPCD) to the Owner's rep that complies with the Owner's Construction Safety Phasing Plan (CSPP).

(iii) Have available at all times and comply with the CSPP and SPCD

(iv) Provide a communication plan and 24/7 points of contact (updated during project if necessary) and ensure that construction personnel are familiar with safety procedures and regulations.

(v) Identify the Contractor's on-site employees responsible for monitoring compliance with the CSPP and SPCD during construction (at least one designated person must be on-site whenever active construction is taking place).

(vi) Describe specifically how the Contractor will:

- Notify construction (7460-1) and comply with permit requirements
- Coordinate safety with contractor, subcontractor, and airport personnel.
- Phase construction including:
  - Areas of construction, duration, night work, impact to airfield operations, coordination of closures and opening of airfield pavements and inspections.
  - Control safety and security of access (gates) and haul routes (marking and signs), vehicles (safety equipment), personnel (safety equipment), equipment (movement, parking) and material (storage).
  - Airfield escort procedures for Contractor personnel (including subcontractors and material suppliers), vehicles and equipment.
  - Communicate with each other (including subcontractors and material suppliers), flagmen and Air Traffic Control Tower.
  - Protect the work areas and runway and taxiway safety areas - use of barricades, markings, lighting and fencing.
  - Keep airport operational for all users per plans (temporary airfield pavement, markings, service roads, etc.).
  - Inspection requirements
- Immediately cease operations within the aircraft movement areas and remove all personnel and equipment from the site during low visibility and SMGCS conditions. Identify areas or activities outside of the aircraft movement areas where work can continue during low visibility and SMGCS conditions. Compliance with this requirement shall be non-compensatory except for time.
- Minimize delays due to construction activity.
- Prohibit or minimize conflicts among construction activities and airport operations.
- Maintain safety of personnel using airport at all times (daily safety meeting, etc.).
- Wildlife management
- Control Foreign Object Debris (FOD), material waste, garbage and hazardous materials.

2. Safety Areas and Work Limits

a. Runway and Taxiway Safety Area (RSA and TSA), Object Free Area (ROFA and TOFA) and Obstacle Free Zone (OFZ) - Requirements defined by AC 150/5300-13 and AC 150/5370-2

(i) Runway thresholds must provide an unobstructed approach surface over equipment and materials.

(ii) No construction may occur within the existing Runway Safety Area (RSA) and Taxiway Safety Area (TSA) while the runway and/or taxiway is open for aircraft operations.

(iii) Open excavations or trenches are not permitted within the RSA while the runway is open for aircraft operations. If the Contractor is permitted to work in the RSA with the runway closed, prior to re-opening the runway, the Contractor shall cover and/or grade and compact the area inside the RSA to support, under dry conditions, snow removal equipment, aircraft rescue and fire fighting (ARFF) equipment and the occasional passage of aircraft without causing structural damage to the aircraft.

(iv) Open excavations or trenches are not permitted within the TSA while the taxiway is open for aircraft operations. If the Contractor is permitted to work in the TSA with the taxiway closed, prior to re-opening the taxiway, the Contractor shall cover and/or grade and compact the area inside the TSA to support, under dry conditions, snow removal equipment, aircraft rescue and fire fighting (ARFF) equipment and the occasional passage of aircraft without causing structural damage to the aircraft.

(v) Maintain the RSA and TSA as defined on the plans and specifications unless the runway is closed or restricted to aircraft operations.

(vi) Construction, including excavations, may be permitted in the Runway Object Free Area (ROFA), however, equipment must be removed when not in use and material shall not be stockpiled in this area.

(vii) No construction may occur within the Taxiway Object Free Area (TOFA) while the taxiway is open for aircraft operations except as follows: Appropriate NOTAMs are issued, appropriately marked and lighted, and five foot clearance is maintained between equipment and materials and any part of an aircraft (includes wingtip overhang). Flaggers must be used to direct construction equipment and wing walkers (airline/aviation personnel) will be necessary to guide aircraft.

(viii) Personnel, equipment and/or material may not penetrate the Obstacle Free Zone (OFZ) while the runway is open for aircraft operations.

(ix) Where operations by turbojet aircraft are anticipated, review takeoff procedures and jet blast characteristics of aircraft and incorporate safety measures for construction workers in the contract documents.

3. Marking and Lighting

a. Hazardous areas on the movement area will be marked with barricades, flags, and/or flashers. These markings must restrict access and make hazards obvious to aircraft, personnel, and vehicles. During periods of low visibility and at night, identify hazardous areas with red flashing or steady-burning lights (specify). The hazardous area marking and lighting will be supplied by the contractor, and will be depicted on the Safety Plan.

b. Barricades must be:
   (i) Marked with diagonal, alternating orange and white stripes
   (ii) Low profile (low in height and mass)
   (iii) Easily collapsible
   (iv) Weighted to prevent displacement
   (v) Have red (steady or flashing) lights every 20’ at night and during low visibility conditions.

*Railroad ties/metal drums/Saw horses and jersey barriers are prohibited in, or adjacent to, the Movement Area.

c. Owner-provided Lighted “X” must be placed, by Contractor, at each end of closed runway.

4. Ground Vehicles and Escort Requirements

a. When any vehicle, other than those having prior approval from the airport operator, must travel over any portion of an aircraft movement area, it will be escorted by airport authority vehicles equipped with radio capable of communicating with ATC and properly identified. Those having prior approval and training to travel in the movement area of the airport shall have a two-way radio and the capability of communicating with the Air Traffic Control Tower. If escorting more than one vehicle and/or equipment, there shall be a lead vehicle and a trail vehicle capable of monitoring and communicating with each other and the Air Traffic Control Tower. Up to five (5) vehicles can be escorted in convoy by two (2) authorized escorts. If escorting through the restricted area to a movement area controlled by a flagger, the escort vehicle must have two-way communications with the flagger and the flagger must have two-way communications with the lead vehicle, the trail vehicle, other flaggers on the travel route and the Air Traffic Control Tower.

b. To operate during daylight hours, the vehicle must have a flag or beacon attached to it. Any vehicle operating on the movement areas during hours of darkness or reduced visibility must be equipped with a flashing amber dome-type light capable of being seen by the Air Traffic Control Tower.

c. Vehicles should be clearly identifiable for control purposes. Decals must be prominently displayed on each side of the vehicle (magnetic or static decals are not acceptable).

d. Employee and equipment parking shall be controlled in designated areas.

e. All vehicle operators having access to the movement area must be trained on operating vehicles within the movement area and be familiar with procedures for the operation of ground vehicles and knowledgeable of the consequences of noncompliance with established vehicle operation rules and regulations.

5. Movement Certification

a. Training in airfield familiarization will provide for safe vehicle operations.
   (i) The Contractor is responsible of obtaining training documents from the Airport Operations department
   (ii) Airport Operations will provide movement training in order for contractors to receive movement area certification allowing them to drive in the movement area unescorted. This will be limited to the precise construction area.
   (iii) Compliance shall be monitored by both the contractor and Airport Operations on a continuous basis.

6. Radio Communication

a. Vehicular traffic located in or crossing an active movement area must have a working two-way radio in contact with the control tower or be escorted by a person in radio contact with the tower. The driver, through personal observation, should confirm that no aircraft is approaching the vehicle position. Construction personnel may operate in a movement area without two-way radio communication provided a NOTAM is issued closing the area and the area is properly marked to prevent incursions.

b. The Contractor is responsible for purchasing and maintaining two-way airfield radios capable of clearly communicating with the Air Traffic Control Tower (ATCT).

7. Daily Inspections of the work area are required and will be conducted by the Airport Operator. These inspections should include items such as locations of parked equipment and stockpiled materials, gates, fencing, barricades and lighting. Airport Operations will

inspect all construction areas located in the Movement area once work has concluded for the day or work period.

P. OPERATION OF THE AIRPORT

The Contractor shall comply with each of the following Special Conditions. Capitalized terms that are not defined in these Special Conditions have the meaning given in the Contract Documents between the Owner and the Contractor for the purchase and installation of the equipment.

1. All Work done under the Contract Documents shall be carried on in such a manner so as to ensure the regular and continuous operations of the Raleigh-Durham International Airport ("Airport"). At times during the duration of the Project, the Contractor will be working in an operational airport terminal environment.

2. The Contractor shall adhere to all Transportation Safety Administration (TSA) and Federal Aviation Administration (FAA) regulations regarding access to, parking near, and work within the terminal buildings and secure areas where the Work will be conducted.

3. No portion of the work may be opened by the Contractor for public use until ordered by the Owner. Should it become necessary to open a portion of the work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Owner, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provisions of the contract. Any damage that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at its expense. The Contractor shall make its own estimate of the inherent difficulties in opening work on a temporary or intermittent basis and shall make no claim for additional compensation or time extension because of any delay or increased cost on account thereof.

Q. SITE AVAILABILITY

1. The Contractor shall have access to the site as identified on the Drawings. Details regarding any limitations on access, including the time of site availability, are indicated in the Contract Documents. All deliveries of equipment and materials shall be made as indicated in the Drawings. Delivery of permit loads will be coordinated a minimum of 24 hours in advance with the Engineer.

2. The Owner reserves the right to limit the number or active work areas at any one time to minimize disruptions of Airport operations.

3. Unless otherwise noted or approved by the Engineer and Owner, and as shown on the Drawings, all primary taxiways, taxi-connectors, and taxi-lanes utilized by aircraft in the

facility will remain open at all times and maintained in an acceptable manner. The work is to be sequenced and scheduled so as to minimize disruption of Airport operations, as further described on the drawings or as indicated herein.

R. USE OF FACILITIES

Use of the operating public parking lots and any other terminal area facilities and/or buildings by employees of the Contractor and its subcontractors and material and equipment suppliers shall be prohibited.

S. CONTRACTOR PERSONNEL IDENTIFICATION REQUIREMENTS

1. Any person employed by the Contractor, sub contractor, material suppliers, etc., will be required to present positive identification before entering the Restricted Area of the Airport or be escorted by properly trained Contractor appointed individuals while in the Restricted Area during the entire course of the project. Positive identification shall be in the form of a security badge issued by the Owner that includes a photo. To obtain a security badge with photo, the requester shall submit to a FBI fingerprint-based Criminal History Records Check (CHRC) and submit a completed and signed RDU Security Authorization Badge Application to the Owner's Security ID Badge Office. There is a fee for the finger print check. Following clearance of the FBI Criminal History Records Check, applicants must then attend a security training class and pass a written examination given by the Owner's Training Department. There is a separate processing fee for the RDU Security Authorization Badge application for each person requesting a security badge. See prevailing rates for fees and for replacement fees at the Office of the Airport Security Administrator. The fee for badges and replacement badges is subject to increase at the Owner's sole discretion. (A "Security Authorization Badge Application" must be obtained from the Security Administrator's office.)

2. Badge applications and applicable fees/deposits must be submitted to the Owner's Security Systems Administrator at least four (4) business days prior to the applicant attending the security training class. In order to reserve a seat in the security training class, applicants must pre-register by calling the Owner's Security System Administrator's Office, between the hours of 8:00 a.m. to 12 noon or 2:00 p.m. to 5:00 p.m. weekdays. Classes are typically held every Tuesday and Thursday (except legal holidays) beginning promptly at 8:30 a.m. and ending at about noon.

In addition to the requirements above, the Department of Homeland Security (DHS) has enacted **Security Bulletin 2007-03**, stated herein.

Effective October 1, 2007, the Transportation Security Administration (TSA) and the Department of Homeland Security (DHS) and will officially begin processing Security Threat Assessment information for all new badge applications of airport employees and other personnel or applicants who will be working in or have unescorted access to the AOA, secured area, sterile area, SIDA, or

any area for which the airport has issued a personnel identification media. Title 49 U.S.C. §114 authorizes the collection of this information by the DHS and TSA.

The information will be used by TSA/DHS and disclosed to personnel and contractors or other agents who need the information to assist in activities related to aviation security. Additionally, DHS may share the information with facility operators, law enforcement or other government agencies as necessary to respond to potential or actual threats to transportation security, or pursuant to its published Privacy Act system of records notice.

- **Information Required on the RDUAA Security Badge Application**

Applicants and employers are required to complete the following information on the RDU Security Authorization Badge Application for the Security Threat Assessment process (STA). The employer shall also be responsible for verifying the information by reviewing valid ID identification provided by the badge holder or badge applicant.

1. Full Name
   a. Last name
   b. First name
   c. Middle name or initial, where available
2. Personal Information
   a. Gender (M or F)
   b. Date of birth (MMDDYYYY)
   c. Place of birth – (Name of US State/Territory or Country)
   d. Social Security Number
   e. Citizenship country
3. Alien Registration Number (if applicable)
4. Non-Immigrant Visa Number (if applicable)
5. Passport (This information is voluntary and may expedite the adjudication process for applicants who are U.S. citizens born abroad.)
   a. Passport country
   b. Passport number

Incomplete applications will not be accepted or processed.

- **Security Threat Assessment Processing Time**

The Federal government and not the Airport Authority dictates the processing time for completing the Security Threat Assessment. It is projected that the initial process may take to up to one full week to complete for a badge applicant.

New applicants will not be allowed to process for a badge until the DHS/TSA Security Threat Assessment is completed. This is in addition to the FBI/TSA Criminal History Records Check required for selected badge types.

- **Security Threat Assessment Results**

TSA will disclose an individual's Security Threat Assessment results on a "PASS" or "FAIL" basis to the airport. If an individual fails the Security Threat Assessment, they shall have their badge or badge application permanently revoked. The DHS/TSA has not provided for an appeals process for applicants failing the Security Threat Assessment.

QUICK REFERENCE GUIDE

FINGERPRINTING (FBI CRIMINAL HISTORY RECORDS CHECKS), TSA SECURITY THREAT ASSESSMENT AND THE BADGING PROCESS

STEP 1 - BADGE APPLICANTS AND THEIR EMPLOYER SHALL REVIEW AND COMPLETE THE RDUAA SECURITY BADGE APPLICATION (IMPORTANT INFORMATION IS ON THE BACK OF THE APPLICATION PERTAINING TO DISQUALIFYING CONVICTIONS AND CONDITIONS.)

- **PLEASE NOTE** – A CRIMINAL CONVICTION MEANS PLEADING GUILTY OR BEING FOUND GUIILTY (OR NOT GUILTY BY REASON OF INSANITY). TO A CRIMINAL CHARGE (MISDEMEANOR AND/OR FELONY, AND DUI/DWI). CONVICTIONS INCLUDED PAYING A FINE, SERVING PROBATION OR SERVING SERVED TIME IN PRISON.

- **OFF AIRPORT CONTRACTORS** – OFF AIRPORT CONTRACTORS (CONSTRUCTION AND/OR SERVICE PROVIDERS) ARE REQUIRED TO BE SPONSORED BY AN RDU AUTHORIZED AIRPORT TENANT OR THE AUTHORITY. THE BADGE APPLICATION SHALL REQUIRE SIGN-OFF BY THE AUTHORIZED MANAGER FOR THE TENANT AND/OR AUTHORITY DEPARTMENT THAT IS SPONSORING THE WORK.

STEP 2 - THE EMPLOYER AND/OR EMPLOYEE SHALL **CONTACT THE RDU ID BADGE OFFICE AT 919-840-7515** DURING NORMAL BUSINESS HOURS (MONDAY THRU FRIDAY 8:00 AM TO 5:00 PM EXCEPT LEGAL HOLIDAYS) TO SET UP FINGERPRINT APPOINTMENT.

FINGERPRINTING IS BY **APPOINTMENT ONLY ON** MONDAY AND WEDNESDAYS (FRIDAY MORNING IS AVAILABLE BY REQUEST ONLY). MISS YOUR APPOINTMENT, THEN YOU MUST RESCHEDULE!

STEP 3 - THE NEW EMPLOYEE MUST BRING THEIR SIGNED AND COMPLETED RDUAA SECURITY AUTHORIZATION BADGE APPLICATION ALONG WITH 2 FORMS OF ID – SOCIAL SECURITY CARD AND GOVERNMENT ISSUED PHOTO ID.

NON-US CITIZENS SHALL ALSO BE REQUIRED TO BRING THEIR PASSPORT AND OR INS ALIEN REGISTRATION CARD (E.G. PERMANENT RESIDENT, EMPLOYMENT AUTHORIZATION DOCUMENT, OR VISA).

EMPLOYERS SUCH AS CONSTRUCTION CONTRACTORS, WHICH DO NOT HAVE A TENANT BILLING RELATIONSHIP WITH RDUAA SHALL ALSO BE REQUIRED TO BRING THE FINGERPRINT FEE SUBMITTAL IN ADVANCE – NO EXCEPTIONS.

- THE NEW EMPLOYEE MUST RESCHEDULE THE APPOINTMENT IF THEY FAIL TO BRING THE COMPLETED AND SIGNED APPLICATION AND/OR ACCEPTABLE FORMS OR IDS AND/OR PAYMENT!

STEP 4 - **ONCE FINGERPRINTS ARE SUBMITTED TO THE TSA, THE TURNAROUND TIME FOR PROCESSING THE APPLICATION IS CONTINGENT ON THE TSA AND FBI COMPLETING THE FINGERPRINT BASED CRIMINAL HISTORY RECORDS CHECK AND SECURITY THREAT ASSESSMENT. PLEASE ALLOW SUFFICIENT LEAD TIME SINCE THE AUTHORITY HAS NO INFLUENCE ON EXPEDITING THE PROCESS ONCE TSA AND FBI RECEIVES SUBMITTAL FOR PROCESSING.**

STEP 5 - EMPLOYEE APPLICANTS OR THEIR EMPLOYERS MAY ARRANGE FOR SIDA CLASS WHEN THEY CALL TO SEE IF THE CRIMINAL HISTORY RESULTS HAVE BEEN REVIEWED AND APPROVED. ONLY THOSE EMPLOYEE APPLICANTS, WHICH THE ID BADGE OFFICE HAS RECEIVED AND REVIEWED THE RESULTS OF THEIR CRIMINAL HISTORY RECORDS CHECKS AND CLEARED SECURITY THREAT ASSESSMENTS WILL BE ALLOWED TO TAKE THE SIDA CLASS.

STEP 6 - UPON PASSING THE SIDA CLASS, THE BADGE ISSUANCE AND PAYMENT PROCESS WILL REMAIN THE SAME AFTER STEPS 1 THROUGH 5 HAVE BEEN COMPLETED.

ID Badge Office
Schedule of Charges, Deposits and Fees

TSA required FBI Fingerprint Based Criminal History Records Check (CHRC) for "SELECT" ID Badges

Non-Air Carrier Employees and Contractors $ prevailing rate

Employee ID Badge $ prevailing rate

- ID Badges are billed on a quarterly basis with Airport Users that have established a billing relationship with RDUAA Finance Department.

Lost ID Badge Fees

1st Time Replacement Fee $ prevailing rate
2nd Time Replacement Fee $ prevailing rate

- *Any ID Badge holder that loses an ID Badge 3 times will not have their Badge reissued.*
- *ID Badges that are recovered and returned within 2 business days are eligible for a Replacement Fee Refund.*

General Aviation Badge Deposit Fee $ prevailing rate

- Refundable when returned to the ID Badge Office after use.

CONTRACTOR FEES & DEPOSITS

Contractor ID Badge Fee $ prevailing rate
Contractor Badge Deposit $ prevailing rate
Airside Vehicle Authorization Decal Deposit $ prevailing rate
Key Deposit $ prevailing rate

- All Deposits are refundable when items are returned to the ID Badge office.

UN-RECOVERED ID BADGE AND KEY PENALTY FEES

- All badges and/or issued by RDUAA are the property of RDUAA. The employer is responsible for recovering and returning ID badge of any employee no longer working or assigned at RDU. The employer may be charged the following penalty fees for failing to recover and return RDU badges.

Un-recovered SIDA Badges (Paid by Employer) $ prevailing rate
Un-recovered Non-SIDA Badges (Paid by Employer) $ prevailing rate
Un-recovered Keys* (Paid by Employer) $ prevailing rate
(*In addition to the cost of re-coring doors and gates based on the key type.)

ALL FEES ARE SUBJECT TO CHANGE BY RDUAA

T. CONTRACTOR VEHICLE IDENTIFICATION

1. All vehicles and equipment used within the project site shall display company identification in a manner acceptable to the Owner. While within the Movement Area of the Restricted Area, all vehicles must be equipped with a rotating amber colored beacon (outside of the vehicle).

2. All vehicles and equipment to be used on the project within the Restricted Area shall be admitted to the project site only after positive identification of said vehicle. Each unescorted vehicle or equipment entering the Restricted Area is required to have an "Airside Vehicle Pass" issued by the Owner's Security Systems Administrator. To obtain this pass the Contractor, subcontractor, or material suppliers must complete and submit an "Airside Vehicle Pass Request Form" per vehicle or equipment with the following information.

    a. a complete description of the vehicle, including make, model, year and color,
    b. the license number, state, and expiration date
    c. the owner of the vehicle (if required), and
    d. evidence that the vehicle is insured in accordance with the Owner's requirements
    e. the authorized driver(s) of the vehicle or equipment

3. Airport vehicle passes will only be issued to company-owned vehicles and under no circumstances shall employee-owned vehicles and equipment be allowed in the Restricted Area. No vehicle without an airport vehicle pass shall be allowed within the Restricted Area except under escort by photo-badged Contractor or sub contractor employees who have the proper designations on their security badges that allow them to drive within the Restricted Area. The Contractor shall complete and submit an "Airside Vehicle Pass Request Form" along with a fifty-dollar ($50) fee per vehicle to obtain such passes. (An "Airside Vehicle Pass Request Form" may be obtained from the Security Administrator's Office.)

4. The Contractor shall designate an authorized company official on the "Authorized Signature Form" who will certify and sign "Key Request" forms, "Security Authorization Badge Application" forms, and "Airside Vehicle Pass Request" forms (an "Authorized Signature Form" may be obtained from the Security Administrator's Office). The Key Request Forms will require both the signature of the authorized company officers and the key holder. Note key cost on fee schedule.

U. DRIVER PERMIT REQUIREMENTS

1. Any person employed by the contractor, subcontractor(s), material suppliers, etc., in connection with the project who will operate motor vehicles or equipment within the Restricted Area, but not in the Movement Area, and without an escort, shall at all times

have a security badge with photo with the proper designation to operate such motor vehicle or equipment within the Restricted Area. To obtain the proper designation on the security badge, the requester shall mark the blocks entitled “SIDA”, “Ramp Driving”, and “Contractor” on Part B, of the Security Authorization Badge Application, attend a Driver’s Training class (the Driver’s Training class immediately follows the Security Training class) held by the Owner’s Training Department, and take a written examination. Each person shall attain a passing score in the drivers training examination prior to receiving the proper designation on their Security Badge. There is no separate fee for requesting this designation; it is part of the fee for obtaining a Security Badge.

2. The examination covers rules, regulations and procedures for operating vehicles and equipment within aircraft movement and non-movement areas. Study material for the written drivers training examination is available in the "Driver's Permit Study Guide" manual issued by the Owner. A copy of the manual can be obtained from the Owner's Security Systems Administrator or Training Department.

3. Vehicles or equipment that are required to have access to the Restricted Area, including those delivering materials to the project site, must obtain an Airside Vehicle Pass as described in Paragraph **U** above or else the drivers of the vehicles and equipment must be included on a list of drivers submitted to the Airport Authority for specific vehicles or equipment through the Engineer a minimum of 48 hours prior to the time at which the driver must access the Restricted Area. The security gate guard described below in Paragraph X will, upon inspection of vehicles or equipment requesting permission to enter the Restricted Area, check whether the driver of the vehicle or equipment is on the list and if the driver is operating vehicles or equipment associated with their name on the list. The Security gate guard may deny access if the drivers name is not on the list and if the drivers name does not match equipment or vehicles for which they are listed to operate in the Restricted Area. The Owner also has the authority to deny access to the Restricted Area at their sole discretion. A current list of cleared drivers shall be maintained by the Security Gate Guards at all times.

4. Additionally, the Contractor shall provide escorts for all vehicles or equipment driven by personnel not possessing and/or displaying a proper security badge. Contractor escorts shall be properly badged and authorized to provide escort within the Restricted Area and if applicable, the Movement Area. A single authorized escort shall be allowed to escort a single vehicle. Up to five (5) vehicles can be escorted in convoy by two (2) authorized escorts. In this case, escorted vehicles shall be led by an approved escort and followed by an approved escort behind the last vehicle in the convoy. The convoy shall remain together at all times when traveling inside the Restricted Area and if applicable, the Movement Area.

5. Any person employed by the contractor, subcontractor(s), material suppliers, etc., in connection with the project who will operate a motor vehicle or equipment within the Movement Area of the Restricted Area without an escort shall at all times possess and display a security badge with photo and proper designation to operate such motor vehicle or equipment within both the Restricted Area and Movement Area. To obtain the proper designation on the security badge for driving within the Movement Area, the requester

shall attend multi-day classroom training on airport orientation, terminology, and communications and airfield driver's training followed by successful completion of both written and practical airfield driver/communication examinations. The practical airfield driver/communication training may require several training sessions to achieve the proficiency necessary to pass the practical airfield examination, which is given at night. The practical airfield driving examination will be conducted by the Operations Department staff and the designated examiner shall be the sole judge of the requester's authorization to receive Movement Area driving privileges.

V. MAINTENANCE OF TRAFFIC

1. General

The Contractor will be required to maintain traffic within the limits of the project, including all existing roads, taxiways, taxi-lanes, taxi-connectors, and apron areas which cross or intersect the project and are within the project limits, and access roads constructed by him/her as required by the Contract, unless otherwise provided on the plans. Traffic shall be maintained from the time the Contractor begins work on the project site until final acceptance of the project, including any periods during which the Contractor's operations are suspended. The Contractor shall conduct his/her work in a manner that will create a minimum amount of inconvenience to traffic.

The Contractor shall be responsible for maintaining in a safe, passable, and convenient condition, such part or parts of existing roads as are being used by him to maintain local or through traffic within the limits of the project from the time the Contractor begins work on the project until final acceptance of the work.

Signing, barriers, barricades, lighting, traffic control devices, and traffic control operations used in maintaining traffic shall be in accordance with the applicable provisions of the edition in effect on the date of advertisement of the *Manual on Uniform Traffic Control Devices for Streets and Highways* as prepared by the National Joint Committee on Uniform Traffic Control Devices and the FAA's Advisory Circular 150/5370-2G, *Operational Safety on Airports During Construction.* Any traffic control devices utilized shall be approved by the Engineer. Certain traffic control items may be addressed on the plans.

Payment for the various traffic control items and maintenance of traffic shall be included in the cost for "Mobilization."

2. Traffic Control Supervision

The Contractor shall designate one individual who will have complete charge of the Contractor's traffic control program on the project as his/her project traffic control supervisor. This individual shall be given full authority by the Contractor to take such

action as may be necessary to ensure that traffic is maintained in accordance with the requirements of the contract. He/she shall work with the Engineer so that the coordinator is informed of all details concerning the Contractor's traffic control program. The Contractor's traffic control supervisor or his/her designated representative shall be on call at all times and shall make any necessary changes in traffic control operations. The Contractor shall submit the traffic control program and the name of the proposed traffic control supervisor to the Engineer within ten (10) days calendar days of start of work.

All traffic control plans are subject to the Engineer's approval.

3. Traffic Control Through the Project

The Contractor shall provide, erect, and maintain all necessary barriers, barricades, suitable and sufficient warning lights, danger signals, and signs; shall provide a sufficient number of flagmen direct the traffic; and shall take all necessary precautions for the protection of the work and the safety of the public.

When the work requires the closure of a runway, the Contractor shall erect at both ends of the closed runway, Runway X's. If the Project includes new "Runway X's," then the Contractor shall use the new equipment. Otherwise the Owner will provide two pieces of equipment in working order. The units are trailer-mounted and the contractor must be equipped to tow the units to the intended locations. The Contractor shall refuel, lubricate as necessary, and keep the equipment in good working order when used, including the replacement of light bulbs. Runway closures, when undertaken independent of taxiway closures, will not require barricades.

When the work requires the closure of a section of taxiway or taxiway connector, the Contractor shall provide and place Contractor-provided barricades at each point of closure. Each point of closure typically requires two to six barricades. The barricades shall be as specified or as indicated in the plans.

For daytime closures, the barricades may require flags, but no lighting. For night time closures, the contractor must provide and install at least two working lights on each barricade.

The Contractor shall erect and maintain effective warning and directional signs along all construction detours clearly directing traffic around the closed portion or portions of the highway, or other route, and along the entire length of the construction detour.

All barriers, barricades, and obstructions or hazardous conditions shall be illuminated as necessary to provide for safe traffic conditions.

Warning and caution signs shall be posted throughout the length of any portion of the project where traffic flow is restricted.

Unless otherwise permitted by the Engineer, signs, markers, barriers, barricades, and other traffic control devices shall be temporarily removed or altered by the Contractor at night or at other times when construction operations are not underway and the condition of the roadway or airfield being used by traffic does not present a hazard. Such traffic control devices shall be replaced by the Contractor prior to the resumption of construction operations.

Advisory speed limit signs used by the Contractor shall be posted only when and where reduced speeds are warranted, and such reduced speeds shall be the maximum speeds which are reasonable under the prevailing conditions.

The Contractor shall provide continuous, safe access to all properties, both public and private, along the project in all cases where such access will be provided by the completed facility and shall conduct his/her operations in such a manner that inconvenience to the property owners will be held to a minimum.

4. Construction While Maintaining Traffic

When work is to be performed while maintaining traffic, the Contractor shall schedule and perform the work so as to create the least safety hazard to traffic.

At each location where work is started that creates a safety hazard, it shall be continued until completed to the extent that the safety hazard is eliminated. If the work is not pursued in a continuous manner, the Engineer will not allow any other work on the project to be performed until the existing safety hazard is eliminated. At each phase of the work or closure, the Contractor is required to work continuously until the closed section of pavement may be re-opened to aircraft movements with the appropriate pavement markings in place.

Payment for maintaining traffic in construction areas shall be inclusive of the unit or lump sum pricing in the Proposal.

W. CONTRACTOR CONTROLLED SECURITY GATES

Where ingress and egress through a security gate is authorized by the Authority’s Security Administrator, the contractor is required to maintain the Airport's security program at all times. Security gates must be operated by responsible, properly trained personnel appointed to control all ingress and egress from the construction site through the contractor-

controlled gate. The gate must never be unattended while left open and must immediately be locked after completion of each ingress/egress operation.

A gate key can be requested by completing and submitting a "Key Request Form" along with a fee per key requested. A "Key Request Form" may be obtained from the Office of the Authority's Security Administrator.

X. COOPERATION BETWEEN CONTRACTORS

The Owner reserves the right at any time to contract for or allow others to contract for and perform other or additional work on or near the work covered by the Contract Documents. The Contractor shall carefully plan its work as well as monitor and coordinate the work of others so as not to affect this Project. When separate or additional contracts are let within the limits of this Project, each contractor shall conduct its work so as not to interfere with or hinder the progress or completion of the work being performed by other contractors. Contractors working within the limits of the same project area shall cooperate with each other.

Y. MAINTENANCE OF EXISTING FACILITIES AND PROTECTION OF WORK BY OTHERS

1. Locations of existing underground utilities and drainage structures shown on the drawings have been taken from public records and field investigations. The Engineer does not guarantee that all existing facilities such as pipelines, electrical lines, conduit, telephone cable, service connections, or other facilities are shown on the Plans. It shall be the Contractor's responsibility to have all utilities located by their respective owners, field mark the utility locations, and protect all such existing facilities prior to beginning construction. The Contractor is fully responsible for notifying all utility owners in accordance with NC General Statute – Chapter 87, Article 8, **The Underground Damage Prevention Act.**

2. Extreme care shall be exercised when working with equipment near existing underground utility lines, drainage structures, and streets. Neither the Engineer nor the Owner will assume or accept any responsibility for charges assessed by private or public utility companies. All such costs are to be borne by the Contractor within the unit prices and/or lump sum prices stated in its bid.

3. In executing the work, the Contractor shall make every effort not to interrupt or damage existing facilities. Any damage that is done thereto shall be restored by the Contractor, at its own expense, to a condition equal to that existing at the time of the award of the Contract.

2. Contractor is responsible to protect airfield, and other, pavements from damage at all times. Any damage caused by Contractor activities shall be restored by Contractor, at its own expense, to a condition equal to that existing at the time of award of contract.

3. In executing the work, the Contractor shall make every effort not to interrupt or damage existing facilities. Any damage that is done thereto shall be promptly repaired by the Contractor at his/her own expense. The Contractor is cautioned that any FAA facility cables in the project limits are essential to the operation of the Airport and are to be protected from damage and interruption at all times.

4. The Contractor shall locate all FAA facility cables by hand excavation prior to construction to determine their vertical locations.

Z. ACCESS ROADS AND HAUL ROADS

1. Access and/or haul roads to and through the construction site will be as shown in the plans and specifications and established in the field by the engineer. The haul route will be established to minimize conflict with the airport operations and shall be maintained, be well defined, and be confined to the minimum area required.

2. The Contractor shall construct the access and/or haul roads and shall maintain the roads as required so as not to create dust. All project traffic must be routed through these areas. The Contractor shall provide all markings required to clearly define these roads.

3. If access and/or haul roads cross a utility, the Contractor shall protect the utility as directed by the owner of the utility.

4. If access and/or haul roads require a ditch/swale crossing, the Contractor shall provide reinforced concrete pipe and any grading necessary to create the ditch/swale crossing.

   There shall be no direct payment for non-public access route construction, continuous maintenance, and removal of access and/or haul roads including seeding, where required, of these areas. Payment shall be included in the cost for “Mobilization".

AA. TEMPORARY FACILITIES AND CONTROLS

1. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to, the following:

   a. Building Code requirements
   b. Health and safety regulations.
   c. Utility company regulations.
   d. Police, Fire Department and Rescue Squad rules.
   e. Environment protection regulations.

2. Standards: Comply with NFPA Code 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

    a. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70, "National Electric Code."

3. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

4. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in safe and efficient manner. Relocate temporary services and facilities as Work progresses. Do no overload facilities or permit them to interfere with progress. Take necessary fire prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on site.

5. Equipment: Provide new equipment; if acceptable to Engineer, undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

BB. SUPPLY OF UTILITIES

1. Contractor shall consult with the Engineer in regard to on-site water supply. A source and manner for obtaining water shall be approved by the Engineer before any water is secured. The Contractor shall be required to provide all equipment, labor, materials, and permitting required to provide a temporary water line to the project site. The Contractor will be required to provide and install a water meter, and a backflow prevention device, approved by the Owner, at the source of the temporary water supply. Connections to fire hydrants may be permitted. Any expenses of securing water connection shall be borne by the Contractor, as well as removing the connection at the end of its use and restoring the property to its original condition or better. The Owner will pay for water usage by the Contractor, including that for a concrete batch plant on site if required, for the duration of the project.

2. The Contractor shall contact Duke/Progress Energy to obtain electrical service in support of Contractor activities. Any expenses of securing construction electrical service from the source of supply shall be borne by the Contractor. The source of supply shall be approved by the Engineer. If the Contractor constructs any temporary structures and/or field office(s) which require the installation of electrical service, the Contractor shall pay for electrical energy used in such facility at the rates of the utility company furnishing power.

CC. CONSTRUCTION LAYOUT

1. The Engineer has established horizontal and vertical control points, as shown on the project plans. No additional control points will be established by the Engineer or Owner. The Contractor shall lay out all work and make all surveys necessary for the satisfactory completion of the work in accordance with the Contract Documents from said control points as given to him/her by the Engineer. The Contractor shall be responsible for all measurements required for the execution of the work. See also Technical Specifications for requirements related to this Section.

2. The Contractor shall furnish, at his/her expense, such stakes, templates, platforms, equipment, tools, and materials, and all labor as may be required in layout of any part of the work from the horizontal and vertical control established by the Engineer. This control shall be provided prior to construction. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks established by the Engineer until authorized to remove them, and if such marks are destroyed by the Contractor through his/her negligence prior to their authorized removal, they shall be promptly replaced by the Contractor. The Engineer or Owner shall require that work be suspended at any time when survey marks established by the Contractor are not reasonably adequate to permit satisfactory prosecution and control of the work.

3. The Contractor shall provide competent and experienced personnel for all layout work. Copies of all field notes, field computations, and other records taken in the field by the Contractor for the purpose of layout, progress, initial and final surveys shall be furnished to the Engineer by the Contractor if requested. All surveys made by the Contractor shall be made under the supervision of a Professional Surveyor registered in the State of North Carolina. All survey and layout performed by the Contractor will be subject to verification by the Owner.

DD. ENVIRONMENTALLY SENSITIVE AREAS ADJACENT TO THE PROJECT SITE

1. Portions of this project are to be constructed adjacent to drainage courses upstream of environmentally sensitive areas. If applicable, the Owner has secured permits to construct within the proper limits as indicated on the drawings. It is imperative that all Contractor's men and equipment stay within the project limits and not disturb areas beyond these limits. Areas adjacent to the project site shall be protected and will be monitored continually throughout the project. Violations of this directive to keep these areas free from men and equipment could result in fines and/or project suspension. Should the Owner be fined for the Contractor's negligence in this matter, the amount of the fine shall be deducted from the Contractor's payment. Should the project be suspended due to Contractor's negligence, the Owner may, at his discretion, impose the appropriate liquidated damages, or actual damages caused by the delay or project termination.

   The following conditions apply for work upstream of the environmentally sensitive areas:

a. The Contractor will take every reasonable effort to perform his activities so as to minimize any adverse impact on fish, wildlife, and natural environmental values.

b. The Contractor will perform his activities so as to minimize any degradation of water quality.

c. The Contractor will permit and cooperate with the Owner and any other agencies in making periodic inspections to assure that activities are being performed in strict accordance with the specific requirements of the contract documents.

d. All activities that involve the discharge of fill materials into adjacent streams shall be consistent will applicable water quality standards, effluent limitations, and standards of performance, prohibitions, pretreatment standards, and management practices established pursuant to the Water Act (33 U.S.C. 1413) and pursuant to State and local law.

2. The Contractor will perform all work that has any impact on environmentally sensitive areas with the highest standards of diligence and care. Particular attention will be placed on construction phasing and implementation of erosion control devices.

EE. EROSION AND SEDIMENTATION CONTROL DURING CONSTRUCTION

1. Erosion and sedimentation control is necessary under the current scope of this project.

2. Portions of this project are to be constructed within the Neuse River Basin Buffer. The Contractor will perform all work that has any impact on the Buffer with the highest standards of diligence and care. Particular attention will be placed on construction phasing and implementation of erosion control devices.

3. The project site is subject to periodic inspections by the North Carolina DEQ personnel to ensure conformance with erosion control regulations. As such, the Contractor will cooperate to the fullest extent in maintaining devices for erosion and sedimentation control and immediately make additions, corrections, and modifications to these devices as directed by the Engineer. No separate payment other than the items indicated in the proposal form will be made to the Contractor for installation and maintenance of erosion and sedimentation control devices.

FF. STORAGE OF EXPLOSIVE MATERIALS

Materials used for blasting operations may not be stored at the project site or anywhere on the property of the Raleigh-Durham International Airport. All explosive materials must be transported to the property and used on the day they are transported or removed at the end of that day.

GG. NIGHT WORK AND LIGHTING REQUIREMENTS

1. The Contractor is allowed to work at night. Additionally, the Contractor may be required to conduct construction operations at night as indicated on the plans. If the Contractor elects to or is required to perform construction activities at night, it shall furnish, install, maintain, and remove temporary construction lights to illuminate night work areas during hours of darkness. The equipment used for lighting shall provide a sufficient amount of light to illuminate the working areas satisfactorily for construction and inspection. The Contractor may be required to provide additional lighting units, as directed by the Engineer, if lighting is deemed to be inadequate. Upon each completion of night time operation, the lighting shall be returned to the Contractor's storage area.

2. The Contractor will be required to coordinate lighting positions with the Air Traffic Control Tower management personnel prior to any night work. This coordination will be accomplished through the Engineer. Temporary lighting shall be positioned so that glare is not imposed on operating aircraft in the area and the Air Traffic Control Tower. In addition, the airfield height limitations zone shall be maintained at all times.

HH. DUST, DEBRIS AND SMOKE CONTROL, AND WASTE REMOVAL

1. The Contractor shall be responsible for the transportation and disposal of all waste materials to an off-airport waste disposal site approved to accept materials in accordance all applicable laws and regulations.

2. The work on this Project is in close proximity to active taxiways, runways, and navigation aids. Accordingly, all work areas must be kept clean of dust and debris at all times. All debris generated each working day must be removed from the Airport and properly disposed. If, after appropriate notification, the Contractor fails to fully comply with this requirement, the Owner reserves the right to undertake, at the Contractor's expense, any and all measures it feels necessary to ensure the safe operation of the airport.

II. FINAL CLEANING

1. This Section specifies administrative and procedural requirements for final cleaning at Completion.

2. Special cleaning requirements for specific elements of Work are included in appropriate Sections of the Technical Specifications.

3. General project closeout requirements are included in the Section of these Special Conditions titled "Closeout Procedures."

4. General cleanup and waste removal requirements are included in Section of these Special Conditions "Temporary Facilities and Controls."

5. Conduct cleaning and waste disposal operations in compliance with all applicable laws, ordinances and safety standards. Comply fully with federal and local environmental and anti-pollution regulations.

    a. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

    b. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

6. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

7. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from commercial cleaning and maintenance program. Comply with manufacturer's instructions.

8. Complete the applicable items of the following cleaning operations before requesting inspection for Certification of Completion for entire Project or a portion of Project.

    a. Clean Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.

    b. Remove tools, construction equipment, machinery and surplus material from the site.

    c. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

    d. Remove labels that are not permanent labels.

    e. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.

    f. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.

g. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs, and defective and noisy starters in fluorescent and mercury vapor fixtures.

h. Leave Project clean and ready for occupancy.

9. Remove temporary protection and facilities installed during construction to protect previously completed installations during remainder of construction period.

10. Where extra material of value remains after completion of associated construction has become Owner's property, dispose of these materials as directed.

JJ. CLOSEOUT INSPECTION PROCEDURES

1. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

   a. Inspection procedures.
   b. Project record document submittal.

2. Closeout requirements for specific construction activities are included in appropriate Technical Specifications.

3. Preliminary Procedures: Before requesting inspection for Certification of Completion, complete the following. List exceptions in request.

   a. In Application for Payment that coincides with, or first follows, date Completion is claimed, show 100 percent completion for portion of Work claimed as complete. Include supporting documentation for completion as indicated in these Contract Documents and statement showing an accounting of changes to Contract Sum.

      (i) If 100 percent completion cannot be shown, include list of incomplete items, value of incomplete construction, and reasons Work is not complete.

   b. Advise Owner of pending insurance change-over requirements.

   c. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.

   d. Obtain and submit releases enabling Owner unrestricted use of Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.

e. Submit record drawings, operations and maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.

f. Deliver tools, spare parts, extra stock, and similar items.

g. Make final change-over of permanent locks and transmit keys to Owner. Advise Owner's personnel of change-over in security provisions.

h. Complete start-up testing of systems, and instruction of Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from site, along with construction tools, mock-ups, and similar elements.

i. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

4. Inspection Procedures: On receipt of request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare Certificate of Completion following inspection, or advise Contractor of construction that must be completed or corrected before certificate will be issued. Results of completed inspection will form basis of requirements for final acceptance.

5. Re-inspection Procedure: The Engineer will re-inspect Work upon receipt of notice that Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to Engineer.

   a. Engineer will provide one repeat inspection under its contract with Owner. Subsequent inspections shall be at Contractor's expense.

   b. Upon completion of re-inspection, Engineer will prepare certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

   c. If necessary, re-inspection will be repeated. The Contractor shall assume and pay for all costs associated with the Owner’s, Engineer's services beyond the initial inspection and one re-inspection of the work. Reimbursement of these costs shall be collected through a deduction from outstanding payments due the Contractor.

6. Final Acceptance: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in request.

   a. Submit final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

b. Submit an updated final statement, accounting for final additional changes to Contract Sum and final Affidavit and Undertaking for Stored Materials.

c. Submit certified copy of Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and list has been endorsed and dated by Engineer.

d. Submit final meter readings for utilities, measured record of stored fuel, and similar data as of date of Substantial Completion, or when Owner took possession of and responsibility for corresponding elements of Work.

e. Submit Consent of Surety to final payment.

f. Submit final liquidated damages settlement statement.

g. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Operating and Maintenance Instructions: In accordance with Section O, arrange for each installer of equipment that requires regular maintenance to meet with Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include detailed review of following items:

   a. Maintenance manuals.
   b. Maintenance Tasks
   c. Record documents, including all final surveys.
   d. Spare parts and materials.
   e. Tools.
   f. Lubricants.
   g. Fuels.
   h. Identification systems.
   i. Control sequences.
   j. Hazards.
   k. Cleaning.
   l. Warranties and bonds.
   m. Maintenance agreements and similar continuing commitments.

8. As part of instruction for operating equipment, demonstrate following procedures:

   a. Start-up.
   b. Shutdown.
   c. Emergency operations.
   d. Noise and vibration adjustments.
   e. Safety procedures.
   f. Economy and efficiency adjustments.

g. Effective energy utilization.

KK. OPERATION AND MAINTENANCE DATA

1. This Section specifies administrative and procedural requirements for operating and maintenance manuals as required by the Contract Documents, including the following:

   a. Preparation and submittal of operating and maintenance manuals for operating systems or equipment.

   h. Preparation and submittal of instruction manuals covering the care, preservation and maintenance of products and finishes.

   i. Preparation and submittal of software manuals, user manuals and programming instructions for any system that uses software or requires programming to function.

   j. Instruction of Owner's operating personnel in operation and maintenance of systems and equipment.

2. Special operating and maintenance data requirements for specific pieces of equipment or operating systems are detailed in the Technical Specifications.

3. Maintenance Manual Preparation: In preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.

   a. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.

   b. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings clearly in an understandable format.

4. Instruction for Owner's Personnel: For instruction of Owner's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the equipment or system involved.

5. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals.

   a. Before Substantial Completion, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit two draft copies of each manual to Engineer for review. Include a complete index or table of contents of each manual. The Engineer will return one copy of the draft with comments within fifteen (15) days of receipt.

b. Submit one copy of data in final form at least fifteen (15) days before final inspection. This copy will be returned within fifteen (15) days after final inspection, with comments.

c. After final inspection make corrections or modifications to comply with Engineer's comments. Submit three (3) copies of each approved manual to Engineer within 15 days of receipt of comments.

6. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into single binder.

a. Binders: For each manual, provide heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2 in. by 11 in. paper. Provide a clear plastic sleeve on the spine and cover, to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.

(i) Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings in accordance with the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

(ii) Identify each binder on the front and spine, with the typed or printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate the volume number for multiple volume sets of manuals.

b. Dividers: Provide heavy paper dividers with celluloid covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.

c. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.

d. Text Material: Where written material is required as part of manual use manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typed on 8-1/2 in. by 11 in., 20 pound white bond paper.

e. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with text.

(i) Where oversize drawings are necessary, fold the drawings to the same size as the text pages and use as a fold-out.

(ii) If drawings are too large to be used practically as fold-out, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a typewritten page indicating the drawing title, description of contents and drawing location at the appropriate location in the manual.

7. Manual Content: In each manual include information specified in the individual Specification Section, and the following information for each major component of equipment and its controls:

   a. General system or equipment description.
   b. Design factors and assumptions.
   c. Copies of applicable Shop Drawings and Product Data.
   d. System or equipment identification, including:
      (i) Name of manufacturer.
      (ii) Model number.
      (iii) Serial number of each component.
   e. Operating instructions.
   f. Emergency instructions.
   g. Wiring diagrams.
   h. Inspection and test procedures.
   i. Maintenance procedures and schedules.
   j. Precautions against improper use and maintenance.
   k. Copies of warranties.
   l. Repair instructions including spare parts listing.
   m. Sources of required maintenance materials and related services.
   n. Manual Index.

8. Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of Product Data, supplemented by drawings and written text, and copies of each warranty, bond and service contract issued.

   a. Title Page: Provide title page in a transparent plastic envelope as the first sheet of each manual. Provide the following information:

      (i) Subject matter covered by the manual.
      (ii) Name and address of Project.
      (iii) Date of submittal.
      (iv) Name, address, and telephone number of Contractor.
      (v) Name and address of Engineer.
      (vi) Cross reference to related systems in other operating and maintenance manuals.

   b. Table of Contents: After the Title Page, include typed table of contents for each volume, arranged systematically according to Project Manual format. Include list of

each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

(i) Where more than one volume is required to accommodate data for a particular system, provide a comprehensive table of contents for all volumes in each volume of the set.

c. General Information: Provide a general information Section immediately following the Table of Contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or installer, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.

d. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation and delete references to information that is not applicable.

e. Written Text: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.

f. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.

g. Do not use original Project Record Documents as part of the Operating and Maintenance Manuals.

h. Warranties, Bonds and Service Contracts: Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure. Provide a list of circumstances and conditions that would affect validity of the warranty or bond.

i. Recurring and/or Preventive Maintenance Requirements: Provide a detailed list of items that require recurring and/or preventive maintenance, a listing of tasks associated with such maintenance, and the recommended frequency of the tasks.

LL. PRODUCT WARRANTIES

1. This Section includes administrative and procedural requirements for warranties required by Contract Documents, including manufacturer's standard warranties on products and special warranties. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of warranty on Work that incorporates products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

2. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as result of such failure or which must be removed and replaced to provide access for correction of warranted construction.

3. Reinstatement of Warranty: When Work covered by warranty has failed and been corrected by replacement or rebuilding, reinstate warranty by written endorsement. Reinstated warranty shall be equal to original warranty with equitable adjustment for depreciation.

4. Replacement Cost: Upon determination that Work covered by warranty has failed, replace or rebuild Work to an acceptable condition complying with requirements of Contract Documents. Contractor is responsible for cost of replacing or rebuilding defective Work regardless of whether Owner has benefited from use of Work through portion of its anticipated useful service life.

5. Owner's Recourse: Expressed warranties made to Owner are in addition to implied warranties, and shall not limit duties, obligations, rights and remedies otherwise available under law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

6. Rejection of Warranties: Owner reserves right to reject warranties and to limit selection to products with warranties not in conflict with requirements of Contract Documents.

7. Submit written warranties to the Engineer prior to date certified for Final Payment. If Engineer's Certificate of Final Payment designates commencement date for warranties other than date of Final Payment for Work, or designated portion of Work, submit written warranties upon request of the Engineer.

    a. When designated portion of Work is completed and occupied or used by Owner, by separate agreement with Contractor during construction period, submit properly executed warranties to the Engineer within 15 days of completion of that designated portion of Work. When Contract Documents require Contractor, or Contractor and

subcontractor, supplier or manufacturer to execute a special warranty, prepare written document that contains appropriate terms and identification, ready for execution by required parties. Submit draft to Owner through the Engineer for approval prior to final execution.

8. Form of Submittal: At Final Completion compile two (2) copies of each required warranty properly executed by Contractor, or by Contractor, sub contractor, supplier, or manufacturer. Organize warranty documents into an orderly sequence based on table of contents of Project Manual. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

    a. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark tab to identify product or installation. Provide typed description of product or installation, including name of product, and name, address, and telephone number of Installer.

    b. Identify each binder on front and spine with typed or printed title "WARRANTIES", Project title or name, and name of Contractor.

    c. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

MM. PROJECT RECORD DOCUMENTS

1. This Section specifies administrative and procedural requirements for Project Record Documents. Project Record Documents required include the following:

    a. Marked-up copies of Contract Drawings.
    b. Marked-up copies of Shop Drawings.
    c. Newly prepared Drawings.
    d. Marked-up copies of Specifications, addenda and Change Orders.
    e. Marked-up Product Data submittals.
    f. Record Samples.
    g. Field records for variable and concealed conditions.
    h. Record information on Work that is recorded only schematically.

2. Maintenance of Documents and Samples: Do not permit Project Record Documents to be used for construction purposes. Maintain record documents in good order, and in clean, dry, legible condition. Make documents and Samples available at all times for inspection by Engineer.

3. Mark-up Procedure: During construction period, maintain set of blue- or black-line white-prints of Contract Drawings and Shop Drawings for Project Record Document purposes.

   a. Mark these Drawings to indicate actual installation where installation varies from installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to, the following:

      (i) Dimensional changes to Drawings.
      (ii) Revisions to details shown on Drawings.
      (iii) Locations and depths of underground utilities.
      (iv) Revisions to routing of piping and conduits.
      (v) Revisions to electrical circuitry.
      (vi) Actual equipment locations.
      (vii) Duct size and routing.
      (viii) Locations of concealed internal utilities.
      (ix) Changes made by Change Order or Construction Change Directive.
      (x) Changes made following Engineer's written orders.
      (xi) Details not on original Contract Drawings.

   b. Mark record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.

   c. Mark record sets with red erasable colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

   d. Mark important additional information that was either shown schematically or omitted from original Drawings.

   e. Note Construction Change Directive numbers, alternate numbers, Change Order numbers and similar identification.

   f. A copy of all current marked-up Contract Drawings shall be submitted to the Engineer with the submission of each Application for Payment. Included in this periodic update shall be any temporary construction measures.

4. Responsibility for Markup: The individual or entity, who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity shall prepare the mark-up on record Drawings.

   a. Accurately record information in an understandable drawing technique.

   b. Record data as soon as possible after obtaining it. Record and check the mark-up prior to enclosing concealed installations.

c. At time of Completion, submit record Drawings to Engineer for Owner's records. Organize into sets, bind and label sets for Owner's continued use.

5. Review of Record Drawings: Immediately prior to inspecting Certification of Substantial Completion, review completed marked-up Record Drawings with the Engineer. Contractor shall provide interpretations, incorporate changes, add details and notes, and resubmit drawings as requested by the Engineer**.** The Engineer's staff will revise project electronic drawing files to develop the Record Drawing set for the Owner. The Contractor shall continue to provide coordination, consultation, and review throughout this effort as requested by the Engineer.

6. Record Specifications: During construction period, maintain one (1) copy of Project Specifications, including addenda and modifications issued, for Project Record Document purposes.

   a. Mark Specifications to indicate actual installation where installation varies from that indicated in Specifications and modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later.

      (i) In each Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.
      (ii) Record the name of the manufacturer, supplier and installer, and other information necessary to provide a record of selections made and to document coordination with record Product Data submittals and maintenance manuals.
      (iii) Note related record Product Data, where applicable. For each principal product specified, indicate whether record Product Data has been submitted in maintenance manual instead of submitted as record Product Data.

   b. Upon completion of mark-up, submit Record Specifications to Engineer for Owner's records.

7. Record Product Data: During construction period, maintain one copy of each Product Data submittal for Project Record Document purposes.

   a. Mark Product Data to indicate actual product installation where installation varies substantially from that indicated in Product Data submitted. Include significant changes in product delivered to site, and changes in manufacturer's instructions and recommendations for installation.

   b. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

c. Note related Change Orders and mark-up of record Drawings, where applicable.

d. Upon completion of mark-up, submit complete set of record Product Data to Engineer for Owner's records.

e. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual, instead of submittal as record Product Data.

8. Record Sample Submitted: Immediately prior to date of Substantial Completion, meet with Engineer and Owner's personnel at site to determine which of the Samples maintained during construction period shall be transmitted to Owner for record purposes. Comply with Engineer instructions for packaging, identification marking, and delivery to Owner's Sample storage space. Dispose of other Samples in manner specified for disposing surplus and waste materials.

9. Post changes and modifications to the Documents as they occur. Do not wait until end of the Project.

NN. NO LOBBYING

1. It is inappropriate for firms competing for this contract, including their agents, to lobby Authority Board members or staff during the entire selection process, from the date the solicitation is issued through the date on which the Authority acts on the staff recommendation regarding the selected firm. Accordingly, potential respondents interested in this engagement are instructed not to conduct activities of any nature that may be perceived as attempts to promote themselves or influence the outcome of the selection process.

OO. COMPENSATION FOR SPECIAL CONDITIONS

1. Costs for all work to be completed, as well as other obligations required to be undertaken by the Contractor pursuant to these Special Conditions, shall be included in the Contractor’s lump sum bid and/or appropriate unit price item.

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ITEM M-101
MOBILIZATION

DESCRIPTION

101-1.1 The work covered by this section consists of preparatory work and operations, including but not limited to:

1. Those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site.

2. Those items necessary for providing the items required by the General Provisions, Special Provisions, and General Requirements.

3. Those items including but not limited to: the establishment of all temporary fencing**,** staging areas, temporary access and haul routes, and other facilities necessary for work in the project.

4. Those items necessary for the maintenance of vehicle and construction traffic; including but not limited to: portable and stationary construction signs, barricades, drums, cones, and other traffic control devices.

5. Surveying and construction staking.

6. All barricades, barricade lights, and other phasing and detour devices.

7. Performance bond, labor and materials bond, insurance.

8. Those items for all other work in the various items on the project site which must be performed or costs incurred prior to beginning work.

9. This item also includes all work outside the limits of construction that is necessary to demobilize and restore areas disturbed by the Contractor to their original condition including, but not limited to, pavement rehabilitation, grading, seeding, mulching, cleaning, and disposal.

MATERIALS

101-2.1 Airfield Barricades

Airfield barricades and closed taxiway markers will be provided by the Contractor. The Contractor shall properly maintain and protect the barricades and markers during the construction. The Contractor shall be responsible for any damage due to his negligence and replace and repair as directed.

Payment for providing airfield barricades and taxiway closure markers shall be included in the lump sum price for mobilization. This price shall be full compensation for installing, relocating, repairing, furnishing all labor, equipment, tools and incidentals necessary to complete this item.

The Contractor shall have a person on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades.

101-2.2 Lighted Runway Closure Markers

Lighted runway closure markers will be provided by the Owner to the Contractor. The Contractor will be responsible for placement and maintenance of the markers during the construction, including providing fuel and replacement bulbs. The Contractor shall be responsible for any damage due to his negligence and replace and repair as directed.

Payment for maintenance and use of the Lighted Runway Closure Markers shall be included in the lump sum price for mobilization. This price shall be full compensation for installing, relocating, repairing, furnishing all labor, equipment, tools and incidentals necessary to complete this item.

101-2.3 Fod Equipment And Personnel

The Contractor shall provide and maintain equipment and dedicated personnel for removal of Foreign Object Damage (FOD) debris from runways, taxiways, and apron areas. FOD shall be classified as any material such as dirt, rocks, sticks, or miscellaneous trash that can be hazardous to aircraft tires, ingested into the engine, or capable of becoming a projectile that could be hazardous to aircraft or personnel.

Payment for this item shall be included in the lump sum price for Mobilization. This price shall be full compensation for providing dedicated equipment and personnel throughout the duration of the project, hauling of FOD off the project site, maintenance of equipment, furnishing all materials, all labor, tools, tools and incidentals to complete this item.

Contractor vehicles entering the Airport Operations Area, shall have their tires inspected for FOD. The inspections shall consist of a complete walk around the vehicle to check the tires for FOD and removal of any loose materials.

CONSTRUCTION METHODS

101-3.1 (Not Used)

METHOD OF MEASUREMENT

101-4.1 (No Measurements)

BASIS OF PAYMENT

101-5.1 All work covered by this section will be paid for at the contract lump sum price for "Mobilization."

101-5.2 Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by 90-11, the final 10%.

Payment will be made under:

Item M-101-1 Mobilization - per lump sum

END OF ITEM M-101

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ITEM M-102

MEASUREMENT OF QUANTITIES

102-01 Measurement of quantities. All work completed under the contract will be measured by the Engineer, or his or her authorized representatives, using United States Customary Units of Measurement or the International System of Units.

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

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

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

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

In computing volumes of excavation the average end area method or other acceptable methods will be used.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.

The term "ton" will mean the short ton consisting of 2,000 pounds avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designed by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear a plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

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

Bituminous materials will be measured by the gallon or ton. When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F using ASTM D1250 for asphalts or ASTM D633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Cement will be measured by the ton or hundredweight.

Timber will be measured by the1,000-0" board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

Scales shall be accurate within 1/2% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1% of the nominal rated capacity of the scale, but not less than 1 pound. The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.

Scale installations shall have available ten standard 50-pound weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of one-half of 1%.

In the event inspection reveals the scales have been underweighing (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the Engineer.

If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

END OF ITEM M-102

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ITEM M-103

CONTROL OF WORK

103-01 Authority of the Engineer. The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. The Engineer shall decide all questions that may arise as to the interpretation of the specifications or plans relating to the work. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

The Engineer does not have the authority to accept pavements that do not conform to FAA specification requirements.

103-02 Conformity with plans and specifications. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his or her opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the Engineer will advise the Owner of his or her determination that the affected work be accepted and remain in place. In this event, the Engineer will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. The Engineer's determination and recommended contract price adjustments will be based on sound engineering judgment and such tests or retests of the affected work as are, in the Engineer's opinion, needed. Changes in the contract price shall be covered by contract change order or supplemental agreement as applicable.

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

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

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Engineer with the authority, after consultation with the FAA, to use sound engineering judgment in his or her determinations as to acceptance of work that is not in strict conformity, but will provide a finished product equal to or better than that intended by the requirements of the contract, plans and specifications.

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

103-03 Coordination of contract, plans, and specifications. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled

dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

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

103-04 Cooperation of Contractor. The Contractor will be supplied with five copies each of the plans and specifications. The Contractor shall have available on the work at all times one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

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

103-05 Cooperation between contractors. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

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

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

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

103-06 Construction layout and stakes. The Engineer has established horizontal and vertical control, as shown on the plans. No additional survey control points will be provided by the Engineer or the Owner. The Contractor must establish all layout and control required for the construction of the work using the points provided, while acknowledging that control provided on plans could be impacted by the expansion of pavement limits. Such stakes and markings as the Engineer may set for either their own or the Contractor's guidance shall be preserved by the Contractor, where possible. The Contractor will provide their re-established control points to the Engineer if requested. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, the Contractor will replace control points at no additional cost to the owner. All control points must be established by a surveyor licensed in North Carolina.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper execution and control of the work contracted for under these specifications.

The Contractor must give copies of survey notes to the Engineer for each area of construction and for each placement of material as specified to allow the Engineer to make periodic checks for conformance

with plan grades, alignments and grade tolerances required by the applicable material specifications. All surveys must be provided to the Engineer prior to commencing work items that will cover or disturb the survey staking as set by the Contractor's surveyor. Survey(s) and notes shall be provided in the following format(s): AutoCAD Civil 3D and/or XML files for surfaces. Signed/sealed PDF's shall be provided by Contractor's surveyor for deliverables. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

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

Construction Staking and Layout includes but is not limited to:

a. Clearing and Grubbing perimeter staking

b. Rough Grade slope stakes at 100'-0" stations

c. Drainage Swales slope stakes and flow line blue tops at 50-foot stations

Subgrade blue tops at 25'-0" stations and 25'-0" offset distance (maximum) for the following section locations:

a. Runway - minimum five (5) per station

b. Taxiways - minimum three (3) per station

c. Holding apron areas - minimum three (3) per station

d. Roadways - minimum three (3) per station

Base Course blue tops at 25'-0" stations and 25'-0" offset distance (maximum) for the following section locations:

a. Runway - minimum five (5) per station

b. Taxiways - minimum three (3) per station

c. Holding apron areas - minimum three (3) per station

Pavement areas:

a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100'-0" stations.

b. Between Lifts at 25'-0" stations for the following section locations:

(1) Runways - each paving lane width

(2) Taxiways - each paving lane width

(3) Holding areas - each paving lane width

c. After finish paving operations at 50'-0" stations:

(1) All paved areas - Edge of each paving lane prior to next paving lot

d. Shoulder and safety area blue tops at 50'-0" stations and at all break points with maximum of 50'-0" offsets.

e. Fence lines at 100'-0" stations minimum.

f. Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, Visual Approach Slope Indicators (VASIs), Precision Approach

Path Indicators (PAPIs), Runway End Identifier Lighting (REIL), Wind Cones, Distance Markers (signs), pull boxes and manholes.

g. Drain lines, cut stakes and alignment on 25'-0" stations, inlet and manholes.

h. Painting and Striping layout (pinned with 1.5" PK nails) marked for paint Contractor. (All nails shall be removed after painting).

i. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400'-0" per pass (that is, paving lane).

The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor.

Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

103-07 Automatically controlled equipment. Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

103-08 Authority and duties of inspectors. Inspectors shall be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

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

103-09 Inspection of the work. All materials and each part or detail of the work shall be subject to inspection. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

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

Any work done or materials used without supervision or inspection by an authorized representative of the Owner may be ordered removed and replaced at the Contractor's expense unless the Owner's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

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

103-10 Removal of unacceptable and unauthorized work. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise

determined acceptable by the Engineer as provided in the subsection 103-02 titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this section.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of these contract documents.

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

Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs incurred by the Owner from any monies due or to become due the Contractor.

103-11 Load restrictions. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his or her hauling equipment and shall correct such damage at his or her own expense.

103-12 Maintenance during construction. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

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

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

103-13 Failure to maintain the work. Should the Contractor at any time fail to maintain the work as provided in the subsection 103-12 titled MAINTENANCE DURING CONSTRUCTION of this section, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Engineer's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

103-14 Partial acceptance. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the Engineer

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

103-15 Final acceptance. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

103-16 Claims for adjustment and disputes. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the Engineer in writing of his or her intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the Engineer who will present it to the Owner for consideration in accordance with local laws or ordinances.

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

END OF SECTION M-103

ITEM M-104

METHOD OF ESTIMATING PERCENTAGE OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

104-01 General. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

104-02 Method for computing PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot values within the lot by using the following formula:

$$\mathbf{X = (x_1 + x_2 + x_3 + \ldots x_n) / n}$$

Where: X = Sample average of all sublot values within a lot

x_1, x_2 = Individual sublot values

n = Number of sublots

e. Find the sample standard deviation (S_n) by use of the following formula:

$$\mathbf{S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2)/(n-1)]^{1/2}}$$

Where: S_n = Sample standard deviation of the number of sublot values in the set

d_1, d_2 = Deviations of the individual sublot values x_1, x_2, … from the average value X

that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X)$ … $d_n = (x_n - X)$

n = Number of sublots

f. For single sided specification limits (that is, L only), compute the Lower Quality Index Q_L by use of the following formula:

$$\mathbf{Q_L = (X - L) / S_n}$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with Q_L, using the column appropriate to the total number (n) of measurements. If the value of Q_L falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (that is, L and U), compute the Quality Indexes Q_L and Q_U by use of the following formulas:

$$\mathbf{Q_L = (X - L) / S_n}$$

and

$$\mathbf{Q_U = (U - X) / S_n}$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$\mathbf{PWL = (P_U + P_L) - 100}$$

Where: P_L = percent within lower specification limit

P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project

Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

A-1 = 96.60

A-2 = 97.55

A-3 = 99.30

A-4 = 98.35

n = 4

2. Calculate average density for the lot.

$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$

$X = (96.60 + 97.55 + 99.30 + 98.35) / 4$

X = 97.95% density

3. Calculate the standard deviation for the lot.

$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2)) / (4 - 1)]^{1/2}$

$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$

$S_n = 1.15$

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

$Q_L = (X - L) / S_n$

$Q_L = (97.95 - 96.30) / 1.15$

$Q_L = 1.4348$

5. Determine PWL by entering Table 1 with $Q_L = 1.44$ and n= 4.

PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

A-1 = 5.00

A-2 = 3.74

A-3 = 2.30

A-4 = 3.25

2. Calculate the average air voids for the lot.

$X = (x_1 + x_2 + x_3 \ldots n) / n$

$X = (5.00 + 3.74 + 2.30 + 3.25) / 4$

$X = 3.57\%$

3. Calculate the standard deviation S_n for the lot.

$S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$

$S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$

$S_n = 1.12$

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

$Q_L = (X - L) / S_n$

$Q_L = (3.57 - 2.00) / 1.12$

$Q_L = 1.3992$

5. Determine P_L by entering Table 1 with $Q_L = 1.41$ and n = 4.

$P_L = 97$

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

$Q_U = (U - X) / S_n$

$Q_U = (5.00 - 3.57) / 1.12$

$Q_U = 1.2702$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and n = 4.

$P_U = 93$

8. Calculate Air Voids PWL

$PWL = (P_L + P_U) - 100$

$PWL = (97 + 93) - 100 = 90$

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project

Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

A-3 = 99.30

A-4 = 98.35

A-2 = 97.55

A-1 = 96.60

2. Use n=4 and upper 5% significance level of to find the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

a. For measurements greater than the average:

If (measurement - average)/(standard deviation) is less than test criterion,

then the measurement is not considered an outlier

For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

Since 1.174 is less than 1.463, the value is not an outlier.

b. For measurements less than the average:

If (average - measurement)/(standard deviation) is less than test criterion,

then the measurement is not considered an outlier.

For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

less than (97.95 - 1.463 × 1.15) = 96.27%.

A1. Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and P_U)	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420
96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892

60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Percent Within Limits (P_L and P_U)	**Negative Values of Q (Q_L and Q_U)**							
	n=3	**n=4**	**n=5**	**n=6**	**n=7**	**n=8**	**n=9**	**n=10**
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566
43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192

20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

END OF SECTION M-104

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ITEM M-105

CONSTRUCTION SAFETY PLANS

105-01 General. Aviation safety is the primary consideration at airports, especially during construction. The Raleigh-Durham International Airport (RDU) Construction Safety and Phasing Plan (CSPP) and the Contractor's Safety Plan Compliance Document (SPCD) are the primary tools to ensure safety compliance when coordinating construction activities with Airport Operations Department. These documents identify all aspects of the construction project that pose a potential safety hazard to airport operations and outline respective mitigation procedures for each hazard.

The CSPP sets forth benchmarks and requirements for the project to help ensure the highest levels of safety, security and efficiency at the airport at the time of construction. The CSPP is to be used by all personnel involved in the project and covers the actions of not only the construction personnel and equipment, but also the action of inspection personnel and airport staff.

The Contractor shall be required to submit a Safety Plan Compliance Document (SPCD) to the Raleigh-Durham Airport Authority Construction Project Manager (CPM), describing how the Contractor will comply with the requirements set forth in this CSPP. The SPCD must be submitted to the CPM and approved prior to issuance of the Notice to Proceed.

In the event the Contractor's activities are found in non-compliance with the provisions of the CSPP or the SPCD, the CPM will direct the Contractor, in writing, to immediately cease those operations in violation. In addition, a safety meeting will be conducted for the purpose of reviewing those provisions in the CSPP/SPCD which were violated. The Contractor will not be allowed to resume any construction operations until conclusion of the safety meeting and all corrective actions required by the Contractor have been implemented.

105-02 Contractor Responsibilities. The contractor is responsible for complying with the CSPP and SPCD. The contractor must:

a. Submit a Safety Plan Compliance Document (SPCD). The Contractor shall submit a SPCD to the airport operator describing how it will comply with the requirements of the CSPP and supplying any details that could not be determined before contract award. The SPCD must include a certification statement by the contractor that indicates it understands the operational safety requirements of the CSPP and it asserts it will not deviate from the approved CSPP and SPCD unless written approval is granted by the airport operator. Any construction practice proposed by the contractor that does not conform to the CSPP and SPCD may impact the airport's operational safety and will require a revision to the CSPP and SPCD and re-coordination with the airport operator and the FAA in advance.

b. Have available at all times copies of the CSPP and SPCD for reference by the airport operator and its representatives, and by subcontractors and contractor employees.

c. Ensure that construction personnel are familiar with safety procedures and regulations on the airport. Provide a point of contact who will coordinate an immediate response to correct any construction-related activity that may adversely affect the operational safety of the airport. Many projects will require 24-hour coverage.

d. Identify in the SPCD the contractor's on-site employees responsible for monitoring compliance with the CSPP and SPCD during construction. At least one of these employees must be on-site whenever active construction is taking place.

e. Conduct inspections sufficiently frequently to ensure construction personnel comply with the CSPP and SPCD and that there are no altered construction activities that could create potential safety hazards.

f. Restrict movement of construction vehicles and personnel to permitted construction areas by flagging, barricading, erecting temporary fencing, or providing escorts, as appropriate and as specified in the CSPP and SPCD.

g. Ensure that no contractor employees, employees of subcontractors or suppliers, or other persons enter any part of the air operations area (AOA) from the construction site unless authorized.

h. Ensure prompt submittal through the airport operator of Form 7460-1 for the purpose of conducting an aeronautical study of contractor equipment such as tall equipment (cranes, concrete pumps, other equipment), stock piles, and haul routes when different from cases previously filed by the airport operator. The FAA encourages online submittal of forms for expediency.

105-03 The Safety Plan Compliance Document (SPCD). The SPCD should include a general statement by the construction contractor that he/she has read and will abide by the CSPP. In addition, the SPCD must include all supplemental information that could not be included in the CSPP prior to the contract award. The contractor statement should include the name of the contractor, the title of the project CSPP, the approval date of the CSPP, and a reference to any supplemental information (that is, "I , Name of Contractor , have read the Title of Project CSPP, approved on Date , and will abide by it as written and with the following additions as noted:"). The supplemental information in the SPCD should be written to match the format of the CSPP indicating each subject by corresponding CSPP subject number and title. If no supplemental information is necessary for any specific subject, the statement, "No supplemental information," should be written after the corresponding subject title. The SPCD should not duplicate information in the CSPP:

a. Coordination. Discuss details of proposed safety meetings with the airport operator and with contractor employees and subcontractors.

b. **Phasing.** Discuss proposed construction schedule elements, including:

(1) Duration of each phase.

(2) Daily start and finish of construction, including "night only" construction.

(3) Duration of construction activities during:

(a.) Normal runway operations.

(b.) Closed runway operations.

(c.) Modified runway "Aircraft Reference Code" usage.

c. Phasing. Areas and operations affected by the construction activity. These areas and operations should be identified in the CSPP and should not require an entry in the SPCD.

d. Protection of NAVAIDs. Discuss specific methods proposed to protect operating NAVAIDs.

e. Contractor access. Provide the following:

(1) Details on how the contractor will maintain the integrity of the airport security fence (gate guards, daily log of construction personnel, and other).

(2) Listing of individuals requiring driver training (for certificated airports and as requested).

(3) Radio communications.

(a.) Type of radios and backup capabilities.

(b.) Who will be monitoring radios.

(c.) Whom to contact if the ATCT cannot reach the contractor's designated person by radio.

(d.) Details on how the contractor will escort material delivery vehicles.

f. Wildlife management. Discuss the following:

(1) Methods and procedures to prevent wildlife attraction.

(2) Wildlife reporting procedures.

g. Foreign Object Debris (FOD) management. Discuss equipment and methods for control of FOD, including construction debris and dust.

h. Hazardous material (HAZMAT) management. Discuss equipment and methods for responding to hazardous spills.

i. Notification of construction activities. Provide the following:

(1) Contractor points of contact.

(2) Contractor emergency contact.

(3) Listing of tall or other requested equipment proposed for use on the airport and the timeframe for submitting 7460-1 forms not previously submitted by the airport operator.

(4) Batch plant details, including 7460-1 submittal.

j. Inspection requirements. Discuss daily (or more frequent) inspections and special inspection procedures.

k. **Underground utilities.** Discuss proposed methods of identifying and protecting underground utilities.

l. **Penalties.** Penalties should be identified in the CSPP and should not require an entry in the SPCD.

m. **Special conditions.** Discuss proposed actions for each special condition identified in the CSPP.

n. **Runway and taxiway visual aids.** Including marking, lighting, signs, and visual NAVAIDs. Discuss proposed visual aids including the following:

(1) Equipment and methods for covering signage and airfield lights.

(2) Equipment and methods for temporary closure markings (paint, fabric, other).

(3) Types of temporary Visual Guidance Slope Indicators (VGSI).

o. Marking and signs for access routes. Discuss proposed methods of demarcating access routes for vehicle drivers.

p. **Hazard marking and lighting.** Discuss proposed equipment and methods for identifying excavation areas.

q. **Protection of runway and taxiway safety areas.** including object free areas, obstacle free zones, and approach/departure surfaces. Discuss proposed methods of identifying, demarcating, and protecting airport surfaces including:

(1) Equipment and methods for maintaining Taxiway Safety Area standards.

(2) Equipment and methods for separation of construction operations from aircraft operations, including details of barricades.

r. Other limitations on construction should be identified in the CSPP and should not require an entry in the SPCD.

105-04 Inspections. Inspections shall be conducted by the Contractor at least daily, but more frequently if necessary, to ensure conformance with the CSPP. A sample checklist is provided in Appendix D of the CSPP, and in FAA Advisory Circular AC 150/5370-2, Operational Safety on Airports During Construction. In addition to contractor's required inspections, Airport Operations Department will inspect the construction site prior to the reopening of any closed active taxiway, runway, and apron. The CPM will have full-time inspectors monitoring activity throughout construction. The contractor is required to immediately remedy and correct any deficiencies to the satisfaction of the Engineer or CPM.

END OF SECTION M-105

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Construction Facilities:
   1. Engineer’s Field Office.

B. Removal of temporary utilities, facilities, and controls.

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Engineer’s Field Office
   1. Basis of Measurement: Per Lump Sum
   2. Basis of Payment: Price shall be full compensation for furnishing all labor, materials, equipment, utilities, monthly utility costs, routine servicing/cleaning, and incidentals necessary to complete this item.

1.3 ENGINEERS FIELD OFFICE

A. The Contractor is required to furnish new equipment or, if acceptable to the Owner’s representative, undamaged, previously used equipment in serviceable condition that is suitable for the intended use, and erect for the Owner and Owner's representative use a temporary field office at the job site, in a mud free location, as directed by the Owner's representative. The office shall be separate from any buildings or trailers used by the Contractor and have a private bathroom. The office shall be erected before work commences, shall be available throughout the duration of the work on the project, and shall be removed 30-days following completion of the project. The office shall remain the property of the Contractor.

B. The office shall be weatherproof construction, tightly floored and roofed, constructed with an air space above the ceiling for ventilation and shall be supported above the ground. The width of the office shall not be less than 10 feet and the floor-to-ceiling height shall not be less than 7 feet 6 inches. The inside walls and ceiling shall be constructed of plywood, amazonite, gypsum board or other suitable materials. Walls and ceilings shall be insulated.

C. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.

D. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F.

E. Provide fluorescent light fixtures in each space, capable of maintaining average illumination of 20 fc at desk height.

F. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.

G. The office shall contain at least 3 windows, each having an area of not less than 540 square inches, and all of which shall be capable of being easily opened and secured from the inside only. Further, the office shall contain at least two (2) doors, having dimensions of not less than 30 inches in width and 78 inches in height. Window screens shall be provided. The door(s) shall be equipped with lock(s) and at least 2 keys therefore shall be furnished the Owner and Owner's representative. Steps shall conform to the State Building Code and shall be maintained free of obstruction to provide safe passage.

H. Telephone/Data: The Contractor shall provide telephone service (including long distance service) and high speed internet service to the field office for the duration of the work. A static IP address is required. The phones and data service shall be compatible with Owner's phones and data requirements. Contractor shall arrange with the local telephone company for service and pay the monthly billings and other direct and indirect costs associated with the temporary telephone and data service. Long distance calls shall not be billed to the field office telephone, by any party.

I. Sanitary Facilities: The Contractor shall provide sanitary connections to the field office by the installation of a storage tank. All requirements of the State and Local Boards of Health, or of the other bodies or courts having jurisdiction in the area, shall be provided. An adequate positive locking system shall be provided on the inside of the doorway to insure privacy.

J. The Contractor shall maintain the office facility including trash, floors, dusting, and toilet facility in a clean and sanitary condition and furnishing toilet and washroom supplies and for cleaning-out and disposal of sanitary waste. As a minimum, twice weekly service and cleaning shall be provided.

K. The Contractor shall provide a chilled drinking water dispenser, with cups, and water supply in the field office. Bottled water is satisfactory.

L. The field office shall have a minimum of 400 square feet of floor space, which shall include 2 offices, 1 conference room/meeting area, and one restroom. Field office shall be equipped with the following:

No.	Item
1	Desk (60" x 34" minimum) each office
1	Conference room table
1	Plan and drawing table (30" x 96" minimum)
1	Metal 4-drawer file cabinet (15" Drawer Width)
1	2-Drawer fire protection file, Underwriters Laboratory Class "C" or "D" label for each office
2	Desk chairs
4	Conference room chairs
5	Waste Baskets
1	Telephone and data port for each office and conference room
1	Plain Paper Copying Machine (automatic feed system - no thermal paper) with print, fax and scan (to PDF file format) capability

M. Portable Fire Extinguishers:
   1. The Contractor shall furnish and maintain one chemical type, portable, UL rated fire extinguisher, with class and extinguishing agent as required by locations and classes of fire exposure, and one 2.5 gallon pressurized water fire extinguisher of standard commercial quality.

N. Contractor will be responsible for providing all power required for the field office.

1.4 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.

B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on Drawings.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

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ITEM P-101
SURFACE PREPARATION

DESCRIPTION

101-1.1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable drawings.

101-1.2. Prior to start of demolition work, submit a demolition plan indicating proposed methods, sequence of operations, and schedule for demolition and removal work to the Engineer for approval. Include coordination for shutoff, capping, and continuation of utility services as required; details for phasing; erosion control; removal methods; disposal of materials; salvage requirements; disconnection schedule of airfield lighting; and coordination of other work in progress.

EQUIPMENT

101-2.1 All equipment shall be specified here and in the following paragraphs or approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

a. Concrete pavement. The existing concrete pavement to be removed shall be freed from the pavement to remain by sawing through the complete depth of the slab 1'-0" inside the perimeter of the final removal limits or outside the dowels, whichever is greater when the limits of removal are located on the joints. The pavement between the perimeter of the pavement removal and the saw cut shall be carefully broken up and removed using hand-held jackhammers, weighing 30 pounds or less, or other light-duty equipment which will not cause distress in the pavement which is to remain in place. The Contractor shall have the option of sawing through the dowels at the joint, removing the pavement and installing new dowels. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, then the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods suitable to the Engineer which will not cause distress in the pavement which is to remain in place. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines, or drainage structures under the pavement. Concrete slabs that are damaged by under breaking shall be removed. Any damage shall be repaired at the Contractor's expense.

Where indicated, concrete pavement removal shall include removal of existing asphalt base course.

Removed concrete pavement shall be recycled per the requirements of P-219 and reused in the construction of the new pavement. Excess recycled material shall be stockpiled on airport property.

b. Asphalt concrete pavement. Asphalt concrete pavement to be removed shall be cut to the full depth of the bituminous material around the perimeter of the area to be removed. The pavement shall be removed so the joint for each layer of pavement replacement is offset 1'-0" from the joint in the preceding layer. This does not apply if the removed pavement is to be replaced with concrete or soil. The removed material shall be disposed of off the airport.

101-3.2 Preparation of joints and cracks. Not Used.

101-3.3 Removal of paint and rubber. Not Used. See Item P-620 for marking removal requirements.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair. Not Used. See Item P-501 for spall repair requirements.

101-3.5 Cold milling. See Item P-160 for milling requirements.

101-3.6. Preparation of asphalt pavement surfaces. Not Used.

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the Engineer. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Re-saw joints removing no more than 1/16" from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry. Allow sufficient time to dry out joints prior to sealing.

101-3.8.2 Cleaning prior to sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Clean joints by sandblasting, or other method approved by the Engineer, on each joint face with nozzle held at an angle and not more than 3" from face. Following sandblasting, clean joints with air free of oil and water. Joint surfaces will be surface-dry prior to installation of sealant.

101-3.9 Preparation of Cracks in Flexible Pavement. Not Used.

METHOD OF MEASUREMENT

101-4.1 Pavement Removal. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor. Pavement removal shall include removal of asphalt base course, crushed aggregate base course, or cement treated base course to the top of existing subgrade. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

101-4.2 Isolated Slab Removal & Replacement. The unit of measurement for isolated slab removal shall be per each slab removed and replaced, complete. The isolated slabs shall be poured per plan details and specification section P-501.

101-4.3 Asphalt Base Removal Beyond Existing Concrete Edge. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor. Pavement removal shall include removal of asphalt base course and crushed aggregate base course to the top of existing subgrade. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P 101-1 – Concrete Pavement Removal, Full Depth – per square yard
Item P 101-2 – Asphalt Pavement Removal, Full Depth – per square yard
Item P 101-3 – Isolated Slab Removal & Replacement – per each
Item P 101-4 – Asphalt Base Removal – per square yard

MATERIAL REQUIREMENTS

ASTM D6690	Standard Specification For Joint And Crack Sealants, Hot Applied, For Concrete And Asphalt Pavements

END OF ITEM P-101

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ITEM P-152
EXCAVATION, SUBGRADE AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material to designated stockpile sites, regardless of its nature which is not otherwise classified and paid for under one of the following items. Stockpile grading areas shown in the plans shall be graded and compacted with excavated material taken from areas excavated in preparation of proposed pavement sections and areas. No separate payment will be made for embankment construction in the stockpile areas with the unclassified excavation material. Cost shall be incidental to the Unclassified Excavation pay item. Compaction and placement of the stockpile area shall meet the requirements of this specification.

b. Embankment. Embankment shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of usable material available from required excavations. Material shall be obtained from areas designated by the Engineer within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable excavation. Any material containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer. Excavated or existing subgrade material may not be deemed unsuitable only based on moisture content. Wet soil that, when dry would be considered suitable, shall not be classified as unsuitable.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any turfed area, the topsoil shall be stripped from the area.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas shown on the plans. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the plans or approved by the Engineer.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the Engineer notified per subsection 70-20. At the direction of the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Those areas outside of the limits of the pavement areas where the top layer of soil material has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4", to loosen and pulverize the soil.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the Engineer, who shall arrange for their removal if necessary. The Contractor, at his or her expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the Engineer. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall disposed as directed by the Engineer. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the Engineer shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas so that it can be measured for payment as specified in paragraph 152-3.3.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12" below the subgrade or to the depth specified by the Engineer. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard for “Undercut Excavation”. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill shall be included in the Undercut Excavation item. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans.

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his or her decision shall be final. Payment will not be made for the removal and disposal of overbreak that the Engineer determines as avoidable. Unavoidable overbreak will be classified as "Unclassified Excavation".

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by someone other than the Contractor; for example, the utility

unless otherwise shown on the plans. All existing foundations shall be excavated at least 2'-0" below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the Engineer. All foundations thus excavated shall be backfilled with suitable material and compacted as specified.

e. Compaction requirements. The subgrade under areas to be paved shall be compacted to a depth of 12" and to a density of not less than 90 percent of the maximum density as determined by ASTM D1557. The material to be compacted shall be within ±3% of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). Samples will be taken for each 1,000 square yards for testing. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified density and moisture content.

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM D2167 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Stones or rock fragments larger than 4" in their greatest dimension will not be permitted in the top 6" of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000'-0" ahead of the paving operations, or as directed by the Engineer.

All loose or protruding rocks on the back slopes of cuts shall be pried loose or otherwise removed to the slope finished grade line. All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the Engineer.

Blasting shall not be allowed.

f. Proof rolling. After compaction is completed, the subgrade area shall be proof rolled with a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi in the presence of the Engineer. Apply a minimum of 100% coverage, as specified by the Engineer, to all paved areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1" or show permanent deformation greater than 1" shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications.

152-2.3 Borrow excavation. Borrow areas within the airport property are indicated on the plans. Borrow excavation shall be made only at these designated locations and within the horizontal and vertical limits as staked or as directed by the Engineer.

When borrow sources are outside the boundaries of the airport property, it shall be the Contractor's responsibility to locate and obtain the borrow sources, subject to the approval of the Engineer. The Contractor shall notify the Engineer at least 15 days prior to beginning the excavation so necessary tests for suitability can be made. All borrow pits shall be opened up to expose the various strata of acceptable material to allow obtaining a uniform product. All unsuitable material shall be disposed of by the Contractor. Borrow pits shall be excavated to regular lines and they shall be drained and left in a neat, presentable condition with all slopes dressed uniformly.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating for drainage ditches such as intercepting; inlet or outlet ditches; for temporary levee construction; or for any other type as designed or as shown on the plans. The work shall be performed in sequence with the other construction. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas

or as directed by the Engineer. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 Preparation of embankment area. All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6" and shall then be compacted as indicated in paragraph 152-2.6.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12" and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 Formation of embankments. Embankments shall be formed in successive horizontal layers of not more than 8" in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

The layers shall be placed to produce a soil structure as shown on the typical cross-section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each layer shall be within ±3% of optimum moisture content before rolling to obtain the prescribed compaction. To achieve a uniform moisture content throughout the layer, the material shall be moistened or aerated as necessary. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken for each 1,000 square yards. Based on these tests, the Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

Rolling operations shall be continued until the embankment is compacted to not less than 90% of maximum density for noncohesive soils, and 90% of maximum density for cohesive soils as determined by ASTM D1557. Under all areas to be paved, the embankments shall be compacted to a depth of 12" and to a density of not less than 90% of the maximum density as determined by ASTM D1557.

On all areas outside of the pavement areas, no compaction will be required on the top 4".

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM D2167 or ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. Contractor’s laboratory shall perform all density tests, for quality control, in the Engineer’s presence and provide the test results upon completion to the Engineer for acceptance. The Engineer shall perform all quality assurance density tests.

Compaction areas shall be kept separate, and no layer shall be covered by another layer until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each layer is placed. Layer placement shall begin in the deepest portion of the embankment fill. As placement progresses, the layers shall be constructed approximately parallel to the finished pavement grade line.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the embankment and the other material shall be incorporated under the future paved areas. Stones or fragmentary rock larger than 4" in their greatest dimensions will not be allowed in the top 6" of the subgrade. Rockfill shall be brought up in layers as specified or as directed by the Engineer and the finer material shall be used to fill the voids with forming a dense, compact mass. Rock or boulders shall not be disposed of outside the excavation or embankment areas, except at places and in the manner designated on the plans or by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in layers not exceeding 2'-0" in thickness. Each layer shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The layer shall not be constructed above an elevation 4'-0" below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in layers, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.7 Finishing and protection of subgrade. After the subgrade is substantially complete, the Contractor shall remove any soft or other unstable material over the full width of the subgrade that will not compact properly. All low areas, holes or depressions in the subgrade shall be brought to grade with suitable select material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans.

Grading of the subgrade shall be performed so that it will drain readily. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes. All ruts or rough places that develop in the completed subgrade shall be graded and recompacted.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer.

152-2.8 Haul. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

152-2.9 Tolerances. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12'-0" straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2", or shall not be more than 0.05 feet from true grade as established by grade hubs. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting.

On safety areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 feet from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.10 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled in the designated Contractor Staging Areas. If, in the judgment of the Engineer, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further rehandling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as directed, or as required in Item T-905.

No direct payment will be made for topsoil under Item P-152. The quantity removed and placed directly or stockpiled shall be paid for at the contract unit price per cubic yard for "Unclassified Excavation".

When stockpiling of topsoil and later rehandling of such material is directed by the Engineer, the material so rehandled shall be paid for at the contract unit price per cubic yard for “Topsoiling,” as provided in Item T-905.

METHOD OF MEASUREMENT

152-3.1 The quantity of excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

152-3.2 The quantity of compacted embankment in-place to be paid for shall be the number of cubic yards measured in its final position.

152-3.3 For payment specified by the cubic yard, measurement for all excavation shall be computed by the average end area method. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by excavation cross-sections shown on the plans, subject to verification by the Engineer. After completion of all excavation operations and prior to the placing of base or subbase material, the final excavation shall be verified by the Contractor by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet. Field cross-sections shall be provided by the Contractor to the Engineer for acceptance.

152-3.4 The quantity of access road removal and backfill to be paid for shall be measured by the square yard and shall include the removal of existing pavement (asphalt and stone base) and backfilled with a suitable material to form smooth grades and positive drainage.

BASIS OF PAYMENT

152-4.1 "Unclassified Excavation" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for excavation, preparation of subgrade in excavations, placement of excavated material in embankments or stockpile areas, and for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.2 "Undercut Excavation, replace with backfill" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for undercut excavation, furnishing, placement, and

compaction of acceptable backfill material, and for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.3 "Undercut Excavation, replace with stone" payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for undercut excavation, furnishing, placement, and compaction of #57 wash stone, and for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. The #57 stone backfill shall only be used in areas as directed by the engineer.

152-4.4 For "Embankment in Place", payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.5 "Access Road Removal and Backfill" payment shall be made at the contract unit price per square yard. This price shall be full compensation for pavement removal, furnishing, placement, and compaction of acceptable backfill material, and for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-152-1 - Unclassified Excavation - per cubic yard

Item P-152-2 - Undercut Excavation, replace with backfill - per cubic yard

Item P-152-3 - Undercut Excavation, replace with stone- per cubic yard

Item P-152-4 – Embankment in Place - per cubic yard

TESTING REQUIREMENTS

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft^3
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft^3
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods Shallow Depth

END OF ITEM P-152

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ITEM P-153
CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Engineer.

MATERIALS

153-2.1 Materials.

a. Portland cement. Portland cement shall conform to the requirements of ASTM C150, Type I or II. If for any reason, cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

b. Fly ash. Fly ash shall conform to ASTM C618, Class C or F.

c. Fine aggregate (sand). Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces performance characteristics of the CLSM specified here will be accepted, except as follows.

Sieve Size	% Passing by weight
3/4"	100
No. 200	0 - 12

d. Water. Water used in mixing shall be potable and free of oil, salt, acid, alkali, sugar, vegetable matter, or other substances injurious to the finished product.

MIX DESIGN

153-3.1 Proportions. The Contractor shall submit, to the Engineer, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the Engineer has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. Laboratory costs are incidental to this item. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed.

a. Compressive strength. CLSM shall be designed to achieve a 28-day compressive strength of 100 psi to 200 psi when tested in accordance with ASTM D4832. There should be no significant strength gain after 28 days.

b. Consistency. CLSM should be designed to achieve a consistency that will produce an approximate 8" diameter circular-type spread without segregation when tested by: (1) filling a 3" inside diameter by 6" length flow cylinder (non-absorbent pipe) (2) strike off of the flow cylinder and start of lift within five seconds of filling and (3) by steady upward pull, lift the cylinder in a time period of between two and four seconds. Adjustments of the material proportions should be made to achieve proper solid suspension

and flowable characteristics, however the theoretical yield shall be maintained at one cubic yard for the given batch weights.

CONSTRUCTION METHODS

153-4.1 Placement.

a. Placement. CLSM may be placed by any reasonable means from a mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes are not displaced from their final position and intrusion of CLSM into unwanted areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the Engineer. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one layer, the base layer shall be free of surface water and loose foreign material prior to placement of the next layer.

b. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°F and rising. At the time of placement, CLSM shall have a temperature of at least 40°F. Mixing and placement shall stop when the air temperature is 40°F and falling or when the anticipated air or ground temperature will be 35°F or less in the 24 hour period following proposed placement.

153-4.2 Curing and protection

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F, the material may be rejected by the Engineer if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi is obtained. The Contractor shall be responsible for providing evidence to the Engineer that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 Acceptance. Acceptance of CLSM delivered and placed as shown on the plans or as directed by the Engineer shall be based upon mix design approval and batch tickets provided by the Contractor to confirm that the delivered material conforms to the mix design. The Contractor shall verify by additional testing, each 1,000 cubic yards of material used. Verification shall include confirmation of material proportions and tests of compressive strength to confirm that the material meets the original mix design and the requirements of CLSM as defined in this specification. Adjustments shall be made as necessary to the proportions and materials prior to further production.

METHOD OF MEASUREMENT

153-5.1 Measurement. There shall be no separate measurement and payment for work performed under this section of the specifications. All work performed shall be considered incidental to the work in which this item is required.

TESTING REQUIREMENTS

ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders

MATERIAL REQUIREMENTS

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements

END OF ITEM P-153

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ITEM P-156
TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

DESCRIPTION

156-1.1 This item shall consist of temporary control measures as shown on the plans or as ordered by the Engineer during the life of a contract to control water pollution, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be designed, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

MATERIALS

156-2.1 Grass. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant. Use of bird attracting seed such as millet will not be allowed.

156-2.2 Mulches. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per ItemT-908. Mulches shall not create a wildlife attractant.

156-2.3 Fertilizer. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

156-2.4 Slope drains. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

156-2.5 Construction Entrance. Construction Entrance shall be installed per plan details at any locations where construction traffic enters public or private roads.

156-2.6 Temporary Drop Inlet Protection: Shall be installed per plan details at locations indicated on the plans.

156-2.7 Temporary Rock Check Dams: Shall be installed per plan details at locations indicated on the plans.

156-2.8 Linear Fiber Roll Protection: Shall be installed per plan details at locations indicated on the plans.

156-2.9 Erosion Control Matting: Shall be installed per plan details at locations indicated on the plans.

156-2.10 Temporary Fiber Check Dams: Shall be installed per plan details at locations indicated on the plans.

156-2.11 Silt fence. The silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461.

156-2.12 Excavated Inlet Protection: Shall be installed per plan details at locations indicated on the plans. Cost shall include removal of dirt, storage within a staging area, and backfill to existing grades once the control is no longer needed. The pay item shall also include removal of the existing concrete apron, and constructing/pouring a new apron to match existing conditions.

156-2.13 Temporary Skimmer Sediment Basin: Shall be installed per plan details at locations indicated on the plans. Pay item shall include all items necessary for the functioning skimmer basin including, but not limited to, the skimmer, baffles, spillway construction, incidental rip-rap, excavation of the basin, and backfill and removal of all items of the basin once construction is complete.

156-2.16 Temporary Slope Drains: Shall be installed per plan details at locations indicated on the plans for multiple pipe diameters. Pay item shall include all components necessary to establish slope drain including stakes, outlet stabilization, inlet stabilization, and removal of pipes at project completion.

156-2.17 Temporary Diversion Ditch: Shall be installed per plan details at locations indicated on the plans. Pay item shall include all components necessary to establish diversion ditches including matting material.

156-2.18 Other. All other materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project

CONSTRUCTION REQUIREMENTS

156-3.1 General. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The Engineer shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

156-3.2 Schedule. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.

156-3.3 Construction details. All erosion control measures shall be constructed and maintained per the details shown on the plans.

The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately if project conditions permit; otherwise, temporary erosion control measures may be required.

The Engineer shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the Engineer.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the Engineer. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the Engineer, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The Engineer may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor during the construction period.

Whenever construction equipment must cross watercourses at frequent intervals, temporary structures should be provided.

Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

156-3.4 Installation, maintenance and removal of silt fences. Silt fences shall extend a minimum of 16" and a maximum of 34" above the ground surface. Posts shall be set no more than 10'-0" on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12" overlap and securely sealed. A trench shall be excavated approximately 4" deep by 4" wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

METHOD OF MEASUREMENT

156-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the Engineer. Completed and accepted work will be measured as follows:

a. Temporary seeding and mulching will be measured by the acre.

b. Construction entrances, temporary drop inlets protection, culvert inlet protection, culvert outlet protection, temporary rock check dams, temporary skimmer sediment basins, and temporary fiber check dams will be measured per each installed, maintained throughout the project, and removed at the end of the project. Item shall include restoration of the area after removal of the temporary measure.

c. Linear fiber roll protection, temporary slope drains, temporary diversion ditches, and silt fence will be measured by the linear foot, installed, maintained throughout the project, and removed at the end of the project. Item shall include restoration of the area after removal of the fiber roll.

d. Erosion Control Matting shall be measured by the square yard of material installed.

156-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

156-5.1 Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 156-4.1 will be paid for under:

Item P-156-1 - Temporary Seeding and Mulching - per acre

Item P-156-2 – Construction Entrance - per each

Item P-156-3 – Temporary Drop Inlet Protection – per each

Item P-156-4 – Linear Fiber Roll Protection – per linear foot

Item P-156-5 – Erosion Control Matting – per square yard

Item P-156-6 – Temporary Fiber Check Dams – per each

Item P-156-7 – Silt Fence – per linear foot

Item P-156-8 – Excavated Inlet Protection – per each

Item P-156-9 – Temporary Skimmer Sediment Basin – per each

Item P-156-10 – Temporary Slope Drain (15”) – per linear foot

Item P-156-11 – Temporary Slope Drain (18”) – per linear foot

Item P-156-12 – Temporary Diversion Ditch – per linear foot

Item P-156-13 – Dewatering – per each

Item P-156-14 – Silt Fence Outlet – per each

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control features not covered by contract items that are ordered by the Engineer will be paid for in accordance with Section 90-05 Payment for Extra work.

MATERIAL REQUIREMENTS

ASTM D6461	Standard Specification for Silt Fence Materials
AC 150/5200-33	Hazardous Wildlife Attractants

END OF ITEM P-156

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ITEM P-160
PAVEMENT MILLING

DESCRIPTION

160-1.1 The work shall consist of milling bituminous pavements in accordance with these specifications and at locations and typical sections indicated on the drawings, or as directed by the Engineer. The price shall also include saw cutting as noted on the plans and removal of asphalt millings.

EQUIPMENT

160-2.1 Cold Milling Machine. Shall be self-propelled pavement profiler with sufficient power, traction, and stability to cold mill bituminous pavements. The milling machine shall be equipped with grade and slope control systems which automatically control the longitudinal profile and cross slope of the milled surface to an accuracy of ± 1/8-inch by the use of one or more sensors. The machine shall be capable of leaving a uniform surface without damage to the underlying pavement structure. The gross weight of the machine shall be sized and distributed to avoid overstressing or damaging the existing pavement structure or subgrade to remain. Conveyors shall be provided to transfer the milled material from the pavement to a truck.

160-2.2 Dust Control. The milling equipment shall be provided with dust control devices as needed to meet local, State, and Federal pollution control regulations.

160-2.3 Miscellaneous. Provide power brooms, hand brooms, shovels, vacuums, and other equipment as needed for final cleaning of milled surface and disposal of debris.

CONSTRUCTION REQUIREMENTS

160-3.1 Milling Operation. The existing pavement shall be milled to the indicated profile and cross-section at the locations shown on the drawings. The Contractor may elect to make multiple cuts to achieve the depth of cut or cross slope required by the drawings.

160-3.2 Grade Control. The profile and cross slope of the milled surface shall be established by the string lines and an automatic cross slope control mechanism. The milled pavement surface will be subject to visual and straight edge inspection. A 10-foot straight edge shall be maintained in the vicinity of the milling operation at all times for the purpose of measuring surface irregularities of the milled pavement surface. The straightedge and labor for its use shall be provided by the Contractor. All longitudinal irregularities in excess of 1/8-inch in 10 feet shall be re-milled at no additional cost to the Owner, including the cost of any leveling material that may be needed.

The cross slope shall be uniform to a degree that no depressions or misalignment of slope greater than ¼-inch in 10 feet are present when tested with a straightedge placed perpendicular to the centerline.

160-3.3 Protection. The milling operation shall proceed in such a manner as to prevent damage to the underlying pavement structure, utilities, drainage structures, light fixtures, paved surfaces outside the milled area, and any other appurtenances. Where necessary, the Contractor shall cut the existing bituminous pavement vertically and to a neat straight line at the termination points of the milling operations. The milled pavement surface shall be reasonably free of excessive scarification marks or other damage as determined by the Resident Project Representative. Any leveling or patching required as

a result of negligence by the Contractor shall be repaired with hot asphalt plant mix at no additional cost to the Owner and in a manner acceptable to the Resident Project Representative. Manholes, inlets, light fixtures, utility lines, and other existing features including existing pavement that is damaged by the Contractor's operations shall be repaired or replaced at the expense of the Contractor. The Resident Project Representative may require re-milling any area where surface laminations or defects resulting from the Contractor's operations cause a non-uniform surface.

160-3.4 Clean Up. The milled pavement surface shall be thoroughly cleaned of all loose aggregate particles, dust, mill cuttings, and other objectionable material. Cuttings not immediately picked up during milling and removal operations shall be promptly removed by power brooming, vacuuming, blowing, or other means as necessary; this clean up shall be done before traffic or construction equipment is allowed to recompact and rebond loose milling residue to the milled surface.

160-3.5 Dust and Hazard Control. The pavement removal operations shall be conducted to effectively control within regulations the amount of dust being emitted. The operation shall be planned and conducted so that it is safe for persons and property adjacent to the work including the traveling public.

160-3.6 Disposal. The material removed by means of milling shall become the property of the Contractor and shall be disposed of off airport property in an approved location. No additional payment will be made for off-site disposal.

METHOD OF MEASUREMENT

160-4.1 The quantity of pavement milling shall be the number of square yards milled, complete in accordance with the plans and specifications. Payment shall only be made for a single pass in each area.

BASIS OF PAYMENT

160-5.1 The square yards measured as provided in the Method of Measurement shall be paid for under the contract bid price for pavement removal. This price shall be full compensation for all saw cutting, pavement removal and disposal of the same and for all labor, equipment tools, and incidentals necessary to complete this item.

Item P-160 Asphalt Milling (2.5")....per square yard

END OF ITEM P-160

ITEM P-209
CRUSHED AGGREGATE BASE COURSE

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans.

MATERIALS

209-2.1 Crushed aggregate base. Crushed aggregate shall consist of clean, sound, durable particles of crushed stone, crushed gravel, and shall be free from coatings of clay, silt, organic material, or other objectionable materials. Aggregates shall contain no clay lumps or balls. Fine aggregate passing the No. 4 sieve shall consist of fines from the coarse aggregate crushing operation. If necessary, fine aggregate may be added to produce the correct gradation. The fine aggregate shall be produced by crushing stone, gravel, that meet the coarse aggregate requirements for wear and soundness.

The coarse aggregate portion, defined as the material retained on the No. 4 sieve, shall not have a loss of greater than 45% when tested per ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. The aggregate shall contain no more than 15%, by weight, of flat, elongated, or flat and elongated particles per ASTM D4791. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than three (3). The aggregate shall have at least 90% by weight of particles with at least two fractured faces and 100% with at least one fractured face per ASTM D5821. The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

a. Sampling and testing for initial aggregate base requirements. Samples shall be taken by the Contractor in the presence of the Engineer. Material shall meet the requirements in paragraph 209-2.1 and 209-2.2. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

209-2.2 Gradation requirements. The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine as defined by ASTM D2487 and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa. The fraction of material passing the No. 200 sieve shall not exceed one-half the fraction passing the No. 40 sieve.

The material finer than 0.02 mm shall be limited to a maximum of 3% and the maximum allowable material passing the No. 200 sieve shall be reduced from 0-8% to 0-5%. Testing per ASTM D422 will be required for the percentage passing the 0.02 mm particle size once per lot.

Requirements For Gradation Of Aggregate Base

Sieve Size	Design Range % by Weight	Contractor's Final Gradation	Job Control Grading Band Tolerances for Contractor's Final Gradation %
2"	100		0
1-1/2"	95-100		±5
1"	70-95		±8
3/4"	55-85		±8
No. 4	30-60		±8
No. 40	10-30		±5
No. 200	0-5		±3

The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

a. Sampling and testing for gradation. Gradation tests shall be performed by the Contractor per ASTM C136 and sieve analysis on material passing the No. 200 sieve per ASTM C117. The Contractor shall take at least two aggregate base samples per lot to check the final gradation. Sampling shall be per ASTM D75. The lot will be consistent with the lot size used for density. The samples shall be taken from the in-place, un-compacted material in the presence of the Engineer. Sampling points and intervals will be designated by the Engineer.

CONSTRUCTION METHODS

209-3.1 Preparing underlying subgrade and/or subbase. The underlying subgrade and/or subbase shall be checked and accepted by the Engineer before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with P-152, at the Contractor's expense, may be required by the Engineer if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

209-3.2 Production. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.4, the approved material may be transported directly to the spreading equipment.

209-3.3 Placing. The aggregate base material shall be placed on the prepared underlying subgrade and/or subbase and compacted in layers to the thickness shown on the plans. Work shall progress without interruption. The material shall be deposited and spread in lanes in a uniform layer without segregation to such loose depth that, when compacted, the layer shall have the specified thickness. The aggregate base course shall be constructed in layers of uniform thickness of not less than 3" nor more than 6" of compacted thickness. The aggregate as spread shall be of uniform grading with no pockets of fine or coarse materials. The aggregate, unless otherwise permitted by the Engineer, shall not be spread more than 2,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within these

limits. Care shall be taken to prevent cutting into the underlying layer during spreading. No material shall be placed in snow or on a soft, muddy, or frozen course. The aggregate base material shall be spread by spreader boxes or other approved devices. This equipment shall have positive thickness controls that spread the aggregate in the required amount to avoid or minimize the need for hand manipulation. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

209-3.4 Compaction. Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade. The moisture content of the material during placing operations shall be within ±2 percentage points of the optimum moisture content as determined by ASTM D1557.

209-3.5 Acceptance sampling and testing for density. Aggregate base course shall be accepted for density on a lot basis. A lot will consist of one day's production if it does not exceed 2,400 square yards. A lot will consist of one-half day's production if a day's production consists of between 2,400 and 4,800 square yards. The Engineer shall perform all density tests for acceptance.

Each lot shall be divided into two equal sublots. One test shall be made for each sublot and shall consist of the average of two random locations for density determination. Sampling locations will be determined by the Engineer on a random basis per ASTM D3665.

Each lot will be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens. The specimens shall be compacted and tested per ASTM D1557. The in-place field density shall be determined per ASTM D1556. Test in accordance with ASTM D4718 if greater than 30% is retained on the 3/4" sieve. Or, in-place field density shall be determined by ASTM D2167 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made at the Contractor's expense. This procedure shall be followed until the specified density is reached.

209-3.6 Surface tolerances. After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3", reshaped and recompacted to grade. until the required smoothness and accuracy are obtained and approved by the Engineer. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

a. Smoothness. The finished surface shall not vary more than 3/8" when tested with a 12'-0" straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously at half the length of the 12'-0" straightedge for the full length of each line on a 50'-0" grid.

b. Accuracy. The grade and crown shall be measured on a 50'-0" grid and shall be within +0 and -1/2" of the specified grade.

209-3.7 Thickness control. The thickness of the base course shall be within +0 and -1/2" of the specified thickness as determined by depth tests taken by the Contractor in the presence of the Engineer. Tests shall be taken at intervals representing no more than 300 square yards per test. Sampling locations will be determined by the Engineer per ASTM D3665. Where the thickness is deficient by more than 1/2", the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3", adding new material of proper gradation, and the material shall be blended and recompacted to grade. Additional test holes may be required to identify the limits of deficient areas. The Contractor shall replace, at his expense, base material where depth tests have been taken.

209-3.8 Protection. Perform construction when the atmospheric temperature is above 35°F. When the temperature falls below 35°F, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements. When the aggregates contain frozen materials or when the underlying course is frozen or wet, the construction shall be stopped. Hauling equipment may be routed over completed portions of the base course, provided no damage results. Equipment shall be routed over the full width of the base course to avoid rutting or uneven compaction. The Engineer will stop all hauling over completed or partially completed base course when, in the Engineer's opinion, such hauling is causing damage. Any damage to the base course shall be repaired by the Contractor at the Contractor's expense.

209-3.9 Maintenance. The Contractor shall maintain the base course in a satisfactory condition until the full pavement section is completed and accepted by the Engineer. The surface shall be kept clean and free from foreign material and properly drained at all times. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any base course that is not paved over prior to the onset of winter shall be retested to verify that it still complies with the requirements of this specification. Any area of base course that is damaged shall be reworked or replaced as necessary to comply with this specification.

Equipment used in the construction of an adjoining section may be routed over completed base course, if no damage results and the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

The Contractor shall remove all survey and grade hubs from the base courses prior to placing any bituminous surface course.

METHOD OF MEASUREMENT

209-4.1 The quantity of crushed aggregate base course will be determined by measurement of the number of cubic yards of material actually constructed and accepted by the Engineer as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per cubic yard for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209-1 - Crushed Aggregate Base Course - per cubic yard

TESTING REQUIREMENTS

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-209

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ITEM P-219
RECYCLED CONCRETE AGGREGATE BASE COURSE

DESCRIPTION

219-1.1 This item consists of a subbase course composed of recycled concrete aggregate, crushed to meet a particular gradation, constructed on a prepared course per these specifications and in conformity to the dimensions and typical cross-sections shown on the plans.

MATERIALS

219-2.1 Aggregate. Recycled concrete aggregate shall consist of portland cement concrete (PCC) or other concrete containing pozzolanic binder material. The recycled concrete material shall be free of reinforcing steel and expansion material. Asphalt concrete overlays shall be removed from the PCC surface prior to pavement removal and crushing. Any full-slab asphalt concrete panels (used as a replacement for a removed PCC slab) shall also be removed. An incidental amount of recycled asphalt concrete pavement and other foreign material may be present in the recycled concrete aggregate.

Recycled concrete aggregate subbase course shall consist of at least 90%, by weight, Portland cement concrete, with the remaining 10% consisting of the following materials:

Wood	0.1% maximum
Brick, mica, schist, or other friable materials	4% maximum
Asphalt concrete	10% maximum

Virgin aggregates may be added to meet the 90% minimum PCC requirement.

The percentage of wood, brick, mica, schist, other friable materials, and asphalt concrete shall be determined by weighing that material retained on the No. 4 sieve, and dividing by the total weight of recycled concrete aggregate material retained on the No. 4 sieve.

The fine aggregate shall be produced by crushing stone, gravel, slag, or recycled concrete that meet the requirements for wear and soundness specified for coarse aggregate. Fine aggregate may be added to produce the correct gradation.

The amount of flat and elongated particles in recycled concrete aggregate shall not exceed 20% for the fraction retained on the 1/2" sieve nor 20% for the fraction passing the 1/2" sieve when tested per ASTM D4791. A flat particle is one having a width to thickness ratio greater than 3; an elongated particle is one having a length to width ratio greater than 3.

The percentage of wear shall not be greater than 45% when tested per ASTM C131. The sodium sulfate soundness test (ASTM C88) requirement is waived for recycled concrete aggregate.

The fraction passing the No. 40 sieve shall have a liquid limit no greater than 25 and a plasticity index of not more than four (4) when tested per ASTM D4318. The fine aggregate shall have a minimum sand equivalent value of 35 when tested per ASTM D2419.

a. Sampling and testing. Recycled concrete aggregate samples for preliminary testing shall be furnished by the Contractor prior to the start of subbase construction. All tests for initial aggregate

submittals necessary to determine compliance with the specification requirements will be made by the Engineer at no expense to the Contractor.

Samples of recycled concrete aggregate shall be furnished by the Contractor at the start of production and at intervals during production. The sampling points and intervals will be designated by the Engineer. The samples will be the basis of approval of specific lots of recycled concrete aggregate for the quality requirements.

Samples of recycled concrete aggregate to check gradation shall be taken at least once daily. Sampling shall be per ASTM D75, and testing shall be per ASTM C136 and ASTM C117.

b. Gradation requirements. The gradation (job mix) of the final mixture shall fall within the design range indicated in the following table, when tested per ASTM C117 and ASTM C136. The final gradation shall be continuously graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.

Requirements for Gradation of Recycled Concrete Aggregate Subbase

Sieve Size	% by Weight Passing Sieves	Job Mix Tolerances %
2"	100	--
1-1/2"	95 - 100	±5
1"	70 - 95	±8
3/4"	55 - 85	±8
No. 4	30 - 60	±8
No. 30	12 - 30	±5
No. 200	0 - 5	±3

The job mix tolerances in the table shall be applied to the job mix gradation to establish a job control gradation band. The full tolerance still will apply if application of the tolerances results in a job control gradation band outside the design range.

EQUIPMENT

219-3.1 General. All equipment necessary to mix, transport, place, compact, and finish the recycled concrete aggregate subbase course shall be furnished by the Contractor. The Contractor shall provide written certification to the Engineer that all equipment meets the requirements for this section. The equipment shall be inspected by the Engineer at the job site prior to the start of construction operations.

219-3.2 Mixing equipment. The subbase course shall be thoroughly mixed in a plant suitable for recycled concrete aggregate. The mixer shall be a batch or continuous-flow type equipped with a calibrated metering and feeding device that introduce the aggregate and water into the mixer in specified quantities. If necessary, a screening device shall be installed to remove oversized material greater than 2" from the recycled concrete aggregate feed.

The Engineer shall have access to the plant at all times for inspection of the plant's equipment and operation and for sampling the mixed recycled concrete aggregate materials.

219-3.3 Hauling equipment. The mixed recycled concrete aggregate subbase course shall be transported from the plant to the job site in hauling equipment having beds that are smooth, clean, and tight. Truck bed covers shall be provided and used to protect the mixed recycled concrete aggregate subbase course from rain during transport.

219-3.4 Placing equipment. Recycled concrete aggregate shall be placed using a mechanical spreader or machine capable of receiving, spreading, and shaping the material into a uniform layer or lift without segregation. The placing equipment shall be equipped with a strike off plate that can be adjusted to the layer thickness. The equipment that is used to place the recycled concrete aggregate shall not damage the geotextile fabric.

219-3.5 Compaction equipment. Recycled concrete aggregate subbase course shall be compacted using one or a combination of the following pieces of equipment: steel-wheeled roller; vibratory roller; pneumatic-tire roller; and/or hand-operated power tampers (for areas inaccessible to rollers).

219-3.6 Finishing equipment. Trimming of the compacted recycled concrete aggregate to meet surface requirements shall be accomplished using a self-propelled grader or trimming machine, with a mold board cutting edge of 12'-0" minimum width automatically controlled by sensors in conjunction with an independent grade control from a taut stringline. Stringline will be required on both sides of the sensor controls for all lanes.

CONSTRUCTION METHODS

219-4.1 Weather limitations. Construction is allowed only when the atmospheric temperature is at or above 35°F. When the temperature falls below 35°F, the Contractor shall protect all completed areas against detrimental effects of freezing. The Contractor shall repair any areas damaged by freezing, rainfall, or other weather conditions.

219-4.2 Preparing underlying course. The new underlying geotextile fabric and the existing select fill course shall be checked by the Engineer before placing and spreading operations are started. Any ruts or soft yielding places caused by improper drainage conditions, hauling, or any other cause shall be corrected at the Contractor's expense before the P-219 subbase course is placed there. Material shall not be placed on frozen material.

To protect the existing layers and to ensure proper drainage, the spreading of the recycled concrete aggregate subbase course shall begin along the centerline of the pavement on a crowned section or on the greatest contour elevation of a pavement with a variable uniform cross slope.

219-4.3 Grade control. Grade control between the edges of the recycled concrete aggregate subbase course lanes shall be accomplished by grade stakes, steel pins, or forms placed in lanes parallel to the centerline and at intervals of 50'-0" or less on the longitudinal grade and 25'-0" or less on the transverse grade.

219-4.4 Mixing. The recycled concrete shall be uniformly blended during crushing operations and mixed with water in a mixing plant suitable for recycled concrete aggregate. The plant shall blend and mix the materials to meet the specifications and to secure the proper moisture content for compaction.

219-4.5 Placing. The recycled concrete aggregate subbase material shall be placed on the moistened geotextile fabric and existing select fill subgrade in layers of uniform thickness with an approved mechanical spreader.

The maximum depth of a compacted layer shall be 6". If the total depth of the compacted material is more than 6", it shall be constructed in two or more layers. In multi-layer construction, the material shall be placed in approximately equal-depth layers.

The previously constructed layer shall be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

Adjustments in placing procedures or equipment shall be made to obtain grades, to minimize segregation grading, to adjust the water content, and to ensure an acceptable recycled concrete aggregate subbase course.

219-4.6 Compaction. Immediately after completion of the spreading operations, the recycled concrete aggregate shall be compacted. The number, type, and weight of rollers shall be sufficient to compact the material to the required density.

Each layer of the recycled concrete aggregate subbase course shall be compacted to the required density using the compaction equipment. The moisture content of the material during placing operations shall be within ±1-1/2 percentage points of the optimum moisture content as determined by ASTM D1557.

The compaction shall continue until each layer has reached compaction that is at least 100% of the laboratory maximum density through the full depth of the layer. The Contractor shall make adjustments in compacting or finishing techniques to obtain true grades, to minimize segregation and degradation, to reduce or increase water content and to ensure a satisfactory subbase course. Any unsatisfactory materials shall be removed and replaced with satisfactory material or reworked, to meet the requirements of this specification.

219-4.7 Acceptance sampling and testing for density. The Engineer shall perform all density tests. Recycled concrete aggregate shall be accepted for density on a lot basis. A lot will consist of one day's production where it does not exceed 2,400 square yards per lift. A lot will consist of one-half day's production, where a day's production is between 2,400 and 4,800 square yards per lift.

Each lot shall be divided into two equal sublots. One density test shall be made for each sublot and shall consist of the average of two random locations for density determination. Sampling locations will be determined by the Engineer on a random basis per ASTM D3665.

Each lot will be accepted for gradation when it falls within the limits and tolerances shown in the table above when tested per ASTM C117 and ASTM C131. If the proper gradation is not attained the gradation test will be repeated. If the re-test does not indicate gradations within the limits of the table above, the entire lot shall be rejected and replaced by the Contractor at the Contractor's expense.

Each lot will be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase course material. The specimens shall be compacted and tested per ASTM D1557. The in-place field density shall be determined per ASTM D1556. Test in accordance with ASTM D4718 if greater than 30% is retained on the 3/4" sieve, or ASTM D2167 or ASTM D6938. The field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method and the machines shall be calibrated in accordance with per ASTM D6938. When using the nuclear method, ASTM D4643 shall be used to determine the moisture content of the material. If the specified density is not attained, the entire lot shall be reworked and two additional random tests made. This procedure shall be followed until the specified density is reached.

219-4.8 Finishing. The surface of the recycled concrete aggregate subbase course shall be finished by equipment designed for this purpose.

Adding a thin layer of material to the top of the subbase course to meet grade shall not be allowed. If the elevation of the layer is 1/2" or more below grade, the layer shall be scarified to a depth of at least 3", new material added, and the layer shall be recompacted. If the finished surface is above plan grade, it shall be cut back to grade and rerolled. The grade shall be measured on a maximum 25'-0" grid (longitudinal and transverse). Thickness results shall be furnished to the Engineer daily for acceptance determination.

Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, and recompacted or replaced at the Contractor's expense.

219-4.9 Surface tolerances. The finished surface shall not vary more than 3/8" when tested with a 12'-0" straightedge applied parallel with or at right angles to the centerline. The Contractor shall correct any deviation in excess of this amount, at the Contractor's expense.

219-4.10 Thickness control. The completed thickness of the subbase course shall be within 1/2" of the design thickness. Four thickness determinations shall be made for each lot of material placed. Each lot shall be divided into four equal sublots and one test shall be made for each sublot. Sampling locations will be determined per ASTM D3665. Where the thickness is more than 1/2" deficient, the Contractor, at his or her expense, shall correct the areas by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

219-4.11 Traffic. Equipment used in construction may be routed over completed portions of the subbase course, provided there is no damage to the subbase course. The equipment shall be routed evenly over the full width of the subbase course to avoid rutting or uneven compaction.

219-4.12 Maintenance. The subbase course shall be maintained until the subbase course is completed and accepted. Maintenance will include immediate repairs to any defects and shall be repeated as often as necessary to keep the completed work intact. The Contractor, at his or her expense, will rework any area of the recycled concrete aggregate subbase course that is damaged.

METHOD OF MEASUREMENT

219-5.1 The quantity of Recycled Concrete Aggregate Subbase Course will be determined by measurement of the number of square yards or cubic yards of material actually constructed and accepted as complying with the plans and specifications.

BASIS OF PAYMENT

219-6.1 Payment shall be made at the contract unit price per square yard for Recycled Concrete Aggregate Subbase Course, based on the required cross-section of material. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

219-6.2 Payment shall be made at the contract unit price per cubic yard for Recycled Concrete Aggregate Subbase Course, based on the varying depth of material in the proposed shoulder section. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-219-1 Recycled Concrete Aggregate Subbase Course (12”) - per square yard
Item P-219-2 Recycled Concrete Aggregate Subbase Course (Under Shoulder) – per cubic yard

TESTING REQUIREMENTS

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D75	Standard Practice for Sampling Aggregates
ASTM C117	Standard Test Method for Materials Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregate
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber-Balloon Method
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-219

ITEM P-306
LEAN CONCRETE BASE COURSE

DESCRIPTION

306-1.1 This item shall consist of a subbase material, herein termed lean concrete, that is composed of aggregate and cement uniformly blended together and mixed with water. The mixture may also include approved cementitious additives, in the form of fly ash or slag, and chemical admixtures. The mixed material shall be spread, shaped, and consolidated using concrete paving equipment in accordance with these specifications and in conformity to the lines, grades, dimensions, and typical cross-sections shown on the plans.

MATERIALS

306-2.1 Aggregate. The coarse aggregate fraction shall be crushed stone, crushed or uncrushed gravel, crushed and adequately seasoned, air-cooled, iron blast furnace slag, or a combination thereof. The fine aggregate fraction may be part of the natural aggregate blend as obtained from the borrow source or it may be natural sand that is added at the time of mixing.

The aggregate shall consist of hard, durable particles, free from an excess of flat, elongated, soft, or disintegrated pieces, or objectionable matter such as roots, sod, weeds, organic impurities, etc. A flat particle is one having a ratio of width to thickness greater than five; an elongated particle is one having a ratio of length to width greater than five.

The design aggregate blend shall conform to the gradation shown in the table below, when tested in accordance with ASTM C136. The aggregates shall be within the limits for deleterious material contained in ASTM C33 Table 3 type 4S. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalies in the cement, except as permitted in ASTM C33.

Aggregate Gradation for Lean Concrete

Sieve Size (square openings)	**Percentage by Weight Passing Sieves**
	Gradation A[1]
2 inch (50 mm)	--
1-1/2 inch (38 mm)	100
1 inch (25 mm)	70 - 95
3/4 inch (19 mm)	55 - 85
No. 4 (4.75 mm)	30 - 60
No. 40 (425 µm)	10 - 30
No. 200 (75 µm)	0 - 10

Note 1: No. 200 sieve maximum percent passing has been reduced from 15 to 10 percent.

306-2.2 Cement. Cement shall conform to the requirements of ASTM C150, Type I or II, low alkali.

306-2.3 Cementitious additives. Pozzolanic and slag cement may be added to the lean concrete mix. If used, each material must meet the following requirements:

a. Pozzolan. Pozzolanic materials must meet the requirements of ASTM C618, Class N, F, or C Fly Ash, except the loss on ignition shall be 6% for Class N and F.

b. Ground granulated blast furnace slag (slag cement). Slag shall conform to ASTM C989, Grade 120.

306-2.4 Chemical admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all the requirements listed below. In addition, the Engineer may require the Contractor to submit complete test data showing that the material to be furnished meets all the requirements of the cited specification.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260.

b. Water-reducing admixtures. Water-reducing, set-controlling admixtures shall meet the requirements of ASTM C494, Type A, D, E, F, or G. Water-reducing admixtures shall be added at the mixer separately from air-entraining admixtures in accordance with the manufacturer's printed instructions. The air entrainment agent and the water-reducing admixture shall be compatible.

c. Retarding admixtures. Retarding admixtures shall meet the requirements of ASTM C494, Type B or D.

d. Accelerating admixtures. Accelerating admixtures shall meet the requirements of ASTM C494, Type C.

306-2.5 Water. Water used in mixing or curing shall be potable, clean and free of oil, salt, acid, alkali, sugar, vegetable, or other deleterious substances injurious to the finished product.

306-2.6 Curing materials. For curing lean concrete, use white-pigmented, liquid membrane-forming compound conforming to ASTM C309, Type 2, Class B, or clear or translucent Type 1-D, Class B with white fugitive dye.

COMPOSITION OF MIXTURE

306-3.1 Mix design. The lean concrete mix design shall be based on trial batch results conducted in the laboratory. The lean concrete shall be designed to meet the criteria in this section.

306-3.1.1 Compressive strength. Compressive strength shall not be less than 500 pounds per square inch (3,445 kPa) nor greater than 800 pounds per square inch (5,516 kPa) at seven (7) days. Three-day and seven-day strengths shall be taken as the average of two compressive strength test results. All compressive strength specimens shall be prepared and tested in accordance with ASTM C192 and ASTM C39, respectively.

If the 3-day strength is greater than 500 pounds per square inch (3,447 kPa), the Contractor shall construct transverse joints in the lean concrete layer in accordance with paragraph 306-5.10.2.

The freeze-thaw weight loss shall not exceed 14% when tested in accordance with American Association of State Highway and Transportation Officials (AASHTO) T136. If there is a change in aggregate sources, type of cement used, or pozzolanic materials, a new mix design must be submitted.

306-3.1.2 Air content. The percentage of air entrainment shall be 6%, ±1/2%. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

306-3.2 Submittals. At least 30 days prior to the placement of the lean concrete, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction, as well as the mix design information for the lean concrete material. Tests older than six (6) months shall not be used. The certification shall show the appropriate ASTM or AASHTO specifications or tests for the

material, the name of the company performing the tests, the date of the tests, the test results, and a statement that the material did or did not comply with the applicable specifications. The submittal package shall include the following:

a. Sources of materials, including aggregate, cement, admixtures, and curing and bond breaking materials.

b. Physical properties of the aggregates, cement, admixtures, curing and bond breaking materials.

c. Mix design:

- Mix identification number
- Weight of saturated surface-dry aggregates (fine and coarse)
- Combined aggregate gradation
- Cement factor
- Water content
- Water-cementitious material ratio (by weight)
- Volume of admixtures and yield for one cubic yard (cubic meter) of lean concrete

d. Laboratory test results:

- Slump
- Air content
- Compressive strength at 3, 7, and 28 days (average values)
- Freeze-thaw weight loss

In addition, where applicable, the Contractor shall submit for approval by the Engineer a jointing plan for transverse joints in the lean concrete layer.

During production, the Contractor shall submit batch tickets for each delivered load.

EQUIPMENT

306-4.1 All equipment necessary to mix, transport, place, compact, and finish the lean concrete material shall be furnished by the Contractor. The equipment shall be subject to inspection and approval by the Engineer.

306-4.2 Mixing. Lean concrete may be mixed in a stationary mixer (central batch plant or at the site), or in a truck mixer. The mixer type and capacity shall be inspected and approved by the Engineer before production begins. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

306-4.2.1 Stationary plant mixer. The batch plant and equipment shall conform to the requirements of ASTM C94. The Engineer shall have unrestricted access to the plant at all times for inspection of the plant's equipment and operation and for sampling the lean concrete mixture and its components.

The mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades.

306-4.2.2 Truck mixers. Truck mixers used for mixing lean concrete shall conform to the requirements of ASTM C94. Lean concrete may be entirely mixed in a truck mixer or partially mixed in a stationary mixer with mixing completed in a truck mixer. Truck mixers shall be equipped with an accurate

continuous registering electronically or mechanically activated revolution counter, to verify the number of drum revolutions.

306-4.3 Hauling. Mixed lean concrete shall be hauled from the stationary plant to the job site in a truck agitator, a truck mixer operating at agitating speed, or a non-agitating truck. All equipment shall conform to the requirements of ASTM C94. When truck mixers are used to mix lean concrete, they may be transported to the job site in the same truck operating at agitating speeds, truck agitators, or a non-agitating truck. The bodies of non-agitating trucks shall be smooth, metal containers and shall be capable of discharging the concrete at a controlled rate without segregation.

306-4.4 Placing and finishing.

306-4.4.1 Forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet (3 m) in length. Forms shall have a depth equal to the pavement thickness at the edge. Flexible or curved forms of proper radius shall be used for curves of 100 feet (30 m) radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer.

The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4 inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when accepted by the Engineer.

306-4.4.2 Fixed form or slip-form pavers. Lean concrete can be placed using fixed form or slip-form pavers. The paver shall be fully energized, self-propelled and capable of spreading, consolidating, and finishing the lean concrete material, true to grade, tolerances, and cross-sections. The paver shall be capable of finishing the surface so that hand finishing is not required. The paver shall be of sufficient weight and power to construct the maximum specified concrete paving lane width, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The slip-form paver shall be equipped with electronic or hydraulic horizontal and vertical control devises using guide wires or stringlines on both sides of the machine. Slope control will not be allowed.

a. Concrete pavers. Concrete pavers are approved as paver-finishing machines for lean concrete, providing they are capable of handling the amount of lean concrete required for the full-lane width specified, and consolidating the lean concrete full depth. A concrete paver is a power-driven machine with augers, strike-off and tamper bars ahead of a pan screed, with at least one trailing oscillating screed or belt finisher.

306-4.5 Consolidation. For side-form construction, vibrators may be either the surface pan type for pavements less than 8 inches (200 mm) thick or the internal type with either immersed tube or multiple spuds for the full width of the slab. They may be attached to the spreader or the finishing machine, or they may be mounted on a separate carriage. They shall not come in contact with the joint, subgrade, or side forms.

For slip-form construction, the paver shall vibrate the lean concrete for the full width and depth of the strip of pavement being placed. Vibration shall be accomplished by internal vibrators.

The number, spacing, frequency, and eccentric weights of vibrators shall be provided to achieve acceptable consolidation without segregation and finishing quality. Adequate power to operate all vibrators at the weight and frequency required for a satisfactory finish shall be available on the paver. The internal vibrators may be supplemented by vibrating screeds operating on the surface of the lean concrete. The Contractor shall constantly monitor the frequency of each of the individual vibrators and shall provide constant monitoring of the consolidation process to avoid honeycombing or segregation. Areas

that are visually determined to be honeycombed or segregated shall be corrected at the Contractor's expense.

The vibrators and tamping elements shall be automatically controlled so that they stop operation as forward motion ceases. Any override switch shall be of the spring-loaded, momentary-contact type.

Hand held vibrators may be used in irregular areas.

306-4.6 Jointing. The Contractor shall provide sawing equipment adequate in number of units and power to produce contraction or construction joints of the required dimensions as shown in the Contractor's submittal should the P-306 mix design compressive strength exceed 500 psi at 3 days. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

CONSTRUCTION METHODS

306-5.1 Weather limitations.

306-5.1.1 Cold weather. Unless authorized by the Engineer, the temperature of the mixed lean concrete shall not be less than 50°F (10°C) at the time of placement. In addition, the lean concrete shall not be placed when the ambient temperature is below 40°F (4°C) or when conditions indicate that the temperature may fall below 35°F (2°C) within 24 hours. Under no circumstances shall the lean concrete be placed on frozen underlying courses or mixed when the aggregate is frozen.

When mixing and placing is authorized during cold weather, the Engineer may require the water and/or the aggregates to be heated to not less than 70°F (21°C) nor more than 150°F (66°C). The aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials. The Contractor shall adhere to the practices recommended in American Concrete Institute (ACI) 306R, Guide to Cold Weather Concreting.

306-5.1.2 Hot weather. To prevent rapid drying of newly constructed lean concrete, the lean concrete temperature from initial mixing through final cure shall not exceed 90°F (32°C). The aggregates and/or mixing water shall be cooled as necessary to maintain the lean concrete temperature at or not more than the specified maximum. Ice or ice water may be substituted for the mixing water for this purpose. The Contractor shall adhere to the practices recommended in ACI 305R.

In addition, during periods of warm weather when the maximum daily air temperature exceeds 85°F (30°C), the forms and/or the underlying material shall be sprinkled with water immediately before placing the lean concrete.

306-5.1.3 Rain. All mixing and batching operations should be halted during rain showers and any plastic lean concrete placed should be covered immediately. The lean concrete shall be kept covered with plastic sheeting or other waterproof material until such time that the rain does not make any surface indentation on the lean concrete layer. Areas damaged by rain shall be refinished or replaced.

306-5.2 Form setting. Forms shall be set sufficiently in advance of the lean concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the grade shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place with not less than three (3) pins for each 10 feet (3 m) section. A pin shall be placed at each side of every joint.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/4 inch (6 mm) at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of lean concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the lean concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

306-5.3 Preparation of underlying course. The underlying P-219 course shall be checked by the Engineer before placing and spreading operations are started, to ensure it is free of any ruts, depressions, or bumps and is finished to the correct grade. Any ruts or soft yielding places in the underlying course shall be corrected at the Contractor's expense before the lean concrete mixture is placed. The underlying course should be wetted down in advance of placing the lean concrete to ensure a firm, moist condition at the time of lean concrete placement. The underlying course shall be protected from frost. Usage of chemicals to eliminate frost is not permissible.

306-5.4 Grade control. Grade control between the edges of the pavement shall be accomplished at intervals of 50 feet (15 m) or less on the longitudinal grade and at 25 feet (7.5 m) or less on the transverse grade. To protect the underlying course and ensure proper drainage, the lean concrete paving shall begin along the centerline of the pavement on a crowned section or on the greatest contour elevation of a pavement with variable cross slope.

306-5.5 Handling, measuring, and batching material. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours transit will be accepted as adequate binning if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using approved interlocked proportioning devises. When bulk cement is used, the Contractor shall use a suitable method such as a chute, boot or other device approved by the Engineer to handle the cement between the weighing hopper and the transporting container or into the batch itself for transportation to the mixer, to prevent loss of cement. The device shall provide positive assurance that each batch has the specified cement content.

306-5.6 Mixing. All lean concrete shall be mixed and delivered to the site per the requirements of ASTM C94. The mixing time should be adequate to produce lean concrete that is uniform in appearance, with all ingredients evenly distributed. Mixing time shall be measured from the time all materials are emptied into the drum (provided all the water is added before one-fourth the preset mixing time has elapsed) and continues until the time the discharge chute is opened to deliver the lean concrete.

If mixing in a plant, the mixing time shall not be less than 50 or greater than 90 seconds. If mixing in a truck, the mixing time shall not be less than 70 or more than 125 truck-drum revolutions at a mixing speed of not less than six (6) or more than 18 truck-drum revolutions per minute.

Re-tempering lean concrete by adding water or by other means will not be permitted, except when lean concrete is delivered in truck mixers. With truck mixers, additional water may be added to the batch materials and additional mixing performed to allow proper placement of the material, provided (a) the addition of water is performed within 45 minutes after the initial mixing operations and (b) the slump and water/cementitious ratio specified in the mix design is not exceeded.

306-5.7 Hauling. The elapsed time from the addition of cementitious material to the mix until the lean concrete is deposited in place at the work site shall not exceed 45 minutes when the concrete is hauled in nonagitating trucks, or 90 minutes when it is hauled in truck mixers or truck agitators.

306-5.8 Placing, consolidating, and finishing. Prior to placement of the lean concrete layer, the prepared underlying P-219 course shall be moistened with water, without saturating, to prevent rapid loss of

moisture from the lean concrete. In cold weather, the underlying course shall be protected so that it will be entirely free of frost when lean concrete is placed.

The Contractor has the option of side- form or slip-form paving. Either option shall require the hauled lean concrete material to be discharged onto the prepared underlying course such that segregation of the mix is minimized and minimum handling of the mix is needed. The lean concrete shall be placed continuously at a uniform rate without unscheduled stops except for equipment failure or other emergencies. Avoid contamination of plastic lean concrete with foreign material on construction equipment, workman's footwear, or any other sources. Lean concrete shall not be mixed, placed, or finished when the natural light is insufficient, unless an adequate artificial lighting system is provided.

306-5.8.1 Side-form construction. For side-form placement, the Contractor shall verify the elevations of the fixed forms so the thickness and finished grade of the lean concrete layer will be in accordance with the requirements of the project plans and specifications. The lean concrete shall be spread uniformly between the forms immediately after it is placed using a spreading machine. Necessary hand spreading shall be done with shovels. Rakes shall not be allowed for spreading lean concrete.

The spreading shall be followed immediately by thorough consolidation using vibrating screeds or spud vibrators. Vibrators may be external or internal type, depending on the thickness of the lean concrete layer. The surface vibrators may be attached to the spreader or they may be mounted on a separate carriage. They shall not come in contact with the joint, subgrade, or side forms. When spud vibrators are used, the lean concrete shall be thoroughly consolidated against and along the faces of all forms and previously placed lean concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 20 seconds in any one location, nor shall the vibrators be used to move the lean concrete.

Hand finishing will not be permitted except in areas where the mechanical finisher cannot operate.

306-5.8.2 Slip-form construction. For slip-form construction, the Contractor shall verify the elevations of the guide wires controlling slip-form pavers such that the thickness and finished grade of the lean concrete will be in accordance with the requirements of the project plans and specifications. The slip-form paver should spread, consolidate, and shape the freshly placed lean concrete in one complete pass of the machine. The machine shall vibrate and finish the lean concrete for the full width and depth of the layer.

306-5.9 Final finishing. Final finishing shall be accomplished while the lean concrete is still in the plastic state. Limited surface refinishing by hand is acceptable to meet the grade and surface tolerance established in paragraphs 306-6.2.3 and 306-6.2.4, after strike off and consolidation.

As the overlying layer is P-501 PCC pavement, the surface of the lean concrete shall not be textured. If the overlying layer is to be HMA pavement, and if the bond between the HMA layer and the lean concrete is considered important for pavement performance, tining or scarifying the surface to provide a coarse texture may be permitted.

306-5.10 Joints. Joints shall be constructed as shown in the Contractor's submittal when the Lean Concrete mix design strength is greater than 500 psi at 3 days.

306-5.10.1 Construction joints. Locate all longitudinal and transverse construction joints as shown in the contractor's submittal. Locate longitudinal joints within 6 inches (150 mm) from planned joints in the PCC to be placed over the lean concrete.

306-5.10.2 Contraction joints. If required by paragraph 306-3.1.1, transverse contraction joints shall be constructed by sawing the hardened lean concrete to a depth of at least one-third the thickness of the lean concrete base. These joints shall match within 3 inches (75 mm) of the planned joints of the overlying concrete surface.

306-5.10.3 Concrete saws. When sawing of joints are specified, the Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and

at the required rate. The Contractor shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations. The Contractor shall provide adequate artificial lighting facilities for night sawing. All equipment shall be on the job at all times during lean concrete placement.

306-5.11 Curing. Immediately after the finishing operations are complete and within two (2) hours of placement of the lean concrete, the entire surface and edges of the newly placed lean concrete shall be sprayed uniformly with white pigmented, liquid membrane forming curing compound. The layer should be kept moist using a moisture-retaining cover or a light application of water until the curing material is applied. The curing compound shall not be applied during rainfall.

The curing material shall be applied at a maximum rate of 200 square feet per gallon (5.0 m^2/l) using pressurized mechanical sprayers. The spraying equipment shall be a fully atomizing type equipped with a tank agitator. At the time of use, the curing compound in the tank shall be thoroughly and uniformly mixed with the pigment. During application the curing compound shall be continuously stirred by mechanical means.

Hand spraying of odd widths or shapes and lean concrete surfaces exposed by the removal of forms is permitted.

If the film of curing material becomes damaged from any cause, including sawing operations, within the required 7-day curing period or until the overlying bond break and P-501layer is constructed, the damaged portions shall be repaired immediately with additional compound or other approved means as quickly as practical.

Edges of the lean concrete layer shall be sprayed with curing compound immediately following placement with slip-form pavers or when side-forms are removed.

306-5.11.1 Curing in cold weather. The lean concrete shall be maintained at a temperature of at least 50°F (10°C) during curing. Cover lean concrete and provide with a source of heat sufficient to maintain 50°F (10°C) minimum while curing. The Contractor shall adhere to the practices recommended in ACI 306R. The Contractor shall be responsible for the quality and strength of the lean concrete placed during cold weather, and any lean concrete injured by frost action shall be removed and replaced at the Contractor's expense.

306-5.11.2 Curing in hot weather. Lean concrete temperature from initial mixing through final cure shall not exceed 90°F (32°C). Shade the fresh lean concrete and start curing as soon as the surface is sufficiently hard to permit curing without damage. The Contractor shall adhere to the practices recommended in ACI 305R.

306-5.12 Protection. The Contractor shall protect the lean concrete from injurious action by sun, rain, flowing water, frost, or mechanical injury. Protect lean concrete surfaces from foot and vehicular traffic and other sources of abrasion for a minimum of 72 hours. The Engineer shall decide when the pavement shall be opened to traffic. Traffic shall not be allowed on the pavement until test specimens made per ASTM C31 have attained a compressive strength of 350 psi (2,413 kPa) when tested per ASTM C39. The Contractor shall maintain continuity of applied curing method for the entire curing period.

306-5.13 Bond-breaker. When the Lean Concrete is to be placed directly beneath PCC, the entire surface of the CTB shall be covered with a Tencate Mirafi 1450BB Nonwoven Cementitious Bond Breaker, or approved equal. The method of installing the de-bonding material shall be submitted for approval by the Engineer prior to being incorporated into the work.

MATERIAL ACCEPTANCE

306-6.1 Acceptance sampling and testing. All acceptance sampling and testing, with the exception of coring for thickness determination, necessary to determine conformance with the requirements specified in this section will be performed by the Engineer. The Contractor shall provide the required lean concrete samples during construction for acceptance testing purposes. The samples shall be taken in the presence of the Engineer.

The lean concrete layer shall be tested for air content, strength, thickness, grade, and surface tolerance. Sampling and testing for air shall be as specified in paragraph 306-6.1.1. Sampling and testing for strength, thickness, grade, and surface tolerance shall be on a lot basis, with a lot consisting of either: (1) one day's production not to exceed 2,000 square yards, or (2) a half day's production, where a day's production is expected to consist of between 2,000 and 4,000 square yards.

Each lot will be divided into four equal sublots. In the event that only three sublots are produced, the three sublots shall constitute a complete lot. If only one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation.

End-of-production sublots (sublots associated with the final placement of lean concrete for the project which are less than a complete lot) shall be handled as (1) three sublots shall constitute a lot, or (2) one or sublots shall be incorporated into the previous lot.

306-6.1.1 Air content testing. Air content tests shall be performed on the first three truckloads of lean concrete produced at the start of operations each day and the first three truckloads produced after any scheduled or non-scheduled shutdown. Additional tests shall be performed each time a sample is taken for a strength test and when requested by the Engineer.

Air content tests shall be made in accordance with ASTM C231. Air content test results shall be between 4% and 8%.

If the first test on a truckload of lean concrete is not within the specification limits, a second test on the same truckload shall be made. If the second test is within the specification limits, the lean concrete will be accepted with respect to entrained air content. If the second test is not within the specification limits, the truckload shall be rejected.

306-6.1.2 Compressive strength testing. One sample of freshly delivered lean concrete shall be taken from each sublot for compressive strength testing. The lean concrete shall be sampled in accordance with ASTM C172. Sampling locations shall be determined per ASTM D3665.

At least two test cylinders shall be made from each sample per ASTM C31. The 7-day compressive strength of each cylinder shall be determined per ASTM C39.

The Contractor shall provide adequate facilities for the initial curing of cylinders. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60 to 80°F (16 to 27°C), and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather or in heavyweight closed plastic bags, or use other suitable methods, provided the temperature and moisture loss requirements are met.

The compressive strength for each sublot shall be computed by averaging the 7-day compressive strengths of the two test cylinders representing that sublot. The compressive strength of the lot shall be the average compressive strength of the individual sublots comprising the lot.

Specimens that are noticeably defective shall not be considered in the determination of the strength. If the test specimens fail to conform to the requirements for strength, the Engineer shall request changes in the lean concrete mixture to increase the strength to meet the requirements.

If the maximum 7-day compressive strength values exceed the maximum strength requirements when evaluated in accordance with paragraph 306-6-2.1, the Contractor shall propose a jointing plan for approval by the Engineer.

306-6.1.3 Thickness testing. After the lean concrete base has cured for three (3) days, one 4-inch (100 mm) diameter core per sublot shall be obtained per ASTM D3665. The thickness of each sampled core shall be determined using the caliper measurement procedures per ASTM C174. The average thickness for the lot shall be determined using the individual sublot core thicknesses. Acceptance criteria for lean concrete thickness are provided in paragraph 306-6.2.2.

When such measurement is deficient more than 1/2 inch (12 mm) and not more than 1 inch (25 mm) from the plan thickness, two additional cores shall be taken at random and used in determining the average thickness for that lot. The thickness of the cores shall be determined by average caliper measurement of cores tested in accordance with ASTM C174.

At all locations where cores have been drilled, the resulting holes shall be filled with lean concrete or non-shrink grout material, as approved by the Engineer.

306-6.1.4 Grade testing. The elevations of the finished lean concrete shall be surveyed on both sides of the lean concrete lane, every 25 feet (7.5 m).

306-6.1.5 Surface tolerance testing. After the lean concrete has hardened sufficiently, it shall be tested for surface tolerance with a 12 feet (3.7 m) straightedge provided by the Contractor.

306-6.2 Acceptance criteria. Acceptance of lean concrete will be based on compressive strength, thickness, grade, and surface tolerance, as described in the paragraphs below.

306-6.2.1 Compressive strength requirements. The lean concrete shall meet all of the following compressive strength requirements on a lot basis:

- The compressive strength of the lot, tested at seven (7) days, shall be greater than 500 pounds per square inch (3,445 kPa). When a given lot of lean concrete fails to meet the minimum compressive strength requirements, the entire lot shall be replaced at the Contractor's expense.
- Not more than 20% of the individual cylinders in a given lot, tested at seven (7) days, shall have a compressive strength greater than 800 pounds per square inch (5,512 kPa). When greater than 20% of the individual cylinders in a given lot have 7-day compressive strengths in excess of 800 pounds per square inch (5,512 kPa), transverse joints must be constructed.

306-6.2.2 Thickness requirements. The completed thickness shall be as shown on the plans. When the average lot thickness is not deficient by more than 1/2 inch (12 mm) from the plan thickness, full payment shall be made. If the lot average thickness is deficient by more than one inch (25 mm), it shall be removed and replaced at the Contractor's expense. When such measurement is deficient more than 1/2 inch (12 mm) and not more than one inch (25 mm) from the plan thickness, one additional core shall be taken at random from each sublot within the lot. The thickness of these additional cores shall be determined as indicated in paragraph 304-6.1.2. A new lot average thickness shall be recomputed based on these additional cores and the original cores taken from each sublot. When the recomputed average lot thickness is not deficient by more than 1/2 inch (12 mm) from the plan thickness, full payment shall be made. If the average lot thickness is deficient by more than 1/2 inch (12 mm) from the plan thickness, the entire lot shall be removed and replaced at the Contractor's expense or shall be permitted to remain in place at an adjusted payment of 75% of the contract unit price.

When the measured thickness is more than that indicated on the plans, it will be considered as conforming to the requirements, provided the surface of the completed lean concrete layer is within the established grade and surface tolerance requirements.

306-6.2.3 Grade requirements. When the completed surface is more than 1/2 inch above the grade shown in the plans, the surface shall be trimmed at the Contractor's expense using an approved grinding machine to an elevation that falls within a tolerance of 1/4 inch (6 mm).

306-6.2.4 Surface tolerance requirements. Surface deviations shall not exceed 3/8 inch from a 12-foot (3.7-m) straightedge laid in any location parallel with or at right angles to the longitudinal axis of the centerline (includes along all edges of the paving lane). Any high spots of more than 3/8 inch in 12-foot (3.7-m) shall be marked and immediately trimmed with an approved grinding machine. If the overlying layer is PCC pavement, the ground surface shall be sprayed with a double application of the curing compound at the specified rate prior to paving.

METHOD OF MEASUREMENT

306-7.1 The quantity of lean concrete will be determined by the number of square yard of lean concrete actually constructed and accepted by the Engineer as complying with the plans and specifications.

BASIS OF PAYMENT

306-8.1 The accepted quantities of lean concrete will be paid for at the contract unit price per square yard (m^2) for lean concrete base. The price and payment shall be full compensation for furnishing and placing all materials, provided; however, for any pavement found deficient in thickness as specified in paragraph 306-6.2.2, the reduced unit price shall be paid.

Item P-306-1	Lean Concrete Base Course (6") – per square yard.

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar-Bar Method)

AASHTO T136	Standard Method of Test for Freezing-and-Thawing Tests of Compacted Soil-Cement Mixtures
ASTM D3665	Standard Practice for Random Sampling of Construction Materials

MATERIAL REQUIREMENTS

ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Specification for Coal Fly Ash and Raw and Calcined Natural Pozzolans for Use in Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars

END OF ITEM P-306

ITEM P-401
HOT MIX ASPHALT (HMA) PAVEMENTS

DESCRIPTION

401-1.1 This item shall consist of pavement courses composed of mineral aggregate and asphalt cement binder (asphalt binder) mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. The portion retained on the No. 4 sieve is coarse aggregate. The portion passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate, and the portion passing the No. 200 sieve is mineral filler.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the bituminous material and free from organic matter and other deleterious substances. The percentage of wear shall not be greater than 40% when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. Clay lumps and friable particles shall not exceed 1.0% when tested in accordance with ASTM C142.

Aggregate shall contain at least 75% by weight of individual pieces having two or more fractured faces and 85% by weight having at least one fractured face. The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be achieved by crushing.

The aggregate shall not contain more than a total of 8%, by weight, of flat particles, elongated particles, and flat and elongated particles, when tested in accordance with ASTM D4791 with a value of 5:1.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter.

The fine aggregate, including any blended material for the fine aggregate, shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

Clay lumps and friable particles shall not exceed 1.0%, by weight, when tested in accordance with ASTM C142.

Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The fine aggregate shall not contain more than 15% natural sand by weight of total aggregates. If used, the natural sand shall meet the requirements of ASTM D1073 and shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The aggregate shall have sand equivalent values of 45 or greater when tested in accordance with ASTM D2419.

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

401-2.2 Mineral filler. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242.

401-2.3 Asphalt cement binder. Asphalt cement binder shall conform to ASTM D6373 Performance Grade (PG) 76-22. A certificate of compliance from the manufacturer shall be included with the mix design submittal. A PG Plus Test will be required to determine if the asphalt cement binder has been properly modified per ASTM D6084 with a minimum elastic recovery of 70%.

The supplier's certified test report with test data indicating grade certification for the asphalt binder shall be provided to the Engineer for each load at the time of delivery to the mix plant. A certified test report with test data indicating grade certification for the asphalt binder shall also be provided to the Engineer for any modification of the asphalt binder after delivery to the mix plant and before use in the HMA.

401-2.4 Preliminary material acceptance. Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

a. Coarse aggregate:
(1) Percent of wear
(2) Soundness
(3) Clay lumps and friable particles
(4) Percent fractured faces
(5) Flat and elongated particles

b. Fine aggregate:
(1) Liquid limit and plasticity index
(2) Soundness
(3) Clay lumps and friable particles
(4) Percent natural sand
(5) Sand equivalent

c. Mineral filler.

d. Asphalt binder. Test results for asphalt binder shall include temperature/viscosity charts for mixing and compaction temperatures.

The certifications shall show the appropriate ASTM tests for each material, the test results, and a statement that the material meets the specification requirement.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

401-2.5 Anti-stripping agent. Any anti-stripping agent or additive if required shall be heat stable, shall not change the asphalt cement viscosity beyond specifications, shall contain no harmful ingredients, shall be added in recommended proportion by approved method, and shall be a material approved by the Department of Transportation of the State in which the project is located.

COMPOSITION

401-3.1 Composition of mixture. The HMA mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 Job mix formula (JMF). No hot-mixed asphalt (HMA) for payment shall be produced until a JMF has been approved in writing by the Engineer. The asphalt mix-design and JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.4. The HMA shall be designed using procedures contained in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition. ASTM D6926 shall be used for preparation of specimens using the manually held and operated hammer for the mix design procedure. ASTM D6927 shall be used for testing for Marshall stability and flow.

If material variability exceeds the standard deviations indicated, the JMF and subsequent production targets shall be based on a stability greater than shown in Table 1 and the flow shall be targeted close to the mid-range of the criteria in order to meet the acceptance requirements.

Tensile strength ratio (TSR) of the composite mixture, as determined by ASTM D4867, shall not be less than 75 when tested at a saturation of 70-80% or an anti-stripping agent shall be added to the HMA, as necessary, to produce a TSR of not less than 75 when tested at a saturation of 70-80%. If an anti-strip agent is required, it shall be provided by the Contractor at no additional cost to the Owner.

The JMF shall be submitted in writing by the Contractor at least 30 days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates currently being produced.

The submitted JMF shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percent by weight of each stockpile used in the job mix formula.

b. Percent of asphalt cement.

c. Asphalt performance grade and type of modifier if used.

d. Number of blows per side of molded specimen.

e. Laboratory mixing temperature.

f. Laboratory compaction temperature.

g. Temperature-viscosity relationship of the PG asphalt cement binder showing acceptable range of mixing and compaction temperatures; and for modified binders include supplier recommended mixing and compaction temperatures.

h. Plot of the combined gradation on a 0.45 power gradation curve.

i. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content.

j. Specific Gravity and absorption of each aggregate.

k. Percent natural sand.

l. Percent fractured faces.

m. Percent by weight of flat particles**,** elongated particles, and flat and elongated particles (and criteria).

n. Tensile Strength Ratio (TSR).

o. Anti-strip agent (if required).

p. Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

The Contractor shall submit to the Engineer the results of verification testing of three (3) asphalt samples prepared at the optimum asphalt content. The average of the results of this testing shall indicate conformance with the JMF requirements specified in Tables 1 and 3.

When the project requires asphalt mixtures of differing aggregate gradations, a separate JMF and the results of JMF verification testing shall be submitted for each mix.

The JMF for each mixture shall be in effect until a modification is approved in writing by the Engineer. Should a change in sources of materials be made, a new JMF must be submitted within 15 days and approved by the Engineer in writing before the new material is used. After the initial production JMF has been approved by the Engineer and a new or modified JMF is required for whatever reason, the subsequent cost of the Engineer's approval of the new or modified JMF, including a new test strip when required by the Engineer, will be borne by the Contractor.

There will be no time extension given or considerations for extra costs associated with the stoppage of production paving or restart of production paving due to the time needed for the Engineer to approve the initial, new or modified JMF.

Table 1. Marshall Design Criteria

Test Property	Value
Number of blows	75
Stability, pounds minimum	2150
Flow[1], 0.01"	10-16
Air voids (%)	3.5
Percent voids in mineral aggregate, minimum	See Table 2

[1] The flow requirement is not applicable for Polymer Modified Asphalts.

Table 2. Minimum Percent Voids In Mineral Aggregate (VMA)

Aggregate (See Table 3)	Minimum VMA
Gradation 3	16%
Gradation 2	15%
Gradation 1	14%

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 3 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 3 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Table 3. Aggregate - HMA Pavements

Sieve Size (inches)	Percentage by Weight Passing Sieve (Gradation 2)
1"	--
3/4"	100
1/2"	79-99
3/8"	68-88
No. 4	48-68
No. 8	33-53
No. 16	20-40
No. 30	14-30
No. 50	9-21
No. 100	6-16
No. 200	3-6
Asphalt Percent:	
Stone or gravel	5.0-7.5
Slag	6.5-9.5

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

401-3.3 Reclaimed Asphalt Pavement (RAP). RAP shall not be used.

401-3.4 Job mix formula (JMF) laboratory. The Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

401-3.5 Test section. Prior to full production, the Contractor shall prepare and place a quantity of HMA according to the JMF. The amount of HMA shall be sufficient to construct a test section 300 feet long and 20 feet wide, placed in two lanes, with a longitudinal cold joint, and shall be of the same depth specified for the construction of the course which it represents. A cold joint for this test section is an exposed construction joint at least four (4) hours old or whose mat has cooled to less than 160°F. The cold joint must be cut back using the same procedure that will be used during production in accordance with 401-4.13. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

The test section shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 401-5.1 and 401-5.2. The test section shall be divided into equal sublots. As a minimum the test section shall consist of three (3) sublots.

The test section shall be considered acceptable if (1) stability, flow, mat density, air voids, and joint density are 90% or more within limits, (2) gradation and asphalt content are within the action limits specified in paragraphs 401-6.5a and 5b, and (3) the voids in the mineral aggregate are within the limits of Table 2.

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the Contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that are not acceptable shall be removed at the Contractor's expense. Full production shall not begin until an acceptable test section has been constructed and accepted in writing by the Engineer. Once an acceptable test section has been placed, payment for the initial test section and the section that meets specification requirements shall be made in accordance with paragraph 401-8.1.

Job mix control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the JMF. If aggregates produced by the plant do not satisfy the gradation requirements or produce a mix that meets the JMF, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens shall be prepared and the optimum asphalt content determined in the same manner as for the original JMF tests.

Contractor will not be allowed to place the test section until the Contractor Quality Control Program, showing conformance with the requirements of Paragraph 401-6.1, has been approved, in writing, by the Engineer.

CONSTRUCTION METHODS

401-4.1 Weather limitations. The HMA shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness (inches)	°F
3" or greater	40
Greater than 2" but less than 3"	45

401-4.2 HMA plant. Plants used for the preparation of HMA shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 with the following changes:

Requirements for all plants include:

a. Truck scales. The HMA shall be weighed on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of Item M-102.

In lieu of scales, and as approved by the Engineer, HMA weight may be determined by the use of an electronic weighing system equipped with an automatic printer that weighs the total HMA production and as often thereafter as requested by the Engineer.

b. Testing facilities. The Contractor shall ensure laboratory facilities are provided at the plant for the use of the Engineer. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, calibrations, current reference standards to comply with the specifications and a masonry saw with diamond blade for trimming pavement cores and samples.

The plant testing laboratory shall have a floor space area of not less than 200 square feet, with a ceiling height of not less than 7'-6". The laboratory shall be weather tight, sufficiently heated in cold weather, air-conditioned in hot weather to maintain temperatures for testing purposes of 70°F ± 5°F. The plant testing laboratory shall be located on the plant site to provide an unobstructed view, from one of its windows, of the trucks being loaded with the plant mix materials. In addition, the facility shall include the minimum:

(1) Adequate artificial lighting.

(2) Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.

(3) A minimum of two (2) Underwriter's Laboratories approved fire extinguishers of the appropriate types and class.

(4) Work benches for testing.

(5) Desk with chairs and file cabinet.

(6) Sanitary facilities convenient to testing laboratory.

(7) Exhaust fan to outside air.

(8) Sink with running water.

Failure to provide the specified facilities shall be sufficient cause for disapproving HMA plant operations.

Laboratory facilities shall be kept clean, and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

c. Inspection of plant. The Engineer, or Engineer's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

d. Storage bins and surge bins. The HMA stored in storage and surge bins shall meet the same requirements as HMA loaded directly into trucks and may be permitted under the following conditions:

(1) Stored in non-insulated bins for a period of time not to exceed three (3) hours.

(2) Stored in insulated bins for a period of time not to exceed eight (8) hours.

If the Engineer determines that there is an excessive amount of heat loss, segregation, or oxidation of the HMA due to temporary storage, no temporary storage will be allowed.

401-4.3 Hauling equipment. Trucks used for hauling HMA shall have tight, clean, and smooth metal beds. To prevent the HMA from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the Engineer. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.3.1 Material transfer vehicle (MTV). A material transfer vehicle is not required, but is optional for shoulder construction. To transfer the material from the hauling equipment to the paver, use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

401-4.4 HMA pavers. HMA pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of HMA that will meet the specified thickness, smoothness, and grade.

The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the HMA uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

If, during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the

scheduled operations, the use of such equipment shall be discontinued and satisfactory equipment shall be provided by the Contractor.

401-4.4.1 Automatic grade controls. The HMA paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within ±0.1%.

The controls shall be capable of working in conjunction with any of the following attachments:

a. Ski-type device of not less than 30'-0" in length.

b. Taut string-line (wire) set to grade.

c. Short ski or shoe.

d. Laser control.

401-4.5 Rollers. Rollers of the vibratory, steel wheel, and pneumatic-tired type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the HMA. The number, type, and weight of rollers shall be sufficient to compact the HMA to the required density while it is still in a workable condition.

All rollers shall be specifically designed and suitable for compacting HMA concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used. Depressions in pavement surfaces caused by rollers shall be repaired by the Contractor at their own expense.

The use of equipment that causes crushing of the aggregate will not be permitted.

401-4.6. Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new HMA. These densities shall be supplied to the Engineer upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.7 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F when added to the aggregate.

401-4.8 Preparation of mineral aggregate. The aggregate for the HMA shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by

overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.9 Preparation of HMA. The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all HMA upon discharge shall not exceed 0.5%.

401-4.10 Preparation of the underlying surface. Immediately before placing the HMA, the underlying course shall be cleaned of all dust and debris. A prime coat or tack coat shall be applied in accordance with Item P-602 or P-603, if shown on the plans.

401-4.11 Laydown plan, transporting, placing, and finishing. Prior to the placement of the HMA, the Contractor shall prepare a laydown plan for approval by the Engineer. This is to minimize the number of cold joints in the pavement. The laydown plan shall include the sequence of paving laydown by stations, width of lanes, temporary ramp locations, and laydown temperature. The laydown plan shall also include estimated time of completion for each portion of the work (that is, milling, paving, rolling, cooling, etc.). Modifications to the laydown plan shall be approved by the Engineer.

The HMA shall be transported from the mixing plant to the site in vehicles conforming to the requirements of paragraph 401-4.3. Deliveries shall be scheduled so that placing and compacting of HMA is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.

The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose for the first lift of all runway and taxiway pavements. Successive lifts of HMA surface course may be placed using a ski, or laser control per paragraph 401-4.4.1, provided grades of the first lift of HMA surface course meet the tolerances of paragraphs 401-5.2b(6) as verified by a survey. Contractor shall survey each lift of HMA surface course and certify to Engineer that every lot of each lift meets the grade tolerances of paragraph 401-5.2b(6) before the next lift can be placed.

The initial placement and compaction of the HMA shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 250°F.

Edges of existing HMA pavement abutting the new work shall be sawcut and carefully removed as shown on the drawings and coated with asphalt tack coat before new material is placed against it.

Upon arrival, the HMA shall be placed to the full width by a HMA paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the HMA mat. Unless otherwise permitted, placement of the HMA shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The HMA shall be placed in consecutive adjacent strips having a minimum width of 12'-0" except where edge lanes require

less width to complete the area. Additional screed sections shall not be attached to widen paver to meet the minimum lane width requirements specified above unless additional auger sections are added to match. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1'-0"; however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10'-0" from transverse joints in the previous course.

Transverse joints in adjacent lanes shall be offset a minimum of 10'-0".

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the HMA may be spread and luted by hand tools.

Areas of segregation in the surface course, as determined by the Engineer, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of 2" deep. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10'-0" long.

401-4.12 Compaction of HMA. After placing, the HMA shall be thoroughly and uniformly compacted by power rollers. The surface shall be compacted as soon as possible when the HMA has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the HMA to the roller, the wheels shall be equipped with a scraper and kept properly moistened but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power driven tampers. Tampers shall weigh not less than 275 pounds, have a tamping plate width not less than 15", be rated at not less than 4,200 vibrations per minute, and be suitably equipped with a standard tamping plate wetting device.

Any HMA that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.13 Joints. The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid HMA except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh HMA against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F; or are irregular, damaged, uncompacted or otherwise defective shall be cut back 3" to 6" to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material shall be removed from the project. Asphalt tack coat or other product approved by the Engineer shall be applied to the clean, dry joint, prior to placing any additional fresh HMA against the joint. Any laitance produced from cutting joints shall be removed by vacuuming and washing. The cost of this work shall be considered incidental to the cost of the HMA.

401-4.14 Saw-cut grooving. Saw cut grooving is not required.

401-4.15 Diamond grinding. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch (3-mm) wide and there shall be a minimum of 55 to 60 blades per 12 inches (300 mm) of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet (0.9 m) wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. The depth of grinding shall not exceed 1/2 inch (13mm) and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. Areas that have been ground will be sealed with a P-608 surface treatment as directed by the Engineer. It may be necessary to seal a larger area to avoid surface treatment creating any conflict with runway or taxiway markings.

401-4.16 Nighttime paving requirements. Paving during nighttime construction shall require the following:

a. All paving machines, rollers, distribution trucks and other vehicles required by the Contractor for his operations shall be equipped with artificial illumination sufficient to safely complete the work.

b. Minimum illumination level shall be twenty (20) horizontal foot-candles and maintained in the following areas:

(1) An area of 30 feet wide by 30 feet long immediately behind the paving machines during the operations of the machines.

(2) An area 15 feet wide by 30 feet long immediately in front and back of all rolling equipment, during operation of the equipment.

(3) An area 15 feet wide by 15 feet long at any point where an area is being tack coated prior to the placement of pavement.

c. As partial fulfillment of the above requirements, the Contractor shall furnish and use, complete artificial lighting units with a minimum capacity of 3,000 watt electric beam lights, affixed to all equipment in such a way to direct illumination on the area under construction.

d. A lighting plan must be submitted by the Contractor and approved by the Engineer prior to the start of any nighttime work.

MATERIAL ACCEPTANCE

401-5.1 Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor except that coring and profilograph testing where required in this section shall be completed and paid for by the Contractor.

Testing organizations performing these tests except profilograph shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction. All equipment in Contractor furnished laboratories shall be calibrated by an independent testing organization prior to the start of operations at the Contractor's expense.

a. Hot mixed asphalt. Plant-produced HMA shall be tested for air voids and stability and flow on a lot basis. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. Samples shall be taken in accordance with ASTM D979.

A standard lot shall be equal to one day's production or 2000 tons whichever is smaller. If the day's production is expected to exceed 2000 tons, but less than 4000 tons, the lot size shall be 1/2 of the day's production. If the day's production exceeds 4000 tons, the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons.

Where more than one plant is simultaneously producing HMA for the job, the lot sizes shall apply separately for each plant.

(1) Sampling. Each lot will consist of four equal sublots. Sufficient HMA for preparation of test specimens for all testing will be sampled by the Engineer on a random basis, in accordance with the procedures contained in ASTM D3665. Samples will be taken in accordance with ASTM D979.

The sample of HMA may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to stabilize to compaction temperature. The compaction temperature of the specimens shall be as specified in the JMF.

(2) Testing. Sample specimens shall be tested for stability and flow in accordance with ASTM D6927. Air voids will be determined by the Engineer in accordance with ASTM D3203. One set of laboratory compacted specimens will be prepared for each sublot in accordance with ASTM D6926 at the number of blows required by paragraph 401-3.2, Table 1. Each set of laboratory compacted specimens will consist of three test specimens prepared from the same sample. The manual hammer in ASTM D6926 shall be used.

Prior to testing, the bulk specific gravity of each test specimen shall be measured by the Engineer in accordance with ASTM D2726 using the procedure for laboratory-prepared thoroughly dry specimens for use in computing air voids and pavement density.

For air voids determination, the theoretical maximum specific gravity of the mixture shall be measured one time for each sublot in accordance with ASTM D2041. The value used in the air voids computation for each sublot shall be based on theoretical maximum specific gravity measurement for the sublot.

The stability and flow for each sublot shall be computed by averaging the results of all test specimens representing that sublot.

(3) Acceptance. Acceptance of plant produced HMA for stability, flow, and air voids shall be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b.

b. In-place HMA. HMA placed in the field shall be tested for mat and joint density on a lot basis. A standard lot shall be equal to one day's production or 2000 tons whichever is smaller. If the day's production is expected to exceed 2000 tons, but less than 4000 tons, the lot size shall be 1/2 of the day's production. If the day's production exceeds 4000 tons, the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons.

(1) Mat density. The lot size shall be the same as that indicated in paragraph 401-5.1a and shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each sublot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. Cores for mat density shall not be taken closer than 1'-0" from a transverse or longitudinal joint.

(2) Joint density. The lot size shall be the total length of longitudinal joints constructed by a lot of HMA as defined in paragraph 401-5.1a. The lot shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each sublot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. All cores for joint density shall be taken centered on the joint. The minimum core diameter for joint density determination shall be 5".

(3) Sampling. Samples shall be neatly cut with a diamond core drill bit. Samples will be taken in accordance with ASTM D979. The minimum diameter of the sample shall be 5". Samples that are clearly defective, as a result of sampling, shall be discarded and another sample taken. The Contractor shall furnish all tools, labor, and materials for cutting samples, cleaning, and filling the cored pavement. Cored pavement shall be cleaned and core holes shall be filled in a manner acceptable to the Engineer and within one day after sampling. Laitance produced by the coring operation shall be removed immediately.

The top most lift of HMA shall be completely bonded to the underlying layer. If any of the cores reveal that the surface is not bonded to the layer immediately below the surface then additional cores shall be taken as directed by the Engineer in accordance with paragraph 401-5.1b to determine the extent of any delamination. All delaminated areas shall be completely removed by milling to the limits and depth and replaced as directed by the Engineer at no additional cost.

(4) Testing. The bulk specific gravity of each cored sample will be measured by the Engineer in accordance with ASTM D2726. Samples will be taken in accordance with ASTM D979. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each sublot sample by the average bulk specific gravity of all laboratory prepared specimens for the lot, as determined in paragraph 401-5.1a(2). The bulk specific gravity used to determine the joint density at joints formed between different lots shall be the lowest of the bulk specific gravity values from the two different lots.

(5) Acceptance. Acceptance of field placed HMA for mat density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(1). Acceptance for joint density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(3).

c. Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. In addition, an agreed to minor placement will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation, that is, n = 5 or n = 6, for example. Partial lots at the end of asphalt production on the project shall be included with the previous lot. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, shall less than three (3) cored samples be obtained, that is, n = 3.

401-5.2 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the HMA and completed pavement as well as the implementation of the Contractor Quality Control Program and test results:

(1) Air voids

(2) Mat density

(3) Joint density

(4) Thickness

(5) Smoothness

(6) Grade

(7) Stability

(8) Flow

Mat density and air voids will be evaluated for acceptance in accordance with paragraph 401-5.2b(1). Stability and flow will be evaluated for acceptance in accordance with paragraph 401-5.2b(2). Joint density will be evaluated for acceptance in accordance with paragraph 401-5.2b(3).

Thickness will be evaluated by the Engineer for compliance in accordance with paragraph 401-5.2b(4). Acceptance for smoothness will be based on the criteria contained in paragraph 401-5.2b(5). Acceptance for grade will be based on the criteria contained in paragraph 401-5.2b(7).

The Engineer may at any time, reject and require the Contractor to dispose of any batch of HMA which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Acceptance criteria.

(1) Mat density and air voids. Acceptance of each lot of plant produced material for mat density and air voids shall be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment shall be determined in accordance with paragraph 401-8.1.

(2) Stability and flow. Acceptance of each lot of plant produced HMA for stability and flow shall be based on the PWL. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. If the PWL is less than 90%, the Contractor shall determine the reason and take corrective action. If the PWL is below 80%, the Contractor must stop production until the reason for poor stability and/or flow has been determined and adjustments to the HMA are made.

(3) Joint density. Acceptance of each lot of plant produced HMA for joint density shall be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot shall be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint shall be reduced by five percentage points. This lot pay factor reduction shall be incorporated and evaluated in accordance with paragraph 401-8.1.

(4) Thickness. Thickness of each lift of surface course shall be evaluated by the Engineer for compliance to the requirements shown on the plans. Measurements of thickness shall be made by the Engineer using the cores extracted for each sublot for density measurement. The maximum allowable deficiency at any point shall not be more than 1/4" less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, shall not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or sublot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the Engineer to circumscribe the deficient area.

(4) Smoothness. The final surface shall be free from roller marks. After final rolling, but not later than 24 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each pavement lot such that the finished surface course of the pavement shall not vary more than 1/4" when evaluated with a 12'-0" straightedge. When the surface course smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the surface course, full depth removal and replacement of surface course corrections shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified. The Contractor shall apply a surface treatment per Item P-608 to all areas that have been subject to grinding as directed by the Engineer.

(5) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50'-0" or more often as determined by the Engineer.

(a) Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to

measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final surface course >1/4" in transverse direction shall be corrected with diamond grinding per paragraph 403-4.13 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(b) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50'-0" or more often if directed by the Engineer. Deviations on final surface course >1/4" in transverse direction shall be corrected with diamond grinding per paragraph 403-4.13 or by removing and replacing full depth of surface course. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(1) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20'-0"; and the third points of paving lanes when widths of paving lanes are 20'-0" or greater. The finished surface shall not vary more than 1/4" when evaluated with a 12'-0" straightedge. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final surface course >1/4" in longitudinal direction will be corrected with diamond grinding per paragraph 403-4.13 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.

(6) Grade. Grade shall be evaluated on the first day of placement and then, as a minimum, at the conclusion of every day of paving to allow adjustments to paving operations if measurements do not meet specification requirements. The Contractor must submit the survey data to the Engineer by the following day after measurements have been taken. The finished surface of the pavement shall not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2". The finished grade of each lot will be determined by running levels at intervals of 50'-0" or less longitudinally and all breaks in grade transversely (not to exceed 50'-0") to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the

Engineer. The lot size shall be 500 square yards. When more than 15% of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates 3/4" or more from planned grade, the Contractor shall remove the deficient area to the depth of the final course plus 1/2" of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off provided the course thickness complies with the thickness specified on the plans. The surface of the ground pavement shall have a texture consisting of grooves between 0.090" and 0.1 30" wide. The peaks and ridges shall be approximately 1/32" higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous. The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement. High point grinding will be limited to 15 square yards. Areas in excess of 15 square yards will require removal and replacement of the pavement in accordance with the limitations noted above. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

c. Percentage of material within specification limits (PWL). The PWL shall be determined in accordance with procedures specified in Item P-400. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

Table 5. Marshall acceptance limits for stability, flow, air voids, density

Test Property		
Number of Blows	**75 blows**	
	Specification Tolerance	
	L	**U**
Stability, minimum (pounds)	1800	--
Flow, 0.01"	8	18
Air Voids Total Mix (%)	2	5
Mat Density (%)	96.3	--
Joint Density (%)	93.3	--

d. Outliers. All individual tests for mat density and air voids shall be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the PWL shall be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 2.1.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 98% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 97.5% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 96% with 2.1% or less variability.

401-5.3 Resampling pavement for mat density.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the

Engineer. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-5.1b and 401-5.2b(1). Only one resampling per lot will be permitted.

(1) A redefined PWL shall be calculated for the resampled lot. The number of tests used to calculate the redefined PWL shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined PWL for a resampled lot shall be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

401-5.4 Leveling course. Any course used for trueing and leveling shall meet the aggregate gradation in Table 3, paragraph 401-3.2. The trueing and leveling course shall meet the requirements of paragraph 401-3.2, 401-5.2b(1) for air voids and 401-5.2b(2) for stability and flow, but shall not be subject to the density requirements of paragraph 401-5.2b(1) for mat density and 401-5.2b(3) for joint density. The leveling course shall be compacted with the same effort used to achieve density of the test section. The trueing and leveling course shall not exceed the maximum lift thickness associated with each gradation in Table 3, paragraph 401-3.2. The leveling course is the first variable thickness lift of an overlay placed prior to subsequent courses.

CONTRACTOR QUALITY CONTROL

401-6.1 General. The Contractor shall develop a Quality Control Program in accordance with Section M of the Special Conditions. The program shall address all elements that affect the quality of the pavement including, but not limited to:

a. Mix design

b. Aggregate grading

c. Quality of materials

d. Stockpile management

e. Proportioning

f. Mixing and transportation

g. Placing and finishing

h. Joints

i. Compaction

j. Surface smoothness

k. Personnel

l. Laydown plan

The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 401-6.3 and Section M of the

Special Conditions. As a part of the process for approving the Contractor's plan, the Engineer may require the Contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

No partial payment will be made for materials that are subject to specific quality control requirements without an approved plan.

401-6.2 Contractor testing laboratory. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, and current reference standards to comply with the specifications.

401-6.3 Quality control testing. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Asphalt content. A minimum of two asphalt content tests shall be performed per lot in accordance with ASTM D6307 or ASTM D2172 if the correction factor in ASTM D6307 is greater than 1.0. The asphalt content for the lot will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

d. Moisture content of HMA. The moisture content shall be determined once per lot in accordance with ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the HMA at the plant, and the HMA at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Additional testing. Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

h. Monitoring. The Engineer reserves the right to monitor any or all of the above testing.

401-6.4 Sampling. When directed by the Engineer, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-6.5 Control charts. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for aggregate

gradation, asphalt content, and VMA. The VMA for each sublot will be calculated and monitored by the Quality Control laboratory.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits For Individual Measurements		
Sieve (inches)	**Action Limit**	**Suspension Limit**
3/4"	±6%	±9%
1/2"	±6%	±9%
3/8"	±6%	±9%
No. 4	±6%	±9%
No. 16	±5%	±7.5%
No. 50	±3%	±4.5%
No. 200	±2%	±3%
Asphalt Content	±0.45%	±0.70%
VMA	-1.00%	-1.50%

b. Range. Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of n = 2. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for n = 3 and by 1.27 for n = 4.

Control Chart Limits Based On Range (Based On n = 2)	
Sieve (inches)	**Suspension Limit**
1/2"	11%
3/8"	11%
No. 4	11%
No. 16	9%
No. 50	6%
No. 200	3.5%
Asphalt Content	0.8%

c. Corrective Action. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range; or

(2) Two points in a row fall outside the Action Limit line for individual measurements.

401-6.6 Quality control reports. The Contractor shall maintain records and shall submit reports of quality control activities daily, in accordance with the Contractor Quality Control Program described in Special Conditions, Section M.

METHOD OF MEASUREMENT

401-7.1 Measurement. HMA shall be measured by the number of tons of HMA used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

401-8.1 Payment. Payment for a lot of HMA meeting all acceptance criteria as specified in paragraph 401-5.2 shall be made based on results of tests for smoothness, mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1a for mat density and air voids and 401-8.1c for smoothness, subject to the limitation that:

a. The total project payment for plant mix bituminous concrete pavement shall not exceed 100% of the product of the contract unit price and the total number of tons of HMA used in the accepted work (See Note 1 under Table 6).

b. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

c. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71% then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1. Payment in excess of 100% for accepted lots of HMA shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100%.

Table 6. Price adjustment schedule[1]

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 - 100	106
90 - 95	PWL + 10
75 - 89	0.5 PWL + 55
55 - 74	1.4 PWL - 12
Below 55	Reject [2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1.

[2] The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

d. Profilograph smoothness. When the final average profile index (subsequent to any required corrective action) does not exceed 7", payment will be made at the contract unit price for the completed pavement. If the final average profile index (subsequent to any required corrective action) exceeds 7" per mile, but does not exceed 15" per mile, the Contractor may elect to accept a contract unit price adjustment in lieu of reducing the profile index.

e. Basis of adjusted payment for smoothness. Price adjustment for pavement smoothness will be made in accordance with Table 7. The adjustment will apply to the total tonnage of HMA within a lot of pavement and shall be applied with the following equation:

(Tons of asphalt concrete in lot) × (lot pay factor) × (unit price per ton) × (smoothness pay factor) = payment for lot)

Table 7. Profilograph Average Profile Index Smoothness Pay Factor

Inches/Miles per 1/10 mile	Short Sections	Pay Factor
0.0 - 7	00.0 - 15.0	100%
7.1 - 9	15.1 - 16	98%
9.1 - 11	16.1 - 17	96%
11.1 - 13	17.1 - 18	94%
13.1 - 14	18.1 - 20	92%
14.1 - 15	20.1 - 22	90%
15.1 and up	22.1 and up	Corrective work required[1]

[1] The Contractor shall correct pavement areas not meeting these tolerances by removing and replacing the defective work. If the Contractor elects to construct an overlay to correct deficiencies, the minimum thickness of the overlay should be at least three times the maximum aggregate size (approximately four (4) times the nominal maximum aggregate size). The corrective overlay shall not violate grade Criteria and butt joints shall be constructed by sawing and

removing the original pavement in compliance with the thickness/ maximum aggregate size ratio. Skin patching shall not be permitted.

HMA placed above the specified grade shall not be included in the quantities for payment.

401-8.1.1. Payment. Payment will be made under:

Item P-401	Hot Mixed Asphalt (HMA) Surface Course - per ton

TESTING REQUIREMENTS

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
AASHTO T030	Standard Method of Test for Mechanical Analysis of Extracted Aggregate
AASHTO T110	Standard Method of Test for Moisture or Volatile Distillates in Hot Mix Asphalt (HMA)
AASHTO T275	Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Paraffin-Coated Specimens
AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
Asphalt Institute Handbook MS-26 - Asphalt Binder	
Asphalt Institute MS-2	Mix Design Manual, 7th Edition

MATERIAL REQUIREMENTS

ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder

END OF ITEM

ITEM P-403
HOT MIX ASPHALT (HMA) PAVEMENTS (BASE, LEVELING OR SURFACE COURSE)

DESCRIPTION

403-1.1 This item shall consist of a surface course composed of mineral aggregate and asphalt cement binder (asphalt binder) mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

403-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should be free of ferrous sulfides, such as pyrite that would cause "rust" staining that can bleed through pavement markings. The portion retained on the No. 4 sieve is coarse aggregate. The portion passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate, and the portion passing the No. 200 sieve is mineral filler.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the bituminous material and free from organic matter and other deleterious substances. The percentage of wear shall not be greater than 40 percent when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. Clay Lumps and friable particles shall not exceed 1.0% when tested in accordance with ASTM C142.

Aggregate shall contain at least 75 percent by weight of individual pieces having two or more fractured faces and 85 percent by weight having at least one fractured face. The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be achieved by crushing.

The aggregate shall not contain more than a total of 8%, by weight, of flat particles, elongated particles, and flat and elongated particles, when tested in accordance with ASTM D4791 with a value of 5:1.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter.

The fine aggregate, including any blended material for the fine aggregate, shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

Clay lumps and friable particles shall not exceed 1.0 percent, by weight, when tested in accordance with ASTM C142.

Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The fine aggregate shall not contain more than 15% natural sand by weight of total aggregates. If used, the natural sand shall meet the requirements of ASTM D1073 and shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The aggregate shall have sand equivalent values of 45 or greater when tested in accordance with ASTM D2419.

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

403-2.2 Mineral filler. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242.

403-2.3 Asphalt cement binder. Asphalt cement binder shall conform to ASTM D6373 Performance Grade (PG) 76-22. A certificate of compliance from the manufacturer shall be included with the mix design submittal. A PG Plus Test will be required to determine if the asphalt cement binder has been properly modified per ASTM D6084 with a minimum elastic recovery of 70%.

The supplier's certified test report with test data indicating grade certification for the asphalt binder shall be provided to the Engineer for each load at the time of delivery to the mix plant. A certified test report with test data indicating grade certification for the asphalt binder shall also be provided to the Engineer for any modification of the asphalt binder after delivery to the mix plant and before use in the HMA.

403-2.4 Preliminary material acceptance. Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

a. Coarse aggregate:

(1) Percent of wear
(2) Soundness
(3) Clay lumps and friable particles
(4) Percent fractured faces
(5) Flat and elongated particles

b. Fine aggregate:

(1) Liquid limit and Plasticity index
(2) Soundness
(3) Clay lumps and friable particles
(4) Percent natural sand
(5) Sand equivalent

c. Mineral filler.

d. Asphalt binder. Test results for a**sphalt binder** shall include temperature/viscosity charts for mixing and compaction temperatures.

The certifications shall show the appropriate ASTM tests for each material, the test results, and a statement that the material meets the specification requirement.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

403-2.5 Anti-stripping agent. Any anti-stripping agent or additive if required shall be heat stable, shall not change the asphalt cement viscosity beyond specifications, shall contain no harmful ingredients, shall be added in recommended proportion by approved method, and shall be a material approved by the Department of Transportation of the State in which the project is located.

COMPOSITION

403-3.1 Composition of mixture. The HMA plant mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

403-3.2 Job mix formula. No hot-mixed asphalt (HMA) for payment shall be produced until a JMF has been approved in writing by the Engineer. The asphalt mix design and JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 403-3.4. The HMA shall be designed using procedures contained in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition. ASTM D6926 shall be used for preparation of specimens using the manually held and operated hammer for the mix design procedure. ASTM D6927 shall be used for testing for Marshall stability and flow.

If material variability exceeds the standard deviations indicated, the JMF and subsequent production targets shall be based on a stability greater than shown in Table 1 and the flow shall be targeted close to the mid-range of the criteria in order to meet the acceptance requirements.

Tensile Strength Ratio (TSR) of the composite mixture, as determined by ASTM D4867, shall not be less than 75 when tested at a saturation of 70-80% or an anti-stripping agent shall be added to the HMA, as necessary, to produce a TSR of not less than 75 when tested at a saturation of 70-80%. If an anti-strip agent is required, it shall be provided by the Contractor at no additional cost to the Owner.

The JMF shall be submitted in writing by the Contractor at least 30 days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates currently being produced.

The submitted JMF shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percent by weight of each stockpile used in the JMF.

b. Percent of asphalt cement.

c. Asphalt performance, grade, and type of modifier if used.

d. Number of blows per side of molded specimen.

e. Laboratory mixing temperature.

f. Laboratory compaction temperature.

g. Temperature-viscosity relationship of the PG asphalt cement binder showing acceptable range of mixing and compaction temperatures and for modified binders include supplier recommended mixing and compaction temperatures.

h. Plot of the combined gradation on the 0.45 power gradation curve.

i. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content.

j. Specific gravity and absorption of each aggregate.

k. Percent natural sand.

l. Percent fractured faces.

m. Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).

n. Tensile Strength Ratio (TSR).

o. Anti-strip agent (if required).

p. Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

The Contractor shall submit to the Engineer the results of verification testing of three (3) asphalt samples prepared at the optimum asphalt content. The average of the results of this testing shall indicate conformance with the JMF requirements specified in Tables 1 and 3.

When the project requires asphalt mixtures of differing aggregate gradations, a separate JMF and the results of JMF verification testing shall be submitted for each mix.

The JMF for each mixture shall be in effect until a modification is approved in writing by the Engineer. Should a change in sources of materials be made, a new JMF must be submitted within 15 days and approved by the Engineer in writing before the new material is used. After the initial production JMF has been approved by the Engineer and a new or modified JMF is required for whatever reason, the subsequent cost of the Engineer's approval of the new or modified JMF will be borne by the Contractor. There will be no time extension given or considerations for extra costs associated with the stoppage of production paving or restart of production paving due to the time needed for the Engineer to approve the initial, new or modified JMF.

Table 1. Marshall Design Criteria

Test Property	Pavements designed for aircraft gross weights of 60,000 pounds or more or tire pressures of 100 psi or more
Number of Blows	75
Stability, pounds minimum	1,800
Flow[1], 0.01"	8-16
Air Voids (percent)	3.5
Percent Voids in Mineral Aggregate (minimum)	See Table 2.

[1]The flow requirement is not applicable for Polymer Modified Asphalts.

Table 2. Minimum Percent Voids In Mineral Aggregate (VMA)

Aggregate (See Table 3)	Minimum VMA
Gradation 3	16

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 3 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 3 represent the limits that shall determine the suitability of aggregate for use from the sources of supply, be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Table 3. Aggregate - HMA Pavements

Sieve Size	% by Weight Passing Sieve
1"	--
3/4"	--
1/2"	100
3/8"	79-99
No. 4	58-78
No. 8	39-59
No. 16	26-46
No. 30	19-35
No. 50	12-24
No. 100	7-17
No. 200	3-6
Asphalt Percent	
Stone or gravel	5.5-8.0
Slag	7.0-10.5

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

403-3.3 Job mix formula (JMF) laboratory. The Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

403-3.4 Test section. A test section is not required. Prior to full production, the Contractor shall prepare and place a quantity of HMA according to the JMF. The amount of HMA shall be sufficient to construct a test section 300 long and 30 wide, placed in two lanes, with a longitudinal cold joint, and shall be of the same depth specified for the construction of the course which it represents. A cold joint for this test section is an exposed construction joint at least four (4) hours old or whose mat has cooled to less than 160°F. The cold joint must be cut back using the same procedure that will be used during production in accordance with 403-4.12. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section. The contractor may use a proposed section of the shoulder for the test section, provided the contractor accepts all risk for removal and replacement, should test criteria not pass requirements of this specification.

The test section shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 403-5.1 and 403-5.2. The test section shall be divided into equal sublots. As a minimum the test section shall consist of three (3) sublots.

The test section shall be considered acceptable if the average mat density of the test section cores is greater than or equal to 96% and the average joint density of the test section cores is greater than or equal to 94%.

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the Contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that are not acceptable shall be removed at the Contractor's expense. Full production shall not begin until an acceptable test section has been constructed and accepted in writing by the Engineer. Once an acceptable test section has been placed, payment for the initial test section and the section that meets specification requirements shall be made in accordance with paragraph 403-8.1.

Job mix control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the JMF. If the aggregates produced by the plant do not satisfy the gradation requirements or produce a mix that meets the JMF, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens shall be prepared and the optimum asphalt content determined in the same manner as for the original JMF tests.

Contractor will not be allowed to place the test section until the Contractor Quality Control Program, showing conformance with the requirements of paragraph 403-6.1, has been approved, in writing, by the Engineer.

CONSTRUCTION METHODS

403-4.1 Weather limitations. The HMA shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)
3" or greater	40
Greater than 2" but less than 3"	45

403-4.2 HMA plant. Plants used for the preparation of HMA shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 with the following changes:

a. Requirements for all plants include:

(1) Truck scales. The HMA shall be weighed on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of the General Provisions, subsection 90-01.

In lieu of scales, and as approved by the Engineer, HMA weights may be determined by the use of an electronic weighing system equipped with an automatic printer that weighs the total HMA production and as often thereafter as requested by the Engineer.

(2) Testing facilities. The Contractor shall ensure laboratory facilities are provided at the plant for the use of the Engineer. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, and current reference standards to comply with the specifications and masonry saw with diamond blade for trimming pavement cores and samples. The plant testing laboratory shall have a floor space area of not less than 200 square feet, with a ceiling height of not less than 7'-6". The laboratory shall be weather tight, sufficiently heated in cold weather, air-conditioned in hot weather to maintain temperatures for testing purposes of 70°F ±5°F. The plant testing laboratory shall be located on the plant site to provide an unobstructed view, from one of its windows, of the trucks being loaded with the plant mix materials. In addition, the facility shall include the minimum:

(a) Adequate artificial lighting.

(b) Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.

(c) A minimum of two (2) Underwriter's Laboratories approved fire extinguishers of the appropriate types and class.

(d) Work benches for testing.

(e) Desk with chairs and file cabinet.

(f) Sanitary facilities convenient to testing laboratory.

(g) Exhaust fan to outside air.

(h) Sink with running water.

Failure to provide the specified facilities shall be sufficient cause for disapproving HMA plant operations.

Laboratory facilities shall be kept clean, and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

(3) Inspection of plant. The Engineer, or Engineer's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

(4) Storage bins and surge bins. The HMA stored in storage and surge bins shall meet the same requirements as HMA loaded directly into trucks and may be permitted under the following conditions:

(a) Stored in non-insulated bins for a period of time not to exceed three (3) hours.

(b) Stored in insulated storage bins for a period of time not to exceed eight (8) hours.

If the Engineer determines that there is an excessive amount of heat loss, segregation or oxidation of the HMA due to temporary storage, no temporary storage will be allowed.

403-4.3 Hauling equipment. Trucks used for hauling HMA shall have tight, clean, and smooth metal beds. To prevent the HMA from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the Engineer. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

403-4.3.1 Material transfer vehicle (MTV). A material transfer vehicle is not required, but is optional for shoulder construction. To transfer the material from the hauling equipment to the paver, use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

403-4.4 HMA pavers. HMA pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of HMA that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the HMA uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

If, during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued and satisfactory equipment shall be provided by the Contractor.

403-4.4.1 Automatic grade control. The HMA paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within ±0.1%.

The controls shall be capable of working in conjunction with any of the following attachments:

a. Ski-type device of not less than 30'-0" in length

b. Taut stringline (wire) set to grade

c. Short ski or shoe

d. Laser control

403-4.5 Rollers. Rollers of the vibratory, steel wheel, and pneumatic-tired type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the HMA. The number, type, and weight of rollers shall be sufficient to compact the HMA to the required density while it is still in a workable condition.

All rollers shall be specifically designed and suitable for compacting hot mix bituminous concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used. Depressions in pavement surfaces caused by rollers shall be repaired by the Contractor at their own expense.

The use of equipment that causes crushing of the aggregate will not be permitted.

403-4.5.1 Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the density gauge and obtain accurate density readings for all new HMA. These densities shall be supplied to the Engineer upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

403-4.6 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the bituminous material to the mixer at a uniform temperature. The temperature of the unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F when added to the aggregate.

403-4.7 Preparation of mineral aggregate. The aggregate for the HMA shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

403-4.8 Preparation of HMA. The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF.

The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all HMA upon discharge shall not exceed 0.5%.

403-4.9 Preparation of the underlying surface. Immediately before placing the HMA, the underlying course shall be cleaned of all dust and debris. A prime coat or tack coat shall be applied in accordance with Item P-602 or Item P-603, if shown on the plans.

403-4.10 Laydown plan, transporting, placing, and finishing. Prior to the placement of the HMA, the Contractor shall prepare a laydown plan for approval by the Engineer. This is to minimize the number of cold joints in the pavement. The laydown plan shall include the sequence of paving laydown by stations, width of lanes, temporary ramp locations, and laydown temperature. The laydown plan shall also include estimated time of completion for each portion of the work (that is, milling, paving, rolling, cooling, etc.). Modifications to the laydown plan shall be approved by the Engineer.

The HMA shall be transported from the mixing plant to the site in vehicles conforming to the requirements of paragraph 403-4.3. Deliveries shall be scheduled so that placing and compacting of HMA is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.

The Contractor shall use a material transfer vehicle to deliver HMA to the paver.

The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose for the first lift of all runway and taxiway pavements. Successive lifts of HMA surface course may be placed using a ski, or laser control per paragraph 403-4.4.1, provided grades of the first lift of bituminous surface course meet the tolerances of paragraphs 403-5.2b(5) as verified by a survey.

Contractor shall survey each lift of HMA surface course and certify to Engineer that every lot of each lift meets the grade tolerances of paragraph 403-5.2b(5) before the next lift can be placed.

The initial placement and compaction of the HMA shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 250°F.

Edges of existing HMA pavement abutting the new work shall be saw cut and carefully removed as shown on the drawings and coated with asphalt tack coat before new material is placed against it.

Upon arrival, the mixture shall be placed to the full width by a bituminous paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the HMA mat. Unless otherwise permitted, placement of the HMA shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The HMA shall be placed in consecutive adjacent strips having a minimum width of 12'-0" except where edge lanes require less width to complete the area. Additional screed sections shall not be attached to widen paver to meet the minimum lane width requirements specified above unless additional auger sections are added to match. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least one foot (30 cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10'-0" from transverse joints in the previous course.

Transverse joints in adjacent lanes shall be offset a minimum of 10'-0"

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the HMA may be spread and luted by hand tools.

Areas of segregation in the course, as determined by the Engineer, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of 2" deep. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10'-0" long.

403-4.11 Compaction of HMA. After placing, the HMA shall be thoroughly and uniformly compacted by power rollers. The surface shall be compacted as soon as possible when the mixture has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, the wheels shall be equipped with a scraper and kept properly moistened using a water soluble asphalt release agent approved by the Engineer.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power driven tampers. Tampers shall weigh not less than 275 pounds, have a tamping plate width not less than 15", be rated at not less than 4,200 vibrations per minute, and be suitably equipped with a standard tamping plate wetting device.

Any HMA that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to

the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

403-4.12 Joints. The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade. The roller shall not pass over the unprotected end of the freshly laid HMA except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh HMA against the joint.

Longitudinal joints which are have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F; or are irregular, damaged, uncompacted or otherwise defective shall be cut back 3" to 6" to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material shall be removed from the project. A asphalt tack coat or other product approved by the Engineer shall be applied to the clean, dry joint prior to placing any additional fresh HMA against the joint. Any laitance produced from cutting joints shall be removed by vacuuming and washing. The cost of this work shall be considered incidental to the cost of the HMA.

MATERIAL ACCEPTANCE

403-5.1 Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

Testing organizations performing these tests shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction. All equipment in Contractor furnished laboratories shall be calibrated by an independent testing organization prior to the start of operations.

a. Hot mixed asphalt. Plant-produced HMA shall be tested for air voids and stability and flow on a lot basis. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. Samples shall be taken in accordance with ASTM D979.

A standard lot shall be equal to one day's production or 2000 tons whichever is smaller. If the day's production is expected to exceed 2000 tons, but less than 4000 tons, the lot size shall be 1/2 day's production. If the day's production exceeds 4000 tons, the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons.

Where more than one plant is simultaneously producing HMA for the job, the lot sizes shall apply separately for each plant.

(1) Sampling. Each lot will consist of four equal sublots. Sufficient HMA for preparation of test specimens for all testing will be sampled by the Engineer on a random basis, in accordance with the procedures contained in ASTM D3665. Samples will be taken in accordance with ASTM D979.

The sample of HMA may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to stabilize to compaction temperature. The compaction temperature of the specimens shall be as specified in the JMF.

(2) Testing. Sample specimens shall be tested for stability and flow in accordance with ASTM D6927. Air voids will be determined by the Engineer in accordance with ASTM D3203. One set of laboratory compacted specimens will be prepared for each sublot in accordance with ASTM D6926 at the number of blows required by paragraph 403-3.2, Table 1. Each set of laboratory compacted specimens will consist of three test specimens prepared from the same sample. The manual hammer in ASTM D6926 shall be used.

Prior to testing, the bulk specific gravity of each test specimen shall be measured by the Engineer in accordance with ASTM D2726 using the procedure for laboratory-prepared thoroughly dry specimens for use in computing air voids and pavement density.

For air voids determination, the theoretical maximum specific gravity of the mixture shall be measured one time for each sublot in accordance with ASTM D2041. The value used in the air voids computation for each sublot shall be based on theoretical maximum specific gravity measurement for the sublot.

The stability and flow for each sublot shall be computed by averaging the results of all test specimens representing that sublot.

(3) Acceptance. Acceptance of plant produced HMA for stability, flow, and air voids shall be determined by the Engineer in accordance with the requirements of paragraph 403-5.1.

b. In-place HMA. HMA placed in the field shall be tested for mat and joint density on a lot basis. A standard lot shall be equal to one day's production or 2,000 tons whichever is smaller. If the day's production is expected to exceed 2,000 tons, but less than 4,000 tons, the lot size shall be 1/2 day's production. If the day's production exceeds 4,000 tons, the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2,000 tons.

(1) Mat density. The lot size shall be the same as that indicated in paragraph 403-5.1a The lot shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each sublot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. Cores for mat density shall not be taken closer than 1'-0" from a transverse or longitudinal joint.

(2) Joint density. The lot size shall be the total length of longitudinal joints constructed by a lot of HMA as defined in paragraph 403-5.1a. The lot shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each sublot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. All cores for joint density shall be taken centered on the joint. The minimum core diameter for joint density determination shall be 5".

(3) Sampling. Samples shall be neatly cut with a diamond core drill bit. Samples will be taken in accordance with ASTM D979. The minimum diameter of the sample shall be 5". Samples that are defective, as a result of sampling, shall be discarded and another sample taken. The Contractor shall furnish all tools, labor, and materials for cutting samples, cleaning, and filling the cored pavement. Cored pavement shall be cleaned and core holes shall be filled in a manner acceptable to the Engineer and within one day after sampling. Laitance produced by the coring operation shall be removed immediately. The top most lift of bituminous material shall be completely bonded to the underlying layers of bituminous

material. If any of the cores reveal that the surface is not bonded to the bituminous layer immediately below the surface then additional cores shall be taken as directed by the Engineer in accordance with paragraph 403-5.1b to determine the extent of any delamination. All delaminated areas shall be completely removed by milling to the limits and depth and replaced as directed by the Engineer at no additional cost.

(4) Testing. The bulk specific gravity of each cored sample will be measured by the Engineer in accordance with ASTM D2726. Samples will be taken in accordance with ASTM D979. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each sublot sample by the average bulk specific gravity of all laboratory prepared specimens for the lot, as determined in paragraph 403-5.1a(2). The bulk specific gravity used to determine the joint density at joints formed between different lots shall be the lowest of the bulk specific gravity values from the two different lots.

(5) Acceptance. Acceptance of field placed HMA format density will be determined by the Engineer in accordance with the requirements of paragraph 403-5.2b(1). Acceptance for joint density will be determined by the Engineer in accordance with the requirements of paragraph 403-5.2b(2).

c. Partial lots HMA. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. In addition, an agreed to minor placement will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation, that is, n = 5 or n = 6, for example. Partial lots at the end of asphalt production on the project shall be included with the previous lot. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, shall less than three (3) cored samples be obtained, that is, n = 3.

403-5.2 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the HMA and completed pavement and test results:

(1) Air Voids

(2) Mat density

(3) Joint density

(4) Thickness

(5) Smoothness

(6) Grade

(7) Stability

(8) Flow

Mat density will be evaluated for acceptance in accordance with paragraph 403-5.2b(1). Stability and flow will be evaluated for acceptance in accordance with paragraph 403-5.1. Joint density will be evaluated for acceptance in accordance with paragraph 403-5.2b(2).

Thickness will be evaluated by the Engineer for compliance in accordance with paragraph 403-5.2b(3). Acceptance for smoothness will be based on the criteria contained in paragraph 403-5.2b(4). Acceptance for grade will be based on the criteria contained in paragraph 403-5.2b(5).

The Engineer may at any time reject and require the Contractor to dispose of any batch of HMA which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Acceptance criteria.

(1) Mat density. Acceptance of each lot of plant produced material for mat density shall be based on the average of all of the densities taken from the sublots. If the average mat density of the lot so established equals or exceeds 96%, the lot shall be acceptable. If the average mat density of the lot is below 96%, the lot shall be removed and replaced at the Contractor's expense.

(2) Joint density. Acceptance of each lot of plant produced HMA for joint density shall be based on the average of all of the joint densities taken from the sublots. If the average joint density of the lot so established equals or exceeds 94%, the lot shall be acceptable. If the average joint density of the lot is less than 94%, the Contractor shall stop production and evaluate the method of compacting joints. Production may resume once the reason for poor compaction has been determined and appropriate measures have been taken to ensure proper compaction.

(3) Thickness. Thickness of each course shall be evaluated by the Engineer for compliance to the requirements shown on the plans. Measurements of thickness shall be made by the Engineer using the cores extracted for each sublot for density measurement. The maximum allowable deficiency at any point shall not be more than 1/4" less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, shall not be less than the indicated thickness. Where thickness deficiency exceeds the specified tolerances, the lot or sublot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the Engineer to circumscribe the deficient area.

(4) Smoothness. The final surface shall be free from roller marks. After final rolling, but not later than 24 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each pavement lot such that the finished surface course of the pavement shall not vary more than 1/4" when evaluated with a 12'-0" straightedge. When the surface course smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the surface course, full depth removal and replacement of surface course corrections shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified. The Contractor shall apply a surface treatment per Item P-608 to all areas that have been subject to grinding as directed by the Engineer.

(5) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50'-0" or more often as determined by the Engineer.

(a) Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final surface course >1/4" in transverse direction shall be corrected with diamond grinding per paragraph 403-4.13 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(b) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50'-0" or more often if directed by the Engineer. Deviations on final surface course >1/4" in transverse direction shall be corrected with diamond grinding per paragraph 403-4.13 or by removing and replacing full depth of surface course. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(1) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when

widths of paving lanes are less than 20'-0"; and the third points of paving lanes when widths of paving lanes are 20'-0" or greater. The finished surface shall not vary more than 1/4" when evaluated with a 12'-0" straightedge. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final surface course >1/4" in longitudinal direction will be corrected with diamond grinding per paragraph 403-4.13 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.

(6) Grade. Grade shall be evaluated on the first day of placement and then at the conclusion of every day of paving to allow adjustments to paving operations if measurements do not meet specification requirements. The Contractor must submit the survey data to the Engineer by the following day after measurements have been taken. The finished surface of the pavement shall not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/". The finished grade of each lot will be determined by running levels at intervals of 50'-0" or less longitudinally and all breaks in grade transversely (not to exceed 50'-0") to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer. The lot size shall be 2,000 square yards (square meters). When more than 15% of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates 3/4" or more from planned grade, the Contractor shall remove the deficient area to the depth of the final course of pavement and replace with new material. Skin patching shall not be permitted. Isolated high points may be ground off providing the course thickness complies with the thickness specified on the plans. High point grinding will be limited to 15 square yards. The surface of the ground pavement shall have a texture consisting of grooves between 0.090" and 0.130" wide. The peaks and ridges shall be approximately 1/32" higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous. The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement. Areas in excess of 15 square yards will require removal and replacement of the pavement in accordance with the limitations noted above. Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

c. Density outliers. If the tests within a lot include a very large or a very small value that appears to be outside the normal limits of variation, check for an outlier in accordance with ASTM E178, at a significance level of 5%, to determine if this value should be discarded.

403-5.3 Resampling Pavement for Mat Density.

a. General. Resampling of a lot of pavement will only be allowed for mat density and then, only if the Contractor requests same in writing, within 48 hours after receiving the written test results from the

Engineer. A retest will consist of all the sampling and testing procedures contained in paragraphs 403-5.1. Only one resampling per lot will be permitted.

(1) A redefined mat density shall be calculated for the resampled lot. The number of tests used to calculate the redefined mat density shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined mat density for a resampled lot shall be used to evaluate the acceptance of that lot in accordance with paragraph 403-5.2.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

403-5.4 Leveling course. Any course used for trueing and leveling shall meet the aggregate gradation in Table 3, paragraph 403-3.2. The trueing and leveling course shall meet the requirements of paragraph 403-3.2, 403-5.1 for air voids and for stability and flow, but shall not be subject to the density requirements of paragraph 403-5.1. The leveling course shall be compacted with the same effort used to achieve density of the test section. The truing and leveling course shall not exceed the maximum lift thickness associated with each gradation in Table 3, paragraph 403-3.2. The leveling course is the first variable thickness lift of an overlay placed prior to subsequent courses.

CONTRACTOR QUALITY CONTROL

403-6.1 General. The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 403-6.3, including but not limited to:

a. Mix Design

b. Aggregate Grading

c. Quality of Materials

d. Stockpile Management

e. Proportioning

f. Mixing and Transportation

g. Placing and Finishing

h. Joints

i. Compaction

j. Surface smoothness

k. Personnel

l. Laydown plan

The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 403-6.3 and Section 100 of the General Provisions. As a part of the process for approving the Contractor's plan, the Engineer may require the Contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

No partial payment will be made for materials that are subject to specific quality control requirements without an approved plan.

403-6.2 Contractor testing laboratory. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, and current reference standards to comply with the specifications.

403-6.3 Quality control testing. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Asphalt content. A minimum of two asphalt content tests shall be performed per lot in accordance with ASTM D6307 or ASTM D2172 if the correction factor in ASTM D6307 is greater than 1.0. The asphalt content for the lot will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444 and ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

d. Moisture content of HMA. The moisture content of the HMA shall be determined once per lot in accordance with ASTM D1461

e. Temperatures. Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the HMA at the plant, and the HMA at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Additional testing. Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

h. Monitoring. The Engineer reserves the right to monitor any or all of the above testing.

403-6.4 Sampling. When directed by the Engineer, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

403-6.5 Control charts. The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each sublot will be calculated and monitored by the Quality Control laboratory.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the JMF target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits For Individual Measurements		
Sieve	**Action Limit**	**Suspension Limit**
3/4"	±6%	±9%
1/2"	±6%	±9%
3/8"	±6%	±9%
No. 4	±6%	±9%
No. 16	±5%	±7.5%
No. 50	±3%	±4.5%
No. 200	±2%	±3%
Asphalt Content	±0.45%	±0.70%
VMA	-1.00%	-1.5%

b. Range. Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of n = 2. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for n = 3 and by 1.27 for n = 4.

Control Chart Limits Based On Range (Based On n = 2)	
Sieve	**Suspension Limit**
1/2"	11%
3/8"	11%
No. 4	11%
No. 16	9%
No. 50	6%
No. 200	3.5%

Control Chart Limits Based On Range (Based On n = 2)	
Sieve	**Suspension Limit**
Asphalt Content	0.8%

c. Corrective action. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range; or

(2) Two points in a row fall outside the Action Limit line for individual measurements.

403-6.6 Quality control reports. The Contractor shall maintain records and shall submit reports of quality control activities daily, in accordance with the Contractor Quality Control Program described in General Provisions, Section 100.

METHOD OF MEASUREMENT

403-7.1 Measurement. Plant mix bituminous concrete pavement shall be measured by the number of tons of HMA used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

403-8.1 Payment. Payment for a lot of HMA meeting all acceptance criteria as specified in paragraph 403-5.2 shall be made at the contract unit price per ton for HMA. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-403-8.1 – Hot Mixed Asphalt (HMA) Surface Course - per ton

TESTING REQUIREMENTS

AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D1074	Standard Test Method for Compressive Strength of Bituminous Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4125	Standard Test Methods for Asphalt Content of Bituminous mixtures by the Nuclear Method
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5581	Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen)
ASTM D6307	Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
AASHTO T030	Standard Method of Test for Mechanical Analysis of Extracted Aggregate
AASHTO T110	Standard Method of Test for Moisture or Volatile Distillates in Hot Mix Asphalt (HMA)
AASHTO T275	Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Paraffin-Coated Specimens).

Asphalt Institute Handbook MS-26 - Asphalt Binder
Asphalt Institute MS-2 Mix Design Manual, 7th Edition

MATERIAL REQUIREMENTS

ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder

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ITEM P-501
PORTLAND CEMENT CONCRETE (PCC) PAVEMENT

DESCRIPTION

501-1.1 This work shall consist of pavement composed of portland cement concrete (PCC), with or without reinforcement, constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans.

MATERIALS

501-2.1 Aggregates.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine aggregate. Fine aggregate shall conform to the requirements of ASTM C33. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and shall have a fineness modulus of not less than 2.50 nor more than 3.40. The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

Gradation for Fine Aggregate (ASTM C 33)

Sieve Designation (Square Openings)	Percentage by Weight Passing Sieves
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

The amount of deleterious material in the fine aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Fine Aggregate for Concrete

Deleterious Material	**ASTM**	**Percentage by Mass**
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve	ASTM C117	3.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Total of all deleterious Material		3.0

c. Coarse aggregate. Gradation, within the separated size groups, shall meet the coarse aggregate grading requirements of ASTM C33 when tested in accordance with ASTM C136. When the nominal maximum size of the aggregate is greater than1", the aggregates shall be furnished in two size groups.

Aggregates delivered to the mixer shall consist of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. Steel blast furnace slag shall not be permitted. The aggregate shall be composed of clean, hard, uncoated particles. Dust and other coating shall be removed from the aggregates by washing.

The percentage of wear shall be no more than 40 when tested in accordance with ASTM C131.

The quantity of flat, elongated, and flat and elongated particles in any size group coarser than 3/8 sieve shall not exceed 8% by weight when tested in accordance with ASTM D4791. A flat particle is defined as one having a ratio of width to thickness greater than 5. An elongated particle is one having a ratio of length to width greater than 5.

The soundness loss shall not exceed 12% when sodium sulfate is used or 18% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:

Limits for Deleterious Substances in Coarse Aggregate for Concrete

Deleterious Material	ASTM	Percentage by Mass
Clay lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve	ASTM C117	1.0
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.4)	1.0
Total of all deleterious material		3.0

Table 1. Gradations for Coarse Aggregate

Sieve Designations (square openings)		Percentage by Weight Passing Sieves		
		From 1-1/2 inch to No. 4 (38 mm - 4.75 mm)		From 1 inch to No. 4 (25.0 mm-4.75 mm)
		#4 1-1/2 inch - 3/4 inch	#67 3/4 inch - No. 4	#57 1 inch - No. 4
inch	mm			
2-1/2	60	---	---	---
2	50	100	---	---
1-1/2	38	90-100	---	100
1	25	20-55	100	95-100
3/4	19	0-15	90-100	---
1/2	13	---	---	25-60
3/8	9	0-5	20-55	---
No. 4	4.75	---	0-10	0-10
No. 8	2.36	---	0-5	0-5

(1) Aggregate susceptibility to durability (D) cracking. Aggregates that have a history of D-cracking shall not be used.

Coarse aggregate may be accepted from sources that have a 20 year service history for the same gradation to be supplied with no durability issues. Aggregates that do not have a record of 20 years of service without major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless it meets the following:

(a) Material currently being produced shall have a durability factor ≥ 95 using ASTM C666 procedure B. Coarse aggregates that are crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test but must meet all other quality tests. Aggregates meeting State Highway Department material specifications may be acceptable.

(b) The Contractor shall submit a current certification that the aggregate does not have a history of D-cracking and that the aggregate meets the state specifications for use in PCC pavement for use on interstate highways. Certifications, tests and any history reports must be for the same gradation as being proposed for use on the project. Certifications which are not dated or which are over one (1) year old or which are for different gradations will not be accepted. Test results will only be accepted when tests were performed by a State Department of Transportation (DOT) materials laboratory or an accredited laboratory.

(2) Combined aggregate gradation. If substituted for the grading requirements specified for coarse aggregate and for fine aggregate and when approved by the Engineer, the combined aggregate grading shall meet the following requirements:

(a) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in d. below, the point thus determined shall fall within the parallelogram described therein.

(b) The CF shall be determined from the following equation:

CF = (cumulative percent retained on the 3/8" sieve)(100) / (cumulative percent retained on the No. 8 sieve)

(c) The Workability Factor WF is defined as the percent passing the No. 8 sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds of cementitious material per cubic yard greater than 564 pounds per cubic yard.

(d) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary.

501-2.2 Cement. Cement shall conform to the requirements of ASTM C150 Type II, low alkali (less than 0.6% equivalent alkalies). Total Alkalies (Na2O and K2O) of the cement secured for the production of concrete shall be independently verified in accordance with ASTM C114.

~~If aggregates are deemed innocuous when tested in accordance with paragraph 501-2.1.a.1 and accepted in accordance with paragraph 501-2.1.a.2, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA.~~ If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

501-2.3 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the mix design, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

b. Slag cement (ground granulated blast furnace(GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

c. Raw or calcined natural pozzolan. Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

~~**d. Ultrafine fly ash and ultrafine pozzolan.** UltraFine Fly Ash (UFFA) and UltraFine Pozzolan (UFP) shall conform to ASTM C618, Class F or N, and the following additional requirements:~~

~~**(1)** The strength activity index at 28 days of age shall be at least 95% of the control specimens.~~

~~**(2)** The average particle size shall not exceed 6 microns.~~

501-2.4 Joint seal. The joint seal for the joints in the concrete pavement shall meet the requirements of Item P-605 and shall be of the type specified in the plans.

501-2.5 Isolation joint filler. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1752, Type II or III, and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

501-2.6 Steel reinforcement. Reinforcing shall consist of welded wire fabric furnished in flat sheets only conforming to the requirements of ASTM A1064**.** Steel for Type A-1 joint shall be per the plan detail.

501-2.7 Dowel ~~and tie bars~~. Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078. Dowel bars shall be coated with an approved, field applied material to break the bond between the steel and the concrete. The maximum pullout load tested in accordance with AASHTO T253 shall be rated better (lower) than SAE 30 Oil. Proof of the pullout load testing shall be provided by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

~~Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.~~

High strength dowel bars shall conform to ASTM A714, Class 2, Type S, Grade I, II, or III, bare finish.

~~Dowel assemblies, tie bars and other miscellaneous steel embedded in the concrete shall be epoxy coated according to ASTM A1078 Type II.~~

501-2.8 Water. Water used in mixing or curing shall be potable, clean, free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product, except that non-potable water, or water from concrete production operations, may be used if it meets the requirements of ASTM C1602.

501-2.9 Material for curing concrete. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class B, or Class A if wax base only.

~~**b.** White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.~~

~~**c.** White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.~~

~~**d.** Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.~~

501-2.10 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium Nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown below:

Constituent	**Limit (% by Mass)**
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

Provide a trained manufacturer's representative to supervise the lithium nitrate admixture dispensing and mixing operations.

501-2.11 Epoxy-resin. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved and as specified in subparagraph 501-4.19e.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 Material acceptance. Prior to use of materials, the Contractor shall submit certified test reports to the Engineer for those materials proposed for use during construction. The certification shall show the appropriate ASTM test for each material, the test results, and a statement that the material passed or failed.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

MIX DESIGN

501-3.1. General. No concrete shall be placed until the mix design has been submitted to the Engineer for review and the Engineer has taken appropriate action. The Engineer's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 Proportions. The laboratory preparing the mix design shall be accredited in accordance with ASTM C1077. The mix design for all Portland cement concrete placed under P-501 shall be stamped or sealed by the responsible professional Engineer of the laboratory. Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-5.2 for a flexural strength of 650 psi per ASTM C78. The mix shall be developed using the procedures contained in the Portland Cement Association's (PCA) publication, "Design and Control of Concrete Mixtures".

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be 470 pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates, but not including moisture absorbed by the aggregates, shall not be more than 0.45 by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. The mix determined shall be workable concrete having a maximum allowable slump between 1" and 2" as determined by ASTM C143. For slip-form concrete, the slump shall be between 1/2" and 1-1/2". At the start of the project, the Contractor shall determine a maximum allowable slump for slip-form pavement which will produce in-place pavement to control the edge slump. The selected slump shall be applicable to both pilot and fill-in lanes.

Before the start of paving operations and after approval of all material to be used in the concrete, the Contractor shall submit a mix design showing the proportions and flexural strength obtained from the concrete at 7 and 28 days. The mix design shall include copies of test reports, including test dates, and a complete list of materials including type, brand, source, and amount of cement, fly ash, ground slag, coarse aggregate, fine aggregate, water, and admixtures. The mix design shall be submitted to the Engineer at least 30 days prior to the start of operations. The submitted mix design shall not be more than 90 days old. Production shall not begin until the mix design is approved in writing by the Engineer.

If a change in sources is made, or admixtures added or deleted from the mix, a new mix design must be submitted to the Engineer for approval.

The results of the mix design shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition. The recommended mixture proportions shall be accompanied by test results demonstrating that the proportions selected will produce concrete of the qualities indicated. Trial mixtures having proportions, slumps, and air content suitable for the work shall be based on methodology described in PCA's publication, Design and Control of Concrete Mixtures, modified as necessary to accommodate flexural strength.

The submitted mix design shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Coarse, fine, and combined aggregate gradations and plots including fineness modulus of the fine aggregate.

b. Reactivity Test Results.

c. Coarse aggregate quality test results, including deleterious materials.

d. Fine aggregate quality test results, including deleterious materials.

e. Mill certificates for cement and supplemental cementitious materials.

f. Certified test results for all admixtures, including Lithium Nitrate if applicable.

g. Specified flexural strength, slump, and air content.

h. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

i. Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

j. Correlation ratios for acceptance testing and Contractor Quality Control testing, when applicable.

k. Historical record of test results documenting production standard deviation, when applicable.

501-3.3 Cementitious materials.

a. Fly ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20% and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25% to 55% of the total cementitious material by weight. If the concrete is to be used for slipforming operations and the air temperature is expected to be lower than 55°F the percent slag cement shall not exceed 30% by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the mix design. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20% and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

~~**d. Ultrafine fly ash (UFFA) and ultrafine pozzolan (UFP).** UFFA and UFP may be used in the mix design with the Engineer's approval. When UFFA and UFP is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 7% and 16% by weight of the total cementitious material.~~

501-3.4 Admixtures.

a. Air-entraining admixtures. Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be 4.5%. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted on trial mixes, with the materials to be used in the work, in accordance with ASTM C 494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

501-3.5 Concrete mix design laboratory. The Contractor's laboratory used to develop the concrete mix design shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete

mix design must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction

501-3.6 Test Section. Upon acceptance of the approved "mix design" and prior to production paving, the Contractor shall construct a test section as part of the production paving area along an outer paving lane as directed by the Engineer. Construction of test section is intended to develop and demonstrate to the satisfaction of the Engineer the proposed techniques of mixing, hauling, placing, consolidating, finishing, curing, initial saw cutting, start-up procedures, testing methods, plant operations, and the preparation of the construction and contraction joints. The test section shall be 500 feet long and one-lane wide, unless otherwise approved by the Engineer. The mixing plant shall be operated and calibrated prior to start of placing the test section and opened to the Engineer for inspection at any time during production. The Contractor will be required to use the same equipment, materials, and construction techniques used on the test section in all subsequent production work. Base course preparation, concrete production, placing, consolidating, curing, construction of joints, and all testing for acceptance shall be in accordance with these and other applicable sections of these specifications. The test section will be treated as a "lot" for acceptance in proceeding with production paving. Failure to construct an acceptable test section will require the complete removal and reconstruction of an additional test section at no additional cost. Production paving shall not commence until the Engineer approves in writing that the test section has satisfactorily met all specifications and acceptance testing. Only an approved test section will be paid as a production lot in accordance with the paragraph titled "Method of Measurement and Basis of Payment".

CONSTRUCTION METHODS

501-4.1 Equipment. Equipment necessary for handling materials and performing all parts of the work shall be approved by the Engineer, but does not relieve the Contractor of the responsibility for the proper operation of equipment and maintaining the equipment in good working condition. The equipment shall be at the jobsite sufficiently ahead of the start of paving operations to be examined thoroughly and approved.

a. Batch plant and equipment. The batch plant and equipment shall conform to the requirements of ASTM C94.

b. Mixers and transportation equipment.

(1) General. Concrete may be mixed at a central plant, or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

(2) Central plant mixer. Central plant mixers shall conform to the requirements of ASTM C94. The mixer shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4" or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

(3) Truck mixers and truck agitators. Truck mixers used for mixing and hauling concrete and truck agitators used for hauling central-mixed concrete shall conform to the requirements of ASTM C94.

(4) Non-agitator trucks. Non-agitating hauling equipment shall conform to the requirements of ASTM C94.

(5) Transfer and spreading equipment. Equipment for transferring concrete from the transporting equipment to the paving lane in front of the paver shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will transfer and spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

c. Finishing equipment. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements. It shall weigh at least 2,200 pounds per 1'-0" of paving lane width and powered by an engine having at least 6.0 horsepower per 1'-0" of lane width.

On irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with approved placement and finishing equipment using stationary side forms. Bridge deck paving machines shall not be used. The screeds shall be full width of the pavement and have an adequate size and number of vibrators. A bridge shall be provided for vibration and finishing so there is no walking in the concrete or on the steel. Hand vibration, screeding and float finishing may only be used on small irregular areas as allowed by the Engineer and provided a bridge is available and used.

d. Vibrators. Vibrator shall be the internal type. Operating frequency for internal vibrators shall be between 8,000 and 12,000 vibrations per minute. Average amplitude for internal vibrators shall be 0.025" - 0.05".

The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the Engineer.

Hand held vibrators may be used in irregular areas only, but shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

e. Concrete saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations. Early-entry saws may be used, subject to demonstration and approval of the Engineer.

f. Side forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10'-0" in length. Forms shall have a depth equal to the pavement thickness at the edge, and a base width equal to or greater than the depth. Flexible or curved forms of proper radius shall be used for curves of 100'-0" radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8" in 10'-0", and the upstanding leg shall not

vary more than 1/4". The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Engineer.

g. Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross-section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

501-4.2 Form setting. Forms shall be set sufficiently in advance of the concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the underlying surface shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Forms shall be staked into place sufficiently to maintain the form in position for the method of placement.

Form sections shall be tightly locked and shall be free from play or movement in any direction. The forms shall not deviate from true line by more than 1/8" at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing of concrete.

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete.

501-4.3 Conditioning of underlying surface. The compacted underlying surface on which the pavement will be placed shall be widened approximately 3'-0" to extend beyond the paving machine track to support the paver without any noticeable displacement. After the underlying surface has been placed and compacted to the required density, the areas that will support the paving machine and the area to be paved shall be trimmed or graded to the plan grade elevation and profile by means of a properly designed machine. The grade of the underlying surface shall be controlled by a positive grade control system using lasers, stringlines, or guide wires. If the density of the underlying surface is disturbed by the trimming operations, it shall be corrected by additional compaction and retested at the option of the Engineer before the concrete is placed except when stabilized subbases are being constructed. If damage occurs on a stabilized subbase, it shall be corrected full depth by the Contractor. If traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately before the placement of concrete. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. The underlying surface shall be protected so that it will be entirely free of frost when concrete is placed.

501-4.4 Conditioning of underlying surface, side-form and fill-in lane construction. The prepared underlying surface shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Damage caused by hauling or usage of other equipment shall be corrected and retested at the option of the Engineers. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor. A template shall be provided and operated on the forms immediately in advance of the placing of all concrete. The template shall be propelled only by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that they may be set and maintained at the correct contour of the underlying surface. The adjustment and operation of the templates shall be such as will provide an accurate retest of the grade before placing the concrete thereon. All excess material shall be removed and wasted. Low areas shall be filled and

compacted to a condition similar to that of the surrounding grade. The underlying surface shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying surface shall not be permitted.

The template shall be maintained in accurate adjustment, at all times by the Contractor, and shall be checked daily.

501-4.5 Handling, measuring, and batching material. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials.

Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage.

Batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using interlocked proportioning devices of an approved type. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance that the cement content specified is present in each batch.

501-4.6 Mixing concrete. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified in the approved mix design is not exceeded, and approved by the Engineer.

501-4.7 Limitations on mixing and placing. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold weather. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

b. Hot weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The finished surfaces of the newly laid pavement shall be kept damp by applying a water-fog or mist with approved spraying equipment until the pavement is covered by the curing medium. When necessary, wind screens shall be provided to protect the concrete from an evaporation rate in excess of 0.2 psf per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. Such measures shall consist of wind screens, more effective fog sprays, and similar measures commencing immediately behind the paver. If these measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

c. Temperature management program. Prior to the start of paving operation for each day of paving, the Contractor shall provide the Engineer with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. As a minimum the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 11-8, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

501-4.8 Placing concrete. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3'-0". The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a flexural strength of 550 psi based on the average of four field cured specimens per 2,000 cubic yards of concrete placed. Also, subgrade and

subbase planers, concrete pavers, and concrete finishing equipment may be permitted to ride upon the edges of previously constructed pavement when the concrete has attained a minimum flexural strength of 400 psi.

The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

a. Slip-form construction. The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9" for slipform and at the end of the dowels for the fill-in lanes The spacing of internal units shall be uniform and shall not exceed 18".

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be within 8,000 to 12,000 cycles per minute and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least 1'-0". The frequency of vibration or amplitude shall vary proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500'-0" segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4", and none of the free edge of the pavement shall have an edge slump exceeding 3/8". (The total free edge of 500'-0" of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500'-0" of paving lane originally constructed as a separate lane will have 1,000'-0" of free edge, 500'-0" of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete

along the pavement edge shall be limited to not more than 18" from the edge. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer.

b. Side-form construction. Side form sections shall be straight, free from warps, bends, indentations, or other defects. Defective forms shall be removed from the work. Metal side forms shall be used except at end closures and transverse construction joints where straight forms of other suitable material may be used.

Side forms may be built up by rigidly attaching a section to either top or bottom of forms. If such build-up is attached to the top of metal forms, the build-up shall also be metal.

Width of the base of all forms shall be equal to or greater than the specified pavement thickness.

Side forms shall be of sufficient rigidity, both in the form and in the interlocking connection with adjoining forms, that springing will not occur under the weight of subgrading and paving equipment or from the pressure of the concrete. The Contractor shall provide sufficient forms so that there will be no delay in placing concrete due to lack of forms.

Before placing side forms, the underlying material shall be at the proper grade. Side forms shall have full bearing upon the foundation throughout their length and width of base and shall be placed to the required grade and alignment of the finished pavement. They shall be firmly supported during the entire operation of placing, compacting, and finishing the pavement.

Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and oiled each time they are used and before concrete is placed against them.

Concrete shall be spread, screeded, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery.

Concrete for the full paving width shall be effectively consolidated by internal vibrators without causing segregation. Internal type vibrators' rate of vibration shall be not less than 7,000 cycles per minute. Amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete more than 1'-0" from the vibrating element. The Contractor shall furnish a tachometer or other suitable device for measuring and indicating frequency of vibration.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

The provisions relating to the frequency and amplitude of internal vibration shall be considered the minimum requirements and are intended to ensure adequate density in the hardened concrete.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2". Excessive vibration shall not be permitted. If the vibrators cause visible tracking in the paving lane, the paving operation shall be stopped and equipment and operations modified to prevent it. Concrete in small, odd-shaped slabs or in isolated locations inaccessible to the gang-mounted vibration equipment shall be vibrated with an approved hand-operated immersion vibrator operated from a bridge spanning the area. Vibrators shall not be used to transport or spread the concrete. Hand-operated vibrators shall not be operated in the concrete at one location for more than 20 seconds. Insertion locations for hand-operated vibrators shall be between 6" to 15" on centers. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the Engineer.

If a lack of consolidation of the concrete is suspected by the Engineer, referee testing may be required. Referee testing of hardened concrete will be performed by the Engineer by cutting cores from the finished pavement after a minimum of 24 hours curing. Density determinations will be made by the Engineer based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original mix design density, with no cores having a density of less than 96% of the original mix design density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 Strike-off of concrete and placement of reinforcement. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screeded. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 Joints. Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2" from their designated position and shall be true to line with not more than 1/4" variation in 10'-0". The surface across the joints shall be tested with a 12'-0" straightedge as the joints are finished and any irregularities in excess of 1/4" shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8" wide and to the depth shown on the plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. Any concrete bridging the joint space shall be removed for the full width and depth of the joint.

~~**d. Tie bars.** Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth. When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.~~

d. Dowel bars. Dowel bars or other load-transfer units of an approved type shall be placed across joints as shown on the plans. They shall be of the dimensions and spacings as shown and held rigidly in

the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. The dowels shall be coated with a bond-breaker as specified under section 501-2.7.

e. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

f. Placing dowels. The method used in installing and holding dowels in position shall ensure that the error in alignment of any dowel from its required horizontal and vertical alignment after the pavement has been completed will not be greater than 1/8" per 1'-0". Except as otherwise specified below, horizontal spacing of dowels shall be within a tolerance of ±5/8". The vertical location on the face of the slab shall be within a tolerance of ±1/2". The vertical alignment of the dowels shall be measured parallel to the designated top surface of the pavement, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The horizontal alignment shall be checked with a framing square. Dowels and tie bars shall not be placed closer than 0.6 times the dowel bar or tie bar length to the planned joint line. If the last regularly spaced longitudinal dowel or tie bar is closer than that dimension, it shall be moved away from the joint to a location 0.6 times the dowel bar or tie bar length, but not closer than 6" to its nearest neighbor. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

(1) Contraction joints. Dowels and ~~tie bars~~ in longitudinal and transverse contraction joints within the paving lane shall be held securely in place, as indicated, by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires. At the Contractor's option, in lieu of the above, dowels and tie bars in contraction joints shall be installed near the front of the paver by insertion into the plastic concrete using approved equipment and procedures. Approval will be based on the results of a preconstruction demonstration, showing that the dowels and tie bars are installed within specified tolerances.

(2) Construction joints. Install dowels and ~~tie bars~~ by the cast-in- place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms. The spacing of dowels and tie bars in construction joints shall be as indicated.

(3) Dowels installed in isolation joints and other hardened concrete. Install dowels for isolation joints and in other hardened concrete by bonding the dowels into holes drilled into the hardened concrete. The concrete shall have cured for seven (7) days or reached a minimum flexural strength of 450 psi before drilling commences. Holes 1/8" greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur to the concrete joint face. Modification of the equipment and operation shall be required if, in the Engineer's opinion, the equipment and/or operation is causing excessive damage. Depth of dowel hole shall be within a tolerance of ±1/2" of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to

completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic grout retention ring fitted around the dowel. Dowels required to be installed in any joints between new and existing concrete shall be grouted in holes drilled in the existing concrete, all as specified above.

h. Sawing of joints. Joints shall be cut as shown on the plans. Equipment shall be as described in paragraph 501-4.1. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8" wide and to the depth shown on the plans. The top of the slot shall be widened by sawing to provide adequate space for joint sealers as shown on the plans. Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. The joints shall be sawn at the required spacing. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial sawcut and maintained for the remaining cure period.

501-4.11 Finishing. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, texturing, and then edging of joints. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Any operations which produce more than 1/8" of mortar-rich surface (defined as deficient in plus U.S. No. 4 sieve size aggregate) shall be halted immediately and the equipment, mixture, or procedures modified as necessary. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way, except for fog (mist) sprays specified to prevent plastic shrinkage cracking. The finished surface shall have no more than 1/8 inch or mortar or paste to be acceptable and determined by evaluation of cores. The final section shall have no segregation and have an even distribution of the coarse aggregates.

a. Machine finishing with slipform pavers. The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. If there is concrete slurry or fluid paste on the surface that runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. Machine finishing with fixed forms. The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. Other types of finishing equipment. Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the Engineer's approval.

Bridge deck finishers shall have a minimum operating weight of 7,500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. Hand finishing. Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Use hand finishing operations only as specified below.

(1) Equipment and screed. In addition to approved mechanical internal vibrators for consolidating the concrete, provide a strike-off and tamping screed and a longitudinal float for hand finishing. The screed shall be at least 1'-0" longer than the width of pavement being finished, of an approved design, and sufficiently rigid to retain its shape, and shall be constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 10'-0" long, of approved design, and rigid and substantially braced, and shall maintain a plane surface on the bottom. Grate tampers (jitterbugs) shall not be used.

(2) Finishing and floating. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross-section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. In addition to previously specified complete coverage with handheld immersion vibrators, the entire surface shall be tamped with the strike-off and tamping template, and the tamping operation continued until the required compaction and reduction of internal and surface voids are accomplished. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed, consolidated and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces.

e. Straightedge testing and surface correction. After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a Contractor furnished 12'-0" straightedge swung from handles 3'-0" longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8" thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness

requirements of paragraph 501-5.2e(3). Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment. This straight-edging is not a replacement for the straightedge testing of paragraph 501-5.2e(3), Smoothness.

501-4.12 Surface texture. The surface of the pavement shall be finished with either a brush or broom, burlap drag, or artificial turf finish for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the Engineer.

a. Burlap drag finish. If a burlap drag is used to texture the pavement surface, it shall be at least 15 ounces per square yard. To obtain a textured surface, the transverse threads of the burlap shall be removed approximately 1'-0" from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface. The corrugations shall be uniform in appearance and approximately 1/16" in depth.

501-4.13 Curing. Immediately after finishing operations are completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-sawcut method is used to construct the contraction joint, the curing compound shall be applied to the sawcut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. Impervious membrane method. The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 s.f. of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the Engineer, a double application rate shall be used to ensure coverage. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface. Curing shall be applied immediately after the bleed water is gone from the surface.

b. Concrete protection for cold weather. The concrete shall be maintained at an ambient temperature of at least 50°F (10°C) for a period of 72 hours after placing and at a temperature above freezing for the remainder of the curing time. The Contractor shall be responsible for the quality and

strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

c. Concrete protection for hot weather. Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the Engineer.

501-4.14 Removing forms. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured as per the methods indicated in paragraph 501-4.13. Major honeycombed areas shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-5.2(f).

501-4.15 Saw-cut grooving. If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.

501-4.16 Sealing joints. The joints in the pavement shall be sealed in accordance with Item P-605.

501-4.17 Protection of pavement. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the Engineer.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days and the joints have been sealed or otherwise protected, and the concrete has attained a minimum field cured flexural strength of 550 psi and approved means are furnished to prevent damage to the slab edge.

All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean, and spillage of concrete or other materials shall be cleaned up immediately upon occurrence.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 Opening to construction traffic. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 pounds / square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 Repair, removal, or replacement of slabs.

a. General. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable shall be removed and replaced or repaired, as directed by the Engineer and as specified hereinafter at no cost to the Owner. Spalls along joints shall be repaired as specified in subparagraph 501-4.19e. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The Engineer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be 4" diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. All epoxy resin used in this work shall conform to ASTM C881, Type V. Repair of cracks as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8" of the pavement surface.

b. Shrinkage cracks. Shrinkage cracks, which do not exceed 4" in depth, shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using procedures as approved by the Engineer. Care shall be taken to assure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the Engineer. Shrinkage cracks, which exceed 4" depth, shall be treated as full depth cracks in accordance with paragraphs 4.19b and 4.19c.

c. Slabs with full depth cracks. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than 4 inches (100 mm) in depth. ~~Interior area is defined as that area more than 6" from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than 4" in depth, that extend into the interior area.~~

~~**d. Cracks close to and parallel to joints.** All cracks essentially parallel to original joints, extending full depth of the slab, and lying wholly within 6" either side of the joint shall be treated as specified here. Any crack extending more than 6" from the joint shall be treated as specified above in subparagraph c.~~

~~**(1) Full depth cracks present, original joint not opened.** When the original un-cracked joint has not opened, the crack shall be sawed and sealed, and the original joint filled with epoxy resin as specified below. The crack shall be sawed with equipment specially designed to follow random cracks. The reservoir for joint sealant in the crack shall be formed by sawing to a depth of 3/4", ±1/16", and to a width of 5/8", ±1/8". Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent such raveling or spalling. The joint sealant shall be a liquid sealant as specified. Installation of joint seal shall be as specified for sealing joints or as directed. If the joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.~~

~~If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. If filler type material has been used to form a weakened plane in the transverse joint, it shall be completely sawed out and the saw cut pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures. Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the~~

~~remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.~~

~~(2) Full depth cracks present, original joint also cracked.~~ ~~At a joint, if there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced for the full lane width and length.~~

d. Removal and replacement of full slabs. Where it is necessary to remove full slabs, ~~unless there are dowels present,~~ all edges of the slab shall be cut full depth with a concrete saw. All saw cuts shall be perpendicular to the slab surface. ~~If dowels, or tie bars are present along any edges, these edges shall be sawed full depth just beyond the end of the dowels or tie bars within the slab to be removed. These joints shall then be carefully sawed on the joint line to within 1" of the depth of the dowel or tie bar.~~

The main slab shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. Suitable equipment shall be used to provide a truly vertical lift, and approved safe lifting devices used for attachment to the slabs. ~~The narrow strips along doweled edges shall be carefully broken up and removed using light, hand-held jackhammers, 30 pounds or less, or other approved similar equipment.~~

Care shall be taken to prevent damage to the ~~dowels, tie bars, or to~~ concrete to remain in place. The joint face below dowels shall be suitably trimmed so that there is not abrupt offset in any direction greater than 1/2" and no gradual offset greater than 1" when tested in a horizontal direction with a 12'-0" straightedge.

No mechanical impact breakers, other than the above hand-held equipment shall be used for any removal of slabs. If under break between 1-1/2" and 4" deep occurs at any point along any edge, the area shall be repaired as directed before replacing the removed slab. Procedures directed will be similar to those specified for surface spalls, modified as necessary.

If under break over 4" deep occurs, the entire slab containing the under break shall be removed and replaced. Where there are no dowels or tie bars, or where they have been damaged, dowels or tie bars of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete using procedures as specified. Original damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of dowels shall be painted and lightly oiled. All four (4) edges of the new slab shall contain dowels or original tie bars.

Placement of concrete shall be as specified for original construction. Prior to placement of new concrete, the underlying material (unless it is stabilized) shall be re-compacted and shaped as specified in the appropriate section of these specifications. The surfaces of all four joint faces shall be cleaned of all loose material and contaminants and coated with a double application of membrane forming curing compound as bond breaker. Care shall be taken to prevent any curing compound from contacting dowels or tie bars. The resulting joints around the new slab shall be prepared and sealed as specified for original construction.

See the Isolated Slab Removal and Replacement Detail within the plans for further details.

e. Repairing spalls along joints. Where directed, spalls along joints of new slabs, and along parallel cracks used as replacement joints, shall be repaired by first making a vertical saw cut at least 2" outside the spalled area and to a depth of at least 2". Saw cuts shall be straight lines forming rectangular areas. The minimum patch length and width within a PCC slab shall be 12-inches and 6-inches respectively. Spall areas within a PCC slab that are less than two feet apart shall be combined and repaired with one

common patch. Areas on adjacent slabs shall not be combined. The concrete between the saw cut and the joint, or crack, shall be chipped out to remove all unsound concrete to at least 1/2" of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with compressed air to remove all loose material. Immediately before filling the cavity, a primer agent recommended by the patch manufacturer shall be applied to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face, to insure good adhesion between existing pavement and patch. The primer coat shall be applied in accordance with the manufacturer's recommendations. Pooling of epoxy resin shall be avoided. The cavity shall be filled with Silspec Flexpatch or DS Brown Delpatch or approved equal. The Contractor shall submit, for review by the Engineer, material cut sheets for material selected prior to starting work. The patch material shall be installed per the manufacturer's recommendations. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints. If any spall penetrates half the depth of the slab or more, the entire slab shall be removed and replaced as previously specified. If any spall would require over 25% of the length of any single joint to be repaired, the entire slab shall be removed and replaced. Repair of spalls as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of spalls shall be allowed in any panel that demonstrates segregated aggregate with a significant absence of coarse aggregate in the upper 1/8" of the pavement surface.

f. Diamond grinding of PCC surfaces. Diamond grinding of the hardened concrete with an approved diamond grinding machine should not be performed until the concrete is 14 days or more old and concrete has reached full minimum strength. When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8" wide and there shall be a minimum of 55 to 60 blades per 12" of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3'-0" wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The area corrected by diamond grinding the surface of the hardened concrete should not exceed 10% of the total area of any sublot. The depth of diamond grinding shall not exceed 1/2" and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. All pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified above, may require removing and replacing in conformance with paragraph 501-4.19.

501-4.20 Existing concrete pavement removal and repair.

All operations shall be carefully controlled to prevent damage to the concrete pavement and to the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab surface.

a. Removal of existing pavement slab.

When it is necessary to remove existing concrete pavement and leave adjacent concrete in place, the joint between the removal area and adjoining pavement to stay in place, including dowels or tie bars, shall first be cut full depth with a standard diamond-type concrete saw. If dowels are present at this joint, the saw cut shall be made full depth just beyond the end of dowels. The edge shall then be carefully sawed on the

joint line to within 1" of the top of the dowel. Next, a full depth saw cut shall be made parallel to the joint at least 24" from the joint and at least 12" from the end of any dowels. All pavement between this last saw cut and the joint line shall be carefully broken up and removed using hand-held jackhammers, 30 pounds or less, or the approved light-duty equipment which will not cause stress to propagate across the joint saw cut and cause distress in the pavement which is to remain in place. Where dowels are present, care shall be taken to produce an even, vertical joint face below the dowels. If the Contractor is unable to produce such a joint face, or if under break or other distress occurs, the Contractor shall saw the dowels flush with the joint. The Contractor shall then install new dowels, of the size and spacing used for other similar joints, by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501-4.10g. All this shall be at no additional cost to the Owner. Dowels of the size and spacing indicated shall be installed as shown on the drawings by epoxy resin bonding them in holes drilled in the joint face as specified in paragraph 501-4.10g. The joint face shall be sawed or otherwise trimmed so that there is no abrupt offset in any direction greater than 1/2" and no gradual offset greater than 1" when tested in a horizontal direction with a 12'-0" straightedge.

b. Edge repair.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Areas that are damaged during construction shall be repaired at no cost to the Owner.

(1) Spall repair. Spalls shall be repaired where indicated and where directed by the Engineer. Repair materials and procedures shall be as previously specified in subparagraph 501-4.19e.

(2) Under break repair. All under break shall be repaired. First, all delaminated and loose material shall be carefully removed. Next, the underlying material shall be recompacted, without addition of any new material. Finally, the void shall be completely filled with paving concrete, thoroughly consolidated. Care shall be taken to produce an even joint face from top to bottom. Prior to placing concrete, the underlying material shall be thoroughly moistened. After placement, the exposed surface shall be heavily coated with curing compound.

(3) Underlying material. The underlying material adjacent to the edge and under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new concrete, and shall be shaped as shown on the drawings or as directed. Sufficient material shall be kept in place outside the joint line to prevent disturbance (or sloughing) of material under the pavement that is to remain in place. Any material under the portion of the concrete pavement to remain in place, which is disturbed or loses its compaction shall be carefully removed and replaced with concrete as specified in paragraph 501-4.20b(2). The underlying material outside the joint line shall be thoroughly compacted and moist when new concrete is placed.

MATERIAL ACCEPTANCE

501-5.1 Acceptance sampling and testing. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the Engineer at no cost to the Contractor. The Contractor shall bear the cost of providing curing facilities for the strength specimens, per paragraph 501-5.1a, and coring and filling operations, per paragraph 501-5.1b. Testing organizations performing these tests shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

Concrete shall be accepted for strength and thickness on a lot basis.

A lot shall consist of a day's production not to exceed 4,500 square yards**.**

a. Flexural strength.

(1) Sampling. Each lot shall be divided into four equal sublots. One sample shall be taken for each sublot from the plastic concrete delivered to the job site. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. The concrete shall be sampled in accordance with ASTM C172.

(2) Testing. Two (2) specimens shall be made from each sample. Specimens shall be made in accordance with ASTM C31 and the flexural strength of each specimen shall be determined in accordance with ASTM C78. The flexural strength for each sublot shall be computed by averaging the results of the two test specimens representing that sublot.

Immediately prior to testing for flexural strength, the beam shall be weighed and measured for determination of a sample unit weight. Measurements shall be made for each dimension; height, depth, and length, at the mid-point of the specimen and reported to the nearest 1/10". The weight of the specimen shall be reported to the nearest 0.1 pound. The sample unit weight shall be calculated by dividing the sample weight by the calculated volume of the sample. This information shall be reported as companion information to the measured flexural strength for each specimen.

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method.

Slump, air content, and temperature tests will also be conducted by the quality assurance laboratory for each set of strength test samples, per ASTM C31.

(3) Curing. The Contractor shall provide adequate facilities for the initial curing of beams. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60°F to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

(4) Acceptance. Acceptance of pavement for flexural strength will be determined by the Engineer in accordance with paragraph 501-5.2b.

b. Pavement thickness.

(1) Sampling. Each lot shall be divided into four equal sublots and one core shall be taken by the Contractor for each sublot. Sampling locations shall be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, shall be excluded from sample locations.

Cores shall be neatly cut with a core drill. The Contractor shall furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes shall be filled by the Contractor with a non-shrink grout approved by the Engineer within one day after sampling.

(2) Testing. The thickness of the cores shall be determined by the Engineer by the average caliper measurement in accordance with ASTM C174.

(3) Acceptance. Acceptance of pavement for thickness shall be determined by the Engineer in accordance with paragraph 501-5.2c.

c. Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they shall constitute a lot. Where one or two sublots have been produced, they shall be incorporated into the next lot or the previous lot and the total number of sublots shall be used in the acceptance criteria calculation, that is, n=5 or n=6.

d. Outliers. All individual flexural strength tests within a lot shall be checked for an outlier (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the percentage of material within specification limits (PWL) shall be determined using the remaining test values.

501-5.2 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-5.2e:

(1) Flexural strength

(2) Thickness

(3) Smoothness

(4) Grade

(5) Edge slump

Flexural strength and thickness shall be evaluated for acceptance on a lot basis using the method of estimating PWL. Acceptance using PWL considers the variability (standard deviation) of the material and the testing procedures, as well as the average (mean) value of the test results to calculate the percentage of material that is above the lower specification tolerance limit (L).

Acceptance for flexural strength will be based on the criteria contained in accordance with paragraph 501-5.2e(1). Acceptance for thickness will be based on the criteria contained in paragraph 501-5.2e(2). Acceptance for smoothness will be based on the criteria contained in paragraph 501-5.2e(3). Acceptance for grade will be based on the criteria contained in paragraph 501-5.2e(4).

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the

presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Flexural strength. Acceptance of each lot of in-place pavement for flexural strength shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

c. Pavement thickness. Acceptance of each lot of in-place pavement shall be based on PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

d. Percentage of material within limits (PWL). The PWL shall be determined in accordance with procedures specified in Section 110 of the General Provisions.

The lower specification tolerance limit (L) for flexural strength and thickness shall be:

Lower Specification Tolerance Limit (L)

Flexural Strength	0.93 × strength specified in paragraph 501-3.1
Thickness	Lot Plan Thickness in inches, - 0.50"

e. Acceptance criteria.

(1) Flexural Strength. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(2) Thickness. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 501-8.1.

(3) Smoothness. As soon as the concrete has hardened sufficiently, but not later than 48 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each section of pavement having an average profile index meeting the requirements of paragraph 501-8.1c when evaluated with a profilograph; and the finished surface of the pavement shall not vary more than 1/4" when evaluated with a 12'-0" straightedge. When the surface smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the pavement, full depth removal and replacement of pavement shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50'-0" or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement

surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement >1/4" in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50'-0" or more often if directed by the Engineer. Maximum gap on final pavement surface >1/4" in transverse direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20'-0"; and at the one third points of paving lanes when widths of paving lanes are 20'-0" or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200'-0" and areas not requiring a profilograph. When approved by the Engineer, the first and last 15'-0" of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than 1/4" when evaluated with a 12'-0" straightedge. Smoothness readings will not be made across grade changes or cross slope transitions, at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straight edge at the edge of pavement section being tested and then moved ahead one-half the length of the straight edge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final pavement surface >1/4" in longitudinal direction will be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of surface. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) Profilograph Testing. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2" blanking band. The bump template must span 1" with an offset of 0.4". The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of 1" = 25'-0" and a vertical scale of 1" = 1". A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.

The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. Deviations on final surface in longitudinal direction shall be corrected with diamond grinding per paragraph 501-4.19g or by removing and replacing full depth of pavement. Grinding will be tapered in all

directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15" per mile or less. If the initial average profile index was less than 15", only those areas representing greater than 0.4" deviation will be re-profiled for correction verification.

(iii) Final profilograph of taxiway. Final profilograph, full length of taxiway, shall be performed to facilitate testing of smoothness between lots. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as ASTM E1274. The pavement must have an average profile index meeting the requirements of paragraph 501-8.1c. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2" blanking band. The bump template must span 1" with an offset of 0.4". The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of 1" = 25'-0" and a vertical scale of 1" = 1". A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing. Profilograph of final taxiway shall be performed 1'-0" right and left of taxiway centerline and 15'-0" right and left of centerline. Any areas that indicate "must grind" will be corrected as directed by the Engineer.

Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 48 hours of placement of material. Smoothness texting indicated in paragraph (iii) shall be performed within 48 hours final paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.

(4) Grade. An evaluation of the surface grade shall be made by the Engineer for compliance to the tolerances contained below. The finish grade will be determined by running levels at intervals of 50'-0" or less longitudinally and all breaks in grade transversely (not to exceed 50'-0" to determine the elevation of the completed pavement. The Contractor shall pay the costs of surveying the level runs, and this work shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer.

(a) Lateral deviation. Lateral deviation from established alignment of the pavement edge shall not exceed ±0.10 feet in any lane.

(b) Vertical deviation. Vertical deviation from established grade shall not exceed ±0.04 feet at any point.

(5) Edge slump. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor as directed by the Engineer in accordance with paragraph 501-4.8a.

f. Removal and replacement of concrete. Any area or section of concrete that is removed and replaced shall be removed and replaced back to planned joints. The Contractor shall replace damaged dowels and the requirements for doweled longitudinal construction joints in paragraph 501-4.10 shall

apply to all contraction joints exposed by concrete removal. Removal and replacement shall be in accordance with paragraph 501-4.20.

CONTRACTOR QUALITY CONTROL

501-6.1 Quality control program. The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that affect the quality of the pavement including but not limited to:

a. Mix Design

b. Aggregate Gradation

c. Quality of Materials

d. Stockpile Management

e. Proportioning

f. Mixing and Transportation

g. Placing and Consolidation

h. Joints

i. Dowel Placement and Alignment

j. Flexural or Compressive Strength

k. Finishing and Curing

l. Surface Smoothness

501-6.2 Quality control testing. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to this specification and as set forth in the Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content.

A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Fine aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566.

c. Slump. Four slump tests shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air content. Four air content tests, shall be performed for each lot of material produced in accordance with the lot size defined in paragraph 501-5.1. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Four unit weight and yield tests shall be made in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

501-6.3 Control charts. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, moisture content and air content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the Engineer may halt production or acceptance of the material.

a. Fine and coarse aggregate gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Specification limits contained in the Lower Specification Tolerance Limit (L) table above and the Control Chart Limits table below shall be superimposed on the Control Chart for job control.

b. Slump and air content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

Control Chart Limits

Control Parameter	Individual Measurements		Range Suspension Limit
	Action Limit	Suspension Limit	
Slip Form:			
Slump	+0 to -1"	+0.5 to -1.5"	±1.5"
Air Content	±1.2%	±1.8%	±2.5%
Side Form:			
Slump	+0.5 to -1"	+1 to -1.5"	±1.5"
Air Content	±1.2%	±1.8%	±2.5%

The individual measurement control charts shall use the mix design target values as indicators of central tendency.

501-6.4 Corrective action. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of control. The Contractor Quality Control Program shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the specification limits in paragraph 501-2.1, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

c. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range

OR

(2) two points in a row fall outside the Action Limit line for individual measurements

d. Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements or range

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

Whenever a point falls outside the Action Limits line, the air-entraining admixture dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility.

METHOD OF MEASUREMENT

501-7.1 Portland cement concrete pavement shall be measured by the number of square yards of either plain or reinforced pavement as specified in-place, completed and accepted.

BASIS OF PAYMENT

501-8.1 Payment. Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-5.2 Acceptance Criteria shall be based on results of smoothness, strength and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness and 501-8.1c for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed 100% of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Additional payment will not be made for thickened edges. Additional concrete thickness for thickened edges shall be considered incidental to the "Portland Cement Concrete Pavement (16") pay item.

Additional payment will not be made for Type A-1 Reinforced Isolation Joint where indicated on plans. Additional steel reinforcement shall be considered incidental to the "Portland Cement Concrete Pavement (16") pay item.

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

a. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both flexural strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both flexural strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either flexural strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both flexural strength and thickness are less than 100%.

Price Adjustment Schedule[1]

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (% of Contract Unit Price)
96 - 100	106
90 - 95	PWL + 10
75 - 90	0.5 PWL + 55
55 - 74	1.4 PWL - 12
Below 55	Reject[2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

[2] The lot shall be removed and replaced. However, if the Engineer and the FAA have decided to allow the rejected lot to remain in accordance with Section 50-02 after the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit

price and the total project payment limitation shall be reduced by the amount withheld for the rejected lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%.

b. Payment. Payment shall be made under:

Item P-501-1 - Portland Cement Concrete Pavement (16") - per square yard.
Item P-501-2 – Spall Repair – per square foot.

c. Basis of adjusted payment for smoothness. Price adjustment for pavement smoothness will apply to the total area of concrete within a section of pavement and shall be applied in accordance the following equation and schedule:

(Square yard in section) × (original unit price per square yard) × PFm = reduction in payment for area within section

Average Profile Index (Inches Per Mile) Pavement Strength Rating			**Contract Unit Price Adjustment (PFm)**
Over 30,000 Pounds	**30,000 Pounds or Less**	**Short Sections**	
0 - 7	0 - 10	0 - 15	0.00
7.1 - 9	10.1 - 11	15.1 - 16	0.02
9.1 - 11	11.1 - 12	16.1 - 17	0.04
11.1 - 13	12.1 - 13	17.1 - 18	0.06
13.1 - 14	13.1 - 14	18.1 - 20	0.08
14.1 - 15	14.1 - 15	20.1 - 22	0.10
15.1 and up	15.1 and up	22.1 and up	Corrective work required

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer Than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

ASTM C142 Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143 Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174 Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227 Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C289 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C295 Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C114 Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C311 Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C566 Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C642 Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260 Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567 Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D3665 Standard Practice for Random Sampling of Construction Materials
ASTM D4791 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178 Standard Practice for Dealing With Outlying Observations
ASTM E1274 Standard Test Method for Measuring Pavement Roughness Using a Profilograph

U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662
Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A184 Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704 Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A714 Standard Specification for High-Strength Low-Alloy Welded and Seamless Steel Pipe
ASTM A775 Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars

ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 305R	Guide to Hot Weather Concreting
ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
AC 150/5320-6	Airport Pavement Design and Evaluation
PCA	Design and Control of Concrete Mixtures

END OF ITEM P-501

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ITEM P-602
BITUMINOUS PRIME COAT

DESCRIPTION

602-1.1 This item shall consist of an application of bituminous material on the prepared base course in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

602-2.1 Bituminous material. The bituminous material shall be an emulsified asphalt indicated in ASTM D3628 as a bituminous application for prime coat appropriate to local conditions or as designated by the Engineer.

CONSTRUCTION METHODS

602-3.1 Weather limitations. The prime coat shall be applied only when the existing surface is dry; the atmospheric temperature is 50°F or above, and the temperature has not been below 35°F for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the Engineer.

602-3.2 Equipment. The equipment shall include a self-powered pressure bituminous material distributor and equipment for heating bituminous material.

Provide a distributor with pneumatic tires of such size and number that the load produced on the base surface does not exceed 65.0 psi of tire width to prevent rutting, shoving or otherwise damaging the base, surface or other layers in the pavement structure. Design and equip the distributor to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard, with a pressure range of 25 psi to 75 psi and with an allowable variation from the specified rate of not more than ±5%, and at variable widths. Include with the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. Equip the distributor to circulate and agitate the bituminous material during the heating process. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the Owner.

A power broom and power blower suitable for cleaning the surfaces to which the bituminous coat is to be applied shall be provided.

602-3.3 Application of bituminous material. Immediately before applying the prime coat, the full width of the surface to be primed shall be swept with a power broom to remove all loose dirt and other objectionable material.

The bituminous material shall be uniformly applied with a bituminous distributor at the rate of 0.15 to 0.30 gallons per square yard depending on the base course surface texture. The type of bituminous material and application rate shall be approved by the Engineer prior to application. Following application of the bituminous material and prior to application of the succeeding layer of pavement, allow the bituminous coat to cure and to obtain evaporation of any volatiles or moisture. Maintain the coated

surface until the succeeding layer of pavement is placed, by protecting the surface against damage and by repairing and recoating deficient areas. Allow the prime coat to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course. Furnish and spread enough sand to effectively blot up and cure excess bituminous material. Keep traffic off surfaces freshly treated with bituminous material. Provide sufficient warning signs and barricades so that traffic will not travel over freshly treated surfaces.

602-3.4 Trial applications. Before providing the complete bituminous coat, the Contractor shall apply three lengths of at least 100'-0" for the full width of the distributor bar to evaluate the amount of bituminous material that can be satisfactorily applied with the equipment. Apply three different trial application rates of bituminous materials within the application range specified in paragraph 602-3.3. Other trial applications will be made using various amounts of material as deemed necessary by the Engineer.

602-3.5 Bituminous material Contractor's responsibility. The Contractor shall provide a statement of source and character of the proposed bituminous material which must be submitted to and approved by the Engineer before any shipment of bituminous materials to the project. The Contractor shall furnish vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The test reports shall be provided to and approved by the Engineer before the bituminous material is applied. If the bituminous material does not meet the specifications, it shall be replaced at the Contractor's expense. Furnishing the vendor's certified test report for the bituminous material shall not be interpreted as basis for final acceptance.

602-3.6 Freight and weigh bills. The Contractor shall submit waybills and delivery tickets during the progress of the work. Before the final estimate is allowed, file with the Engineer certified waybills and certified delivery tickets for all bituminous materials used in the construction of the pavement covered by the contract. Do not remove bituminous material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

602-4.1 The bituminous material for prime coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F in accordance with ASTM D1250. The bituminous material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of bituminous material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the bituminous material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

602-5.1 Payment shall be made at the contract unit price per gallon for bituminous prime coat. This price shall be full compensation for furnishing all materials and for all preparation, delivering, and applying the materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item P-602-1 - Bituminous Prime Coat - per gallon

TESTING REQUIREMENTS

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables

MATERIAL REQUIREMENTS

ASTM D977	Standard Specification for Emulsified Asphalt
ASTM D2028	Standard Specification for Cutback Asphalt (Rapid-Curing Type)
ASTM D2397	Standard Specification for Cationic Emulsified Asphalt
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

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ITEM P-603
BITUMINOUS TACK COAT

DESCRIPTION

603-1.1 This item shall consist of preparing and treating a bituminous or concrete surface with bituminous material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 Bituminous materials. The bituminous material shall be an emulsified asphalt indicated in ASTM D3628 as a bituminous application for tack coat appropriate to local conditions or as designated by the Engineer.

CONSTRUCTION METHODS

603-3.1 Weather limitations. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F or above; the temperature has not been below 35°F for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the Engineer.

603-3.2 Equipment. The Contractor shall provide equipment for heating and applying the bituminous material.

Provide a distributor with pneumatic tires of such size and number that the load produced on the base surface does not exceed 65.0 psi of tire width to prevent rutting, shoving or otherwise damaging the base, surface or other layers in the pavement structure. Design and equip the distributor to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard, with a pressure range of 25 psi to 75 psi and with an allowable variation from the specified rate of not more than ±5%, and at variable widths. Include with the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. Equip the distributor to circulate and agitate the bituminous material during the heating process. If the distributor is not equipped with an operable quick shutoff valve, the tack operations shall be started and stopped on building paper. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the Owner.

A power broom and/or power blower suitable for cleaning the surfaces to which the bituminous tack coat is to be applied shall be provided.

603-3.3 Application of bituminous material. Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

Emulsified asphalt shall be diluted by the addition of water when directed by the Engineer and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before the overlying mixture is placed on the tacked surface.

The bituminous material including vehicle shall be uniformly applied with a bituminous distributor at the rate of 0.05 to 0.10 gallons per square yard depending on the condition of the existing surface. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the Engineer. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed.

603-3.4 Bituminous material Contractor's responsibility. The Contractor shall provide a statement of source and character of the proposed bituminous material which must be submitted and approved by the Engineer before any shipment of bituminous materials to the project.

The Contractor shall furnish the vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The tests reports shall be provided to and approved by the Engineer before the bituminous material is applied. If the bituminous material does not meet the specifications, it shall be replaced at the Contractor's expense. Furnishing the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance.

603-3.5 Freight and weigh bills The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the Engineer certified waybills and certified delivery tickets for all bituminous materials used in the construction of the pavement covered by the contract. Do not remove bituminous material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

603-4.1 The bituminous material for tack coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F in accordance with ASTM D1250. The bituminous material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of bituminous material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the bituminous material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603.5-1 Payment shall be made at the contract unit price per gallon of bituminous material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603-1 - Bituminous Tack Coat - per gallon

MATERIAL REQUIREMENTS

ASTM D633	Standard Volume Correction Table for Road Tar
ASTM D977	Standard Specification for Emulsified Asphalt
ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2028	Standard Specification for Cutback Asphalt (Rapid-Curing Type)
ASTM D2397	Standard Specification for Cationic Emulsified Asphalt
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

END ITEM P-603

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ITEM P-605
JOINT SEALANTS FOR CONCRETE PAVEMENTS

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints and cracks in rigid pavements.

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D5893 Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant. The material shall have a water absorption of not more than 5% when tested in accordance with ASTM C509. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the crack.

605-2.3 Backup materials. Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be 25 ±5% larger in diameter than the nominal width of the crack.

605-2.4 Bond breaking tapes. Provide a bond breaking tape or separating material that is a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 " wider than the nominal width of the joint and shall not bond to the joint sealant.

CONSTRUCTION METHODS

605-3.1 Time of application. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 15 days prior to use on the project.

a. Tractor-mounted routing tool. Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the

joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

c. Sandblasting equipment. Sandblasting is not allowed.

d. Waterblasting equipment. Include with the waterblasting equipment a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. Provide water tank and auxiliary resupply equipment of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1" above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in psi at which the equipment is operating.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

f. Two-component, cold-applied, machine mix sealing equipment. Provide equipment used for proportioning, mixing, and installing Federal Specification SS-S-200 Type M joint sealants designed to deliver two semifluid components through hoses to a portable mixer at a preset ratio of one (1) to one (1) by volume using pumps with an accuracy of ±5% for the quantity of each component. The reservoir for each component shall be equipped with mechanical agitation devices that will maintain the components in a uniform condition without entrapping air. Incorporate provisions to permit thermostatically controlled indirect heating of the components, when required. However, immediately prior to proportioning and mixing, the temperature of either component shall not exceed 90°F. Provide screens near the top of each reservoir to remove any foreign particles or partially polymerized material that could clog fluid lines or otherwise cause misproportioning or improper mixing of the two components. Provide equipment capable of thoroughly mixing the two components through a range of application rates of 10 to 60 gallons per hour and through a range of application pressures from 50 psi to 1500 psi as required by material, climatic, or operating conditions. Design the mixer for the easy removal of the supply lines for cleaning and proportioning of the components. The mixing head shall accommodate nozzles of different types and sizes as may be required by various operations. The dimensions of the nozzle shall be such that the nozzle tip will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval.

g. Two-component, cold-applied, hand-mix sealing equipment. Mixing equipment for Federal Specification SS-S-200 Type H sealants shall consist of a slow-speed electric drill or air-driven mixer with a stirrer in accordance with the manufacturer's recommendations. Submit printed copies of manufacturer's recommendations 15 days prior to use on the project where installation procedures, or any part thereof, are required to be in accordance with those recommendations. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

h. Cold-applied, single-component sealing equipment. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of

the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

605-3.3 Preparation of joints.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw, or waterblaster as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2" from the joint edge shall be waterblasted clean. Waterblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3" from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Back-up material. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50'-0" ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/8" ±1/16" below the pavement surface. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 Joint sealing material shall be measured by the linear foot of sealant in place, completed, and accepted.

BASIS OF PAYMENT

605-5.1 Payment for joint sealing material shall be made at the contract unit price per linear foot. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-1 Joint Sealing, per linear foot

TESTING REQUIREMENTS

ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
ASTM C509	Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D1644	Standard Test Methods for Nonvolatile Content of Varnishes

MATERIAL REQUIREMENTS

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END ITEM P-605

ITEM P-610
STRUCTURAL PORTLAND CEMENT CONCRETE

DESCRIPTION

610-1.1 This item shall consist of plain and reinforced structural portland cement concrete (PCC), prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans. This specification shall be used for all structural and miscellaneous concrete including signage bases.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Engineer before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

Contractor shall submit concrete mix design and substantiating data for approval.

a. Reactivity. Fine and Coarse aggregates to be used in all concrete shall be evaluated and tested by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and C1567. Aggregate and mix proportion reactivity tests shall be performed for each project.

(1) Coarse and fine aggregate shall be tested separately in accordance with ASTM C1260. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.10% at 28 days (30 days from casting).

(2) Combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) CRD C662. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water.

(3) If the expansion of the proposed combined materials test specimens, tested in accordance with ASTM C1567, modified for combined aggregates, or COE CRD C662, does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion of the proposed combined materials test specimens is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33. The Engineer may consider and reserve final approval of other State classification procedures addressing aggregate durability.

Coarse aggregate shall be well graded from coarse to fine and shall meet the following gradation shown in the table below when tested per ASTM C136.

Gradation For Coarse Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves						
	2"	1-1/2"	1"	3/4"	1/2"	3/8"	No. 4
No. 4 to 1"	---	100	90-100	---	25-60	---	0-10

610-2.2.1 Aggregate susceptibility to durability (D) cracking. Aggregates that have a history of D-cracking shall not be used.

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet the requirements of ASTM C33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of the table below when tested in accordance with ASTM C136:

Gradation For Fine Aggregate

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3/8"	100
No. 4	95-100
No. 16	45-80
No. 30	25-55
No. 50	10-30
No. 100	2-10

Blending will be permitted, if necessary, to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, if the deficiency does not exceed 5% and is remedied by the addition of pozzolanic or cementitious materials other than Portland cement, as specified in paragraph 610-2.6, Admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

610-2.4 Cement. Cement shall conform to the requirements of ASTM C150 - Type IA.

If aggregates are deemed innocuous when tested in accordance with paragraph 610-2.1.a.1 and accepted in accordance with paragraph 610-2.1.a.3, higher equivalent alkali content in the cement may be allowed if approved by the Engineer and FAA. If cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before use of the cement is granted. All test reports shall be subject to verification by testing sample materials received for use on the project.

610-2.5 Water. The water used in concrete shall be fresh, clean and potable; free from injurious amounts of oils, acids, alkalies, salts, organic materials or other substances deleterious to concrete.

610-2.6 Admixtures and Supplementary Cementitious Material. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. Lithium nitrate. The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon (1.2 kg/L), and shall have the approximate chemical form as shown below:

Constituent	**Limit (Percent by Mass)**
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

Provide a trained representative to supervise the lithium nitrate admixture dispensing and mixing operations.

e. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash for use in mitigating alkali-silica reactivity shall have a Calcium Oxide (CaO) content of less than 13%.

610-2.7 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM D1751**.**

610-2.8 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.9 Steel reinforcement. Reinforcing shall consist of Grade 60 deformed reinforcing steel conforming to the requirements of ASTM A615.

610-2.10 Materials for curing concrete. Curing materials shall conform to one of the following:

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the Engineer.

610-3.2 Concrete composition. The concrete shall develop a compressive strength of 3,500 psi, unless otherwise noted on the plans, in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cement per cubic yard. The concrete shall contain 5% of entrained air, ±1%, as determined by ASTM C231 and shall have a slump of not more than 4" as determined by ASTM C143.

610-3.3 Acceptance sampling and testing. Concrete for each structure will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The concrete shall be sampled in accordance with ASTM C172. Concrete cylindrical compressive strength specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C39. The Contractor shall cure and store the test specimens under such conditions as directed by the Engineer. The Engineer will make the actual tests on the specimens at no expense to the Contractor.

610-3.4 Qualifications for concrete testing service. Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM C1077 or ASTM E329.

610-3.5 Proportioning and measuring devices. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so the required, exact weight of aggregates is obtained.

610-3.6 Consistency. The consistency of the concrete shall be determined by the slump test specified in ASTM C143.

610-3.7 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94.

610-3.8 Mixing conditions. The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without permission of the Engineer. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material shall not be permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.9 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface. The forms shall not be removed until at least 30 hours after concrete placement for vertical faces, walls, slender columns, and similar structures. Forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate the concrete has developed at least 60% of the design strength.

610-3.10 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.11 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.12 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the Engineer. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5'-0". Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.13 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309, Guide for Consolidation of Concrete. Where bars meeting ASTM A775 or A934 are used, the vibrators shall be equipped with rubber or non-metallic vibrator heads. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4" in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4" or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6,000 cycles per minute when submerged. Do not use vibrators to transport the concrete in the forms. Penetrate the previously placed lift with the vibrator when more than

one lift is required. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete. Vibrators shall be manipulated to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any point shall be of sufficient duration to accomplish compaction but shall not be prolonged to where segregation occurs. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie or other approved method and shall not be disturbed after placement.

610-3.14 Construction joints. If the placement of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, provisions shall be made for grooves, steps, reinforcing bars or other devices as specified. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete that has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

610-3.15 Expansion joints. Expansion joints shall be constructed at such points and dimensions as indicated on the drawings. The premolded filler shall be cut to the same shape as the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place so that it will not be displaced when concrete is deposited against it.

610-3.16 Defective work. Any defective work discovered after the forms have been removed, which in the opinion of the Engineer cannot be repaired satisfactorily, shall be immediately removed and replaced at the expense of the Contractor. Defective work shall include deficient dimensions, or bulged, uneven, or honeycomb on the surface of the concrete.

610-3.17 Surface finish. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

The surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a finishing machine.

610-3.18 Curing and protection. All concrete shall be properly cured and protected by the Contractor. The concrete shall be protected from the weather, flowing water, and from defacement of any nature during the project. The concrete shall be cured by covering with an approved material as soon as it has sufficiently hardened. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for at least three (3) days following concrete placement. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to air currents. Wooden forms shall be kept wet at all times until removed to prevent opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for seven (7) days after the concrete has been placed.

610-3.19 Drains or ducts. Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

610-3.20 Cold weather placing. When concrete is placed at temperatures below 40°F, the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated to place the concrete at temperatures between 50°F and 100°F.

Calcium chloride may be incorporated in the mixing water when directed by the Engineer. Not more than 2 pounds of Type 1 nor more than 1.6 pounds of Type 2 shall be added per bag of cement. After the concrete has been placed, the Contractor shall provide sufficient protection such as cover, canvas, framework, heating apparatus, etc., to enclose and protect the structure and maintain the temperature of the mix at not less than 50°F until at least 60% of the designed strength has been attained.

610-3.21 Hot weather placing. Concrete shall be properly placed and finished with procedures previously submitted. The concrete-placing temperature shall not exceed 90°F when measured in accordance with ASTM C1064. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph 610-2.6 may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 120°F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature. Submit the proposed materials and methods for review and approval by the Engineer, if concrete is to be placed under hot weather conditions.

610-3.22 Filling joints. All joints that require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not start until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be done with proper equipment to obtain a neat looking joint free from excess filler.

METHOD OF MEASUREMENT

610-4.1 There shall be no separate measurement and payment for work performed under this section of the specifications. All work performed shall be considered incidental to the work in which this item is required.

TESTING REQUIREMENTS

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregates (Accelerated Mortar-Bar Method)
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

US Army Corps of Engineers (USACE) Concrete Research Division (CRD) C662
Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

MATERIAL REQUIREMENTS

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

ITEM P-620
RUNWAY AND TAXIWAY MARKING

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms "paint" and "marking material" as well as "painting" and "application of markings" are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer's certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers 55 gallons or smaller for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

620-2.2 Marking materials. Paint shall be waterborne in accordance with the requirements of paragraph 620-2.2.a unless otherwise noted. Paint shall be furnished in White – 37925, Red – 31136, Yellow - 33538 or 33655, and Black - 37038 in accordance with Federal Standard No. 595.

Paint for the 'Surface Painted Holding Position' shall be preformed thermoplastic in accordance with the requirements of paragraph 620-2.2.b. Paint shall be furnished in White – 37925, Red – 31136 and Black - 37038 in accordance with Federal Standard No. 595.

a. Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

b. Preformed Thermoplastic Airport Pavement Markings. Markings must be composed of ester modified resins in conjunction with aggregates, pigments, and binders that have been factory produced as a finished product. The material must be impervious to degradation by aviation fuels, motor fuels, and lubricants.

(1) The markings must be able to be applied in temperatures as low as 35°F without any special storage, preheating, or treatment of the material before application.

(a) The markings must be supplied with an integral, non-reflectorized black border.

(2) Graded glass beads.

(a) The material must contain a minimum of 30% intermixed graded glass beads by weight. The intermixed beads shall conform to Federal Specification TT-B-1325D, Type I, gradation A.

(b) The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of one (1) lb (0.45 kg) (±10%) per 10 square feet (1 sq m). These factory applied coated surface beads shall have a minimum of 90% true spheres, minimum refractive index of 1.50, and meet the following gradation.

Size Gradation (U.S. Mesh)	Retained, %	Passing, %
12	0-2	98-100
14	0-3.5	96.5-100
16	2-25	75-98
18	28-63	37-72
20	63-72	28-37
30	67-77	23-33
50	89-95	5-11
80	97-100	0-3

(3) Heating Indicators. The material manufacturer shall provide a method to indicate that the material has achieved satisfactory adhesion and proper bead embedment during application and that the installation procedures have been followed.

(4) Pigments. Percent by weight.

(a) White:

Titanium Dioxide, ASTM D476, type II shall be 10% minimum.

(b) Yellow and Colors:

Titanium Dioxide, ASTM D476, type II shall be 1% minimum. Organic yellow, other colors, and tinting as required to meet color standard.

(5) Prohibited Materials. The manufacturer shall certify that the product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

(6) Daylight directional reflectance.

(a) White: The daylight directional reflectance of the white paint shall not be less than 75% (relative to magnesium oxide), when tested in accordance with ASTM E2302.

(b) Yellow: The daylight directional reflectance of the yellow paint shall not be less than 45% (relative to magnesium oxide), when tested in accordance with ASTM E2302. The x and y values shall be consistent with the Federal Hegman yellow color standard chart for traffic yellow standard 33538, or shall be consistent with the tolerance listed below:

x .462	x .470	x .479	x .501
y .438	y .455	y .428	y .452

(7) Skid resistance. The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E303.

(8) Thickness. The material must be supplied at a nominal thickness of 65 mil (1.7 mm).

(9) Environmental resistance. The material must be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to aviation fuels, gasoline, and oil.

(10) Retroreflectivity. The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of nighttime retroreflection when tested in accordance to ASTM E1710.

(11) Packaging. Packaging shall protect the material from environmental conditions until installation.

(12) Preformed thermoplastic airport pavement requirements.

(a) The markings must be a resilient thermoplastic product with uniformly distributed glass beads throughout the entire crosssectional area. The markings must be resistant to the detrimental effects of aviation fuels, motor fuels and lubricants, hydraulic fluids, deicers, anti-icers, protective

coatings, etc. Lines, legends, and symbols must be capable of being affixed to asphalt and/or Portland cement concrete pavements by the use of a large radiant heater. Colors shall be available as required.

(b) The markings must be capable of conforming to pavement contours, breaks, and faults through the action of airport traffic at normal pavement temperatures. The markings must be capable of fully conforming to grooved pavements, including pavement grooving per advisory circular (AC) 150/5320-12, current version. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastics when heated with a heat source per manufacturer's recommendation.

(c) Multicolored markings must consist of interconnected individual pieces of preformed thermoplastic pavement marking material, which through a variety of colors and patterns, make up the desired design. The individual pieces in each large marking segment (typically more than 20 feet (6 m) long) must be factory assembled with a compatible material and interconnected so that in the field it is not necessary to assemble the individual pieces within a marking segment. Obtaining multicolored effect by overlaying materials of different colors is not acceptable due to resulting inconsistent marking thickness and inconsistent application temperature in the marking/substrate interface.

(d) The marking material must set up rapidly, permitting the access route to be re-opened to traffic after application.

(e) The marking material shall have an integral color throughout the thickness of the marking material.

620-2.3 Reflective media. Glass beads shall meet the requirements for Federal Specification TT-B-1325D, Types I and III, as designated on plans, gradation A. Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

CONSTRUCTION METHODS

620-3.1 Weather limitations. The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F and rising and the pavement surface temperature is at least 5°F above the dew point or meets the manufacturer's recommendations. Markings shall not be applied when the pavement temperature is greater than 130°F. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

620-3.3 Preparation of surface. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by waterblasting~~, shotblasting, grinding, or by other methods as required~~ to remove all contaminants without damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

Paint shall not be applied to Portland cement concrete pavement until the areas to be painted are clean of curing material. High-pressure water shall be used to remove curing materials. The concrete must achieve adequate strength per specification P-501 before equipment used for marking operations is permitted on the pavement.

Pretreatment for Early Painting. Where early painting is required for rapid construction, a pretreatment with an aqueous solution (e.g., 3 percent phosphoric acid and 2 percent zinc chloride) must be applied to the prepared pavement areas prior to painting.

620-3.3.1 Cleaning of Existing Markings Cleaning of existing markings indicated to remain shall include removal of loose existing markings, such that 90% of any loose markings are removed. Removal of loose markings shall be accomplished by low pressure (3,500 psi – 10,000 psi) waterblasting. After removal, the surface shall be cleaned of all residue or debris either with sweeping or blowing with compressed air, or both.

620-3.3.2 Marking Removal Existing markings indicated to be removed shall be removed such that 95% of the existing markings are removed. Removal may be accomplished with waterblasting or ~~shotblasting~~. Removal method shall cause negligible damage to existing pavements, surface texture, joint sealants, or other airfield appurtenances, as determined by the Engineer. The Contractor shall repair at his expense any damage to the pavement, sealants, in-pavement lighting, or appurtenances caused by the removal work. Repair methods shall be approved by the Engineer.

Marking removal equipment shall be fully instrumented and have controls to monitor and vary the velocity and pattern of the water or steel abrasive, depth of pavement marking removal, as well as computer controlled speed of the machine.

Synchronous to the removal process, machinery shall have the capability to vacuum the pavement surface of water or steel abrasive and store removed surface material in a sealed, self-contained, truck mounted hopper. No transferring of vacuumed materials from the collection unit to another unit will be permitted if the hopper exposes the material to the atmosphere on the job site. In no case shall the material be dumped on the pavement to be transferred to another unit.

To determine compliance with the degree of removal, a clear grid containing 100 equal squares, each approximately 1-inch square, may be placed on the areas of pavement where paint removal operations have been conducted at the discretion of the Engineer. The degree of paint removal required should equal the number of squares within the grid that contain no paint. For example, if 95% paint removal is required, 95 squares should show that paint has been completely removed from the pavement, but 5 squares may contain paint remnants.

Any removal method that causes objectionable dust or other such hazards or nuisance shall be controlled by means approved by the Engineer that eliminate such causes of objection, or its use will not be allowed.

After removal, the surface shall be cleaned of all residue or debris either with sweeping or blowing with compressed air, or both.

Contractor shall only remove the quantity of markings which can be repainted in the same work period.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is

appropriate for the type of marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's surface preparation and application requirements must be submitted and approved by the Engineer prior to the initial application of markings.

620-3.4 Layout of markings. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans. The locations of markings to receive silica sand shall be shown on the plans.

620-3.5 Application. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the Engineer. The edges of the markings shall not vary from a straight line more than 1/2" in 50'-0", and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36" or less	±1/2"
greater than 36" to 6'-0"	±1"
greater than 6'-0" to 60'-0"	±2"
greater than 60'-0"	±3"

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. A period of 30 days shall elapse between placement of a bituminous surface course or seal coat and application of the paint.

Temporary paint markings shall be applied to new asphalt pavements at a 50% application rate. No glass beads are required for temporary markings.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

620-3.6 Test strip. Prior to the full application of airfield markings, the Contractor shall produce a test strip in the presence of the Engineer. The test strip shall include the application of a minimum of 5 gallons of paint and application of 35 lbs of Type I/50 lbs of Type III glass beads. The test strip shall be used to establish thickness/darkness standard for all markings. The test strip shall cover no more than the maximum area prescribed in Table 1 (e.g., for 5 gallons of waterborne paint shall cover no more than 575 square feet).

Table 1. Application Rates For Paint and Glass Beads
(See Note regarding Red and Pink Paint)

Paint Type	Paint Square feet per gallon, ft^2/gal	Glass Beads, Type I, Gradation A Pounds per gallon of paint-lbs/gal	Glass Beads, Type III, Gradation A Pounds per gallon of paint-lbs/gal
Waterborne Type II	115 ft^2/gal max	7 lbs/gal min	10 lb/gal min

Note: The glass bead application rate for Red and Pink paint shall be reduced by 2 lb/gal for Type I and Type IV beads. Type III beads shall not be applied to Red or Pink paint.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.7 Application--preformed thermoplastic airport pavement markings.

a. Asphalt and Portland cement. To ensure minimum single-pass application time and optimum bond in the marking/substrate interface, the materials must be applied using a variable speed self-propelled mobile heater with an effective heating width of no less than 16 feet (5 m) and a free span between supporting wheels of no less than 18 feet (5.5 m). The heater must emit thermal radiation to the marking material in such a manner that the difference in temperature of 2 inches (50 mm) wide linear segments in the direction of heater travel must be within 5% of the overall average temperature of the heated thermoplastic material as it exits the heater. The material must be able to be applied at ambient and pavement temperatures down to 35°F (2°C) without any preheating of the pavement to a specific temperature. The material must be able to be applied without the use of a thermometer. The pavement shall be clean, dry, and free of debris. A non-volatile organic content (non-VOC) sealer with a maximum applied viscosity of 250 centiPoise must be applied to the pavement shortly before the markings are applied. The supplier must enclose application instructions with each box/package.

620-3.8 Protection and cleanup. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1 The quantity of runway and taxiway markings to be paid for shall be the number of square feet of painting performed in accordance with the specifications and accepted by the Engineer.

BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract price per square foot for runway and taxiway painting to include reflective media. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-620-1 – Permanent Pavement Markings, Reflective, Type I Glass Beads - per square foot

Item P-620-2 - Permanent Pavement Markings, Reflective, Type III Glass Beads - per square foot

Item P-620-3 – Permanent Pavement Markings, Non-Reflective, Black - per square foot

Item P-620-4 - Pavement Marking Removal - per square foot

Item P-620-5 – Surface Painted Holding Position Sign – per each

TESTING REQUIREMENTS

ASTM C371	Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

MATERIAL REQUIREMENTS

ASTM D476
Standard Classification for Dry Pigmentary Titanium Dioxide Products

40 CFR Part 60, Appendix A-7, Method 24
Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

FED SPEC TT-B-1325D
Beads (Glass Spheres) Retro-Reflective

American Association of State Highway and Transportation Officials (AASHTO) M247
Standard Specification for Glass Beads Used in Pavement Markings

FED SPEC TT-P-1952E
Paint, Traffic and Airfield Marking, Waterborne

Commercial Item Description A-A-2886B
Paint, Traffic, Solvent Based

FED STD 595
Colors used in Government Procurement

AC 150/5340-1
Standards for Airport Markings

END OF ITEM P-620

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate base course on a prepared subgrade.

B. Related Sections:
   1. Item P-152 Excavation, Subgrade, and Embankment
   2. Section 32 12 16 - Asphalt Paving: Binder and finish asphalt courses.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Coarse Aggregate Type ABC:
   1. Basis of Measurement: ABC will not be measured for payment. ABC shall be incidental to Item "Haul Route Repair (Full Depth Pavement)".

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-pound) rammer and a 457-mm (18-inch) drop.

B. ASTM International:
   1. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
   2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   4. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. NCDOT Standard Specifications:
   1. Standard Specifications for Roads and Structures, January 2018, published by the North Carolina Department of Transportation.

1.4 SUBMITTALS

A. Submit electronically for review and approval by the engineer.

B. Samples: Submit to testing laboratory 10-pound sample of each type of aggregate in airtight containers.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Section 520 of NCDOT Standard Specifications.

B. Maintain one copy of document on site.

C. Furnish each aggregate material from single source throughout the Work.

D. Use sources participating in NCDOT Aggregate Quality Assurance/Quality Control Program.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aggregate Base Course: Coarse aggregate Type A or B with a gradation of ABC conforming to Sections 1005, 1006, and 1010 of NCDOT Standard Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. See General Provisions. Verify existing conditions before starting work.

B. Verify substrate has been inspected and gradients and elevations are correct and dry.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting as specified in P-152 Excavation, Subgrade, and Embankment.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Place aggregate in minimum 4-inch and maximum 10-inch layers and roller compact to specified density. When total thickness is 10 inches or less, place in one layer. When total thickness is greater than 10 inches, place in two equal layers.

B. Have each layer of material compacted and approved prior to placing succeeding layers.

C. Level and contour surfaces to elevations and gradients indicated on Drawings.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Use mechanical tamping equipment in areas inaccessible to roller compaction equipment.

3.4 TOLERANCES

A. Maximum Variation from Thickness: 1/2 inch.

B. Maximum Variation from Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. See Special Conditions.

B. Laboratory Material Tests: Conform to Modified Proctor ASTM D1557 or AASHTO T180.

C. In-place Compaction Tests: Conform to:
   1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D6938.
   2. Moisture Tests: ASTM D6938.

D. Compaction:
   1. 100 percent of maximum when measured in-place by standard methods.
   2. 98 percent of maximum when measured in-place by nuclear methods.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F. Frequency of Compaction Tests: Two tests per layer for each pad of aggregate base course.

END OF SECTION

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SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphaltic Concrete Paving: Surface and intermediate binder courses.
   2. Surface Sealer.
   3. Quality Control and Testing.

B. Related Sections:
   1. Item P-152 Excavation, Subgrade and Embankment
   2. Item 32 11 23 Aggregate Base Course
   3. Item P-602 Bituminous Prime Coat
   4. Item P-603 Bituminous Tack Coat
   5. Item P-620 Runway and Taxiway Marking

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Asphalt Intermediate Binder Course Type I-19.0B (2.5"):
   1. Basis of Measurement: By ton.
   2. Basis of Payment: Includes placing, compacting and rolling, and testing.

B. Asphalt Surface Course Type S-9.5B (1.5"):
   1. Basis of Measurement: By ton.
   2. Basis of Payment: Includes placing, compacting and rolling, and testing.

1.3 REFERENCES

A. NCDOT Standard Specifications:
   1. Standard Specifications for Roads and Structures, January 2018, published by the North Carolina Department of Transportation.

1.4 SUBMITTALS

A. Submit product data and asphalt mix design electronically for review and approval.

B. Product Data: Submit product information and mix design.

C. Manufacturer's Certification: Certify products are produced at a plant approved by NCDOT and that products meet or exceed specified requirements.

D. Installer Certification: Certify installer is on list of NCDOT approved contractors with an approved Quality Control Plan.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Division 6 of NCDOT Standard Specifications.

B. Maintain on site one copy of each document.

C. Obtain materials from same source throughout.

D. Installer Qualification: Company specializing in performing work of this Section with minimum 5 years experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt base course or intermediate course when ambient air or road surface temperature is less than 35 degrees F. or surface is wet or frozen.

B. Do not place asphalt surface course when ambient air or road surface temperature is less that 50 degrees F. or wet.

C. Place bitumen mixture when temperature is not more than 15 degrees F. below temperature at when initially mixed and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Plant Mix Materials: Conform to Sections 1012 and 1020 of NCDOT Standard Specifications.

B. Prime Coat and Tack Coat: Conform to Items P-602 and P-603 of the specifications.

C. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or full depth removal of existing asphalt concrete pavements. Conform to Section 1012 of NCDOT Standard Specifications.

D. Sand: Fine aggregate, gradation S1 or S2 conforming to Sections 1005 and 1006 of NCDOT Standard Specifications.

2.2 ASPHALT PAVING MIX

A. General: Use Superpave mix design conforming to Section 610 of NCDOT Standard Specifications.

B. Intermediate Course: Type I-19.0B.

C. Surface Course: Type S-9.5B.

D. Wedging or Leveling Mix: Conform to intermediate course.

E. Reclaimed Asphalt Pavement (RAP) Content: Use maximum 50 percent for base and intermediate courses, maximum 15 percent for surface course.

2.3 SOURCE QUALITY CONTROL AND TESTS

A. Testing, inspection, and analysis requirements shall be per Section M of the Special Conditions.

B. Submit proposed mix design of each class of mix for review prior to beginning Work.

C. Obtain materials from plant approved by NCDOT.

D. Test plant samples in accordance with Section 609 of NCDOT Standard Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade and aggregate base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Verify utility structure frames and lids are installed in correct position and elevation.

3.2 PLACING ASPHALT PAVEMENT

A. Install Work in accordance with Section 610 and 620 of NCDOT Standard Specifications.

B. Place asphalt within 24 hours of applying prime coat or tack coat.

C. Place asphalt in courses to the thicknesses and dimensions shown on the Drawings.

D. Place binder and intermediate courses.

E. Place surface course within 2 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.

F. Place surface course to thicknesses and dimensions shown on the Drawings.

G. Compact each course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

H. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.3 JOINTS

A. Traverse Joints:
1. When Work is suspended long enough to allow mixture to chill, construct transverse joint.

2. Use butt joint when traffic will not pass over pavement.
3. Use sloped wedge ahead of the end of pavement when traffic will pass over pavement. Place paper parting strip to removal of wedge.
4. Tack coat edge of pavement prior to placing adjoining pavement.

B. Longitudinal Joints:
1. Tack the edge of longitudinal joints prior to placing adjoining pavement.
2. Pinch joint by rolling immediately behind the paver.
3. Offset longitudinal joints in each layer by approximately 6 inches.

3.4 TOLERANCES

A. Density Compaction: Minimum of 92 percent of Maximum Specific Gravity (G_{mm}).

B. Flatness: Maximum variation of 1/8-inch measured with 10-foot straight edge.

C. Compacted Thickness: Within 1/4-inch.

D. Variation From Indicated Elevation: Within 1/2-inch.

3.5 FIELD QUALITY CONTROL

A. Independent testing firm, field testing, and inspecting shall be per the requirements of the Sections M and N of the Special Conditions.

B. Perform Contractor Quality Control Program in accordance with Section 609 on NCDOT Standard Specifications.

C. Take compaction tests every 1,000 linear feet or fraction thereof per day on pavement placed at the paver lay down width.

D. Take 6-inch diameter full depth pavement cores every 1,000 linear feet or fraction thereof per day on pavement placed at the paver lay down width.

E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.6 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect pavement from mechanical injury for seven days or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Traffic lines, legends and markings on asphalt and concrete surfaces.
   2. Waterborne Traffic Paint.
   3. Glass beads.

B. Related Sections:
   1. Section 32 12 16 - Asphalt Paving.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Paint Pavement Marking Lines, 6” Solid:
   1. Basis of Measurement: By linear feet regardless of color.
   2. Basis of Payment: Includes furnishing, installing, inspecting, and related maintenance and protection of traffic. Waterborne paint shall have glass beads for reflectivity.

B. Paint Pavement Marking Lines, 6”, Dashed:
   1. Basis of Measurement: By linear feet regardless of color.
   2. Basis of Payment: Includes furnishing, installing, inspecting, and related maintenance and protection of traffic. Waterborne paint shall have glass beads for reflectivity.

C. Paint Pavement Marking Lines, 12”, Solid:
   1. Basis of Measurement: By linear feet regardless of color.
   2. Basis of Payment: Includes furnishing, installing, inspecting, and related maintenance and protection of traffic. Waterborne paint shall have glass beads for reflectivity.

D. Thermoplastic Pavement Marking Lines, 24”, Solid:
   1. Basis of Measurement: By linear feet regardless of color.
   2. Basis of Payment: Includes furnishing, installing, inspecting and maintaining pavement markings, and related maintenance and protection of traffic. Both thermoplastic and waterborne paint shall have glass beads for reflectivity.

E. Thermoplastic Pavement Marking Symbols:
   1. Basis of Measurement: By each symbol.
   2. Basis of Payment: Includes furnishing, installing, inspecting and maintaining pavement markings, and related maintenance and protection of traffic.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M247 - Standard Specification for Glass Beads Used in Pavement Marking.

B. NCDOT Standard Specifications:
   1. Standard Specifications for Roads and Structures, January 2018, published by the North Carolina Department of Transportation.

1.4 PERFORMANCE REQUIREMENTS

A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.

B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within 10 minutes after application.

1.5 SUBMITTALS

A. All submittals shall be sent electronically to the engineer for review and approval.

B. Product Data: Submit paint formulation for each type of paint and glass beads if required.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, and application of glass beads if required.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with Section 1205 of NCDOT Standard Specifications, January 2018.

B. Maintain one copy of document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 5 years experience.

B. Applicator: Company specializing in performing work of this section with minimum 5 years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Invert containers several days prior to use when paint has been stored more than two months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.

B. Where glass beads are required, store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer or:
   1. Waterborne Paint: Apply when ambient air temperature and surface temperature is minimum 40 degrees F and rising and a maximum of 160 degrees F.
   2. Thermoplastic: Do not apply until ambient air temperature and temperature of the pavement is 50 degrees F or higher.

B. Do not apply materials during rain or snow when relative humidity is outside humidity ranges or moisture content of surfaces exceed those required by paint product manufacturer.

C. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Manufacturers:
   1. Ennis Paint Co., (ennispaint.com).
   2. Franklin Paint Company (franklinpaint.com).
   3. EZ-Liner Industries (ezliner.com).
   4. TAPCO, Inc. (tapconet.com).
   5. Pervo Paint Company (pervo.com).

B. Furnish materials in accordance with NCDOT Standard Specifications.

C. Waterborne Paint: Ready mixed, fast dry waterborne traffic paints, lead-free, non-toxic, suitable for roadway or parking lots.

D. Thermoplastic: Alkyd based ready mixed, fast dry, lead free, non toxic, for roadways.

E. Glass Beads: AASHTO M247, Type 1, coated to enhance embedment and adherence with paint.

2.2 EQUIPMENT

A. Roadway Application for Continuous Longitudinal Lines: Use equipment with following capabilities.
   1. Dual nozzle paint gun to simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
   2. Pressurized bead-gun to automatically dispense glass beads onto painted surface, at required application rate.
   3. Measuring device to automatically and continuously measure length of each line placed, to nearest foot.
   4. Device to heat paint to manufacturer’s temperature recommendation for fast dry and thermoplastic applications.

B. Machine Calibration: Calibrate machines to meet specified tolerances.

C. Other Equipment: For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

3.2 PREPARATION

A. Maintenance and Protection of Traffic:
   1. Provide short term traffic control in accordance with NCDOT approved methods.
   2. Prevent traffic from interrupting or driving on newly applied markings before markings dry.
   3. Maintain roadway travel lanes per traffic control plans.
   4. Maintain access to existing businesses and other properties requiring access.

B. Surface Preparation.
   1. Clean and dry paved surface prior to painting.
   2. Blow or sweep surface free of dirt, debris, oil, grease, or gasoline.
   3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.
   4. Notify Engineer after placing pavement spots and minimum three days prior to applying traffic lines.

3.3 EXISTING WORK

A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with black paint. Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.

B. Clean and repair existing or remaining lines and legends.

3.4 APPLICATION

A. Agitate paint for 1-15 minutes prior to application to ensure even distribution of paint pigment.

B. Dispense paint at temperature recommended by manufacturer to wet-film thickness of 15 mils.

C. Dispense thermoplastic at temperature recommended by manufacture to thickness of:
   1. 90 mils for crosswalk markings and arrow symbols.

D. Apply glass beads at rate of 1 to 3 pounds per gallon of paint.

E. Apply markings to indicated dimensions at indicated locations.

F. Prevent splattering and over spray when applying markings.

G. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free.

H. When vehicle crosses a marking and tracks it or when splattering or overspray occurs, eradicate affected marking and resultant tracking and apply new markings.

I. Collect and legally dispose of residues from painting operations.

3.5 APPLICATION TOLERANCES

A. Maximum Variation from Wet Film Thickness: 1 mil.

B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

C. Maintain cycle length for skip lines at tolerance of plus or minus 6 inches per 40 feet and line length or plus or minus 3 inches per 10 feet.

D. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F.

3.6 FIELD QUALITY CONTROL

A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

B. Repair lines and markings which after application and curing do not meet following criteria:
   1. Incorrect Location: Remove and replace incorrectly placed patterns.
   2. Insufficient Thickness, Line Width, Paint Coverage, Retention or Glass Bead Coverage (where required): Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
   3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

C. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists:
   1. Marking is discolored or exhibits pigment loss and is determined to be unacceptable by visual comparison with beaded color plates.
   2. If glass beads are used, the average retro-reflectivity is less than 375 mcd/m2/1x for white pavement markings and 250 mcd/m2/1x for yellow pavement markings.

D. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 32 12 16 - Asphalt Paving.

E. Maintain daily log showing work complete, results of inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign, and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.7 PROTECTION OF FINISHED WORK

A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than two minutes dry time.

END OF SECTION

ITEM D-701
PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below.

Storm Sewer Pipe shall be RCP per ASTM C76, Class IV in sizes indicated on the drawings.

701-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

701-2.3 Concrete. Concrete for pipe cradles shall have a minimum compressive strength of 2,000 psi at 28 days and conform to the requirements of ASTM C94.

701-2.4 Rubber gaskets. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 Joint mortar. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

701-2.6 Joint fillers. Poured filler for joints shall conform to the requirements of ASTM D6690.

701-2.7 Plastic gaskets. Plastic gaskets shall conform to the requirements of AASHTO M198 (Type B).

701-2.8. Controlled low-strength material (CLSM). CLSM is not allowed.

CONSTRUCTION METHODS

701-3.1 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6" on each side. The trench walls shall be approximately vertical.
The Contractor shall comply with all current Federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths

shown on the plans trench detail. The trench bottom shall be shaped to fully and uniformly support the bottom quadrant of the pipe.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8" or 1/2" for each 1'-0" of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6" in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 Bedding. The pipe bedding shall conform to the class specified on the plans. Bedding shall be incidental to the pipe pay item. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.

a. Rigid pipe.

Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6" below the bottom of the pipe and extending up around the pipe for a depth of not less than 30% of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least 10% of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be sand or select sandy soil with 100% passing a 3/8" sieve and not more than 10% passing a No. 200 sieve.

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

701-3.3 Laying pipe. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 Joining pipe. Joints shall be made with 1) Portland cement mortar, 2) Portland cement grout, 3) rubber gaskets, 4) plastic gaskets, 5) coupling bands, or 6) rubber O-ring gaskets (all Class IV pipes within this project shall be rubber O-ring gaskets).

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. **Concrete pipe.** Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be so the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before applying mortar or grout.

b. **Class IV, O-ring Gasketed Pipe.** All class IV RCP pipe indicated on the plans shall be o-ring gasketed pipe that shall receive external joint wrap. External pipe joints shall be wrapped with an outside sealer wrap that is at least 12 inches wide and covers the joint covering the outside diameter of the pipe. Use Conwrap CS-21 from Concrete Sealants, Inc., EZ-wrap from Press-Seal Gasket Corporation, Seal Wrap from Mar-Mac Manufacturing Co., Inc., or an approved equal. If the outside sealer wrap is not applied in a continuous strip along the entire joint, a 12 inch minimum lap of the outside sealer wrap is permitted. Before placing the outside joint wrap, clean and prime the area receiving the outside joint wrap in accordance with manufacturer's recommendations. The joint wrap shall be covered with a 3 foot strip of filter fabric conforming to type 4 requirements in section 1056 of the NCDOT standard specifications.

701-3.5 Backfilling. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil or granular material selected from the excavation or a source of the Contractor's choosing**.** It shall not contain frozen lumps, stones that would be retained on a 2" sieve, chunks of highly plastic clay, or other objectionable material. Granular backfill material shall have 95% or more passing the a 1/2" sieve, with 95% or more being retained on the No. 4 sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6" on each side of the pipe and shall be brought up 1'-0" above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the backfill material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6" and shall be brought up evenly on each side of the pipe to 1'-0" above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12'-0", whichever is less.

All backfill shall be compacted to the density required under Item P-152.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All pipe bedding and pipe fittings shall be included in the footage as typical pipe sections in the pipe being measured.

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated.

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D-701-1	18 inch RCP, Class IV - per linear foot

MATERIAL REQUIREMENTS

AASHTO M198	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

END OF ITEM D-701

ITEM D-705
PIPE UNDERDRAINS FOR AIRPORTS

DESCRIPTION

705-1.1 This item shall consist of the construction of pipe drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

705-2.1 General. Materials shall meet the requirements shown on the plans and specified below.

705-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements.

ASTM F758 Standard Specification for Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

705-2.3 Joint mortar. Pipe joint mortar shall consist of one part by volume of Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

705-2.4 Elastomeric seals. Elastomeric seals shall conform to the requirements of ASTM F477.

705-2.5 Porous backfill. Porous backfill shall consist of NCDOT #57 stone.

705-2.6. Granular material. Granular material used for backfilling shall conform to the requirements of ASTM D2321 for Class IA, IB, or II materials, or shall meet the requirements of AASHTO Standard Specification for Highway Bridges Section 30.

705-2.7. Filter fabric. The filter fabric shall conform to the requirements of AASHTO M288 Class 2.

Table 2

Fabric Property	Test Method	Test Requirement
Grab Tensile Strength, lbs	ASTM D4632	125 min
Grab Tensile Elongation %	ASTM D4632	50 min
Burst Strength, psi	ASTM D3785	125 min
Trapezoid Tear Strength, lbs	ASTM D4533	55 min
Puncture Strength, lbs	ASTM D4833	40 min
Abrasion, lbs	ASTM D4886	15 max loss
Equivalent Opening Size	ASTM D4751	70-100
Permittivity sec^{-1}	ASTM D4491	0.80
Accelerated Weathering (UV Stability) (Strength Retained - %)	ASTM D4355 *(500 hrs exposure)	70

705-2.8. Controlled low-strength material (CLSM). CLSM is not allowed.

CONSTRUCTION METHODS

705-3.1 Equipment. All equipment required for the construction of pipe underdrains shall be on the project, in good working condition, and approved by the Engineer before construction is permitted to start.

705-3.2 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but shall not be less than the external diameter of the pipe plus 6" on each side of the pipe. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4". The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6" in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the Engineer. The excavation shall not be carried below the required depth; if this occurs, the trench shall be backfilled at the Contractor's expense with material approved by the Engineer and compacted to the density of the surrounding material.

The pipe bed shall be shaped so at least the lower quarter of the pipe shall be in continuous contact with the bottom of the trench. Spaces for the pipe bell shall be excavated to allow the pipe barrel to support the entire weight of the pipe.

The Contractor shall do trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to Federal, state and local laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the backfill has reached at least 12" over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per 1'-0" for the pipe.

705-3.3 Laying and installing pipe.

a. PVC or polyethylene pipe. PVC or polyethylene pipe shall be installed in accordance with the requirements of ASTM D2321 or AASHTO Standard Specification for Highway Bridges Section 30. Perforations shall meet the requirements of AASHTO M252 or AASHTO M294 Class 2, unless otherwise indicated on the plans. The pipe shall be laid accurately to line and grade.

b. All types of pipe. The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the Engineer.

Unless otherwise shown on the plans, a 4" bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the plans.

c. Filter fabric. The filter fabric shall be installed in accordance with the manufacturer's recommendations, or in accordance with AASHTO M288 Appendix, unless otherwise shown on the plans.

705-3.4 Mortar. The mortar shall be of the desired consistency for caulking and filling the joints of the pipe and for making connections to other pipes or to structures. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted.

705-3.5 Joints in concrete pipe. When open or partly open joints are required or specified, they shall be constructed as indicated on the plans. The pipe shall be laid with the ends fitted together as designed. If bell and spigot pipe is used, mortar shall be placed along the inside bottom quarter of the bell to center the following section of pipe.

The open or partly open joints shall be surrounded with granular material meeting requirements of porous backfill No. 2 in Table 1 or as indicated on the plans. This backfill shall be placed so its thickness will be not less than 3" nor more than 6", unless otherwise shown on the plans.

When the original material excavated from the trench is impervious, commercial concrete sand or granular material meeting requirements of porous backfill No. 1 shall surround porous backfill No. 2 (Table 1), as shown on the plans or as directed by the Engineer.

When the original material excavated from the trench is pervious and suitable, it may be used as backfill in lieu of porous backfill No. 1, when indicated on the plans or as directed by the Engineer.

705-3.6 Backfilling.

a. Earth. All trenches and excavations shall be backfilled soon after the pipes are installed, unless additional protection of the pipe is directed. The backfill material shall be select material from excavation or borrow and shall be approved by the Engineer. The select material shall be placed on each side of the pipe out to a distance of the nominal pipe diameter and 1'-0" over the top of the pipe and shall be readily compacted. It shall not contain stones 3" or larger in size, frozen lumps, chunks of highly plastic clay, or any other material that is objectionable to the Engineer. The material shall be moistened or dried, as required to aid compaction. Placement of the backfill shall not cause displacement of the pipe. Thorough compaction under the haunches and along the sides to the top of the pipe shall be obtained.

The backfill shall be placed in loose layers not exceeding 6" in depth under and around the pipe, and not exceeding 8" over the pipe. Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the Engineer, until the trench is completely filled and brought to the planned elevation. Backfilling shall be done to avoid damaging top or side pressures on the pipe.

In embankments and other unpaved areas, the backfill shall be compacted per Item P-152 to the density required for embankments in unpaved areas. Under paved areas, the subgrade and any backfill shall be compacted per Item P-152 to the density required for embankments for paved areas.

b. Granular backfill. When granular backfill is required, placement in the trench and about the pipe shall be as shown on the plans. The granular backfill shall not contain an excessive amount of foreign matter, nor shall soil from the sides of the trench or from the soil excavated from the trench be allowed to filter into the granular backfill. When required by the Engineer, a template shall be used to properly place and separate the two sizes of backfill. The backfill shall be placed in loose layers not exceeding 6" in depth. The granular backfill shall be compacted by hand and pneumatic tampers to the requirements as given for embankment. Backfilling shall be done to avoid damaging top or side pressure on the pipe. The granular backfill shall extend to the elevation of the trench or as shown on the plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the plans. If the original material excavated from the trench is pervious and suitable, it shall be used in lieu of porous backfill No. 1.

If porous backfill is placed in paved or adjacent to paved areas before grading or subgrade operations is completed, the backfill material shall be placed immediately after laying the pipe. The depth of the granular backfill shall be not less than 12", measured from the top of the underdrain. During subsequent construction operations, a minimum depth of 12" of backfill shall be maintained over the underdrains. When the underdrains are to be completed, any unsuitable material shall be removed exposing the porous backfill. Porous backfill containing objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any unsuitable material shall be at the Contractor's expense.
If a granular subbase blanket course is used which extends several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2" above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material that remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

c. Controlled low-strength material (CLSM). CLSM is not allowed.

d. Deflection testing. The Engineer may at any time, notwithstanding previous material acceptance, reject or require re-installation of pipe that exceeds 5% deflection when measured in accordance with ASTM D2321, including Appendices.

705-3.7 Connections. When the plans call for connections to existing or proposed pipe or structures, these connections shall be watertight and made to obtain a smooth uniform flow line throughout the drainage system.

705-3.8 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, soil, and rubbish from the site. Surplus soil may be deposited in embankments, shoulders, or as directed by the Engineer. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

METHOD OF MEASUREMENT

705-4.1 The length of pipe shall be the number of linear feet of pipe underdrains in place, completed, and approved; measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types, and sizes shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipeline being measured.

The quantity for underdrain cleanouts and underdrain connections to existing structures shall be measured per each in place, completed and accepted.

The quantity for underdrain removal shall be measured per linear foot of underdrain removed, including placement and compaction of backfill material, if necessary. Existing cleanout removal shall be considered incidental to underdrain removal.

BASIS OF PAYMENT

705-5.1 Pipe underdrains, Complete. Pipe underdrains, including porous backfill and filter fabric shown in the typical section on the plans, shall be made at the contract unit price per linear foot. Additional porous material and fabric needed above that shown in the typical section on the plan shall be paid for separately and be measured by cubic yard and square yard, respectively.

Payment for underdrain cleanouts and underdrain connections to existing structures shall be for the actual number per each installed in place and accepted.

Payment for underdrain removal shall be measured per linear foot of underdrain removed. Removal of existing cleanout with concrete collar is incidental to underdrain removal.

These prices shall be full compensation for furnishing all materials and for all preparation, excavation, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D-705-1	4 inch Perforated PVC - per linear foot complete (including porous backfill and filter fabric of typical section)
Item D-705-2	6 inch Perforated PVC - per linear foot complete (including porous backfill and filter fabric of typical section)
Item D-705-3	6 inch Non-Perforated PVC - per linear foot complete
Item D-705-4	Underdrain Cleanout - per each
Item D-705-5	Underdrain Connection to Existing Structure - per each
Item D-705-6	Underdrain Removal - per linear foot.

Item D-705-7 #57 Stone – Underdrain – per cubic yard.

Item D-705-8 Non-Woven Filter Fabric - Underdrain - per square yard.

MATERIAL REQUIREMENTS

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C444	Standard Specification for Perforated Concrete Pipe
ASTM C654	Standard Specification for Porous Concrete Pipe
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F758	Standard Specification for Smooth Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
AASHTO M190	Standard Specification for Bituminous - Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M288	Standard Specification for Geotextile Specification for Highway Applications
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 12" - to 60" Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel-Reinforced Polyethylene (PE) Ribbed Pipe, 12" - 36" diameter
AASHTO	Standard Specifications for Highway Bridges

END OF ITEM D-705

ITEM D-751
MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.

MATERIALS

751-2.1 Concrete. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-501.

751-2.2 Frames, covers, and grates. The castings shall conform to one of the following requirements:

a. ASTM A48, Class 35B: Gray iron castings

b. ASTM A47, Malleable iron castings

c. ASTM A27, Steel castings

d. ASTM A283, Grade D: Structural steel for grates and frames

e. ASTM A536, Grade 65-45-12: Ductile iron castings

f. ASTM A897, Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.
Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.3 Steps. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of bituminous paint, when directed.

751-2.4 Precast inlet structures. Manufactured in accordance with and conforming to ASTM C1433.

CONSTRUCTION METHODS

751-3.1 Unclassified excavation.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the

bottoms of footings, as shown on the plans, shall be considered as approximately only; and the Engineer may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturb and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the Engineer. No concrete or reinforcing steel shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

751-3.2 Demolition of Concrete structures.

a. The Contractor shall be responsible for repair of any existing concrete structures to remain that are damaged by the contractor during demolition.

b. The existing concrete structures for Inlets No. 1 to 14 shall be partially demolished as follows: The cast iron frame shall be saw cut at four locations as shown on Drawing S1. The cast iron frame and grate shall be removed and disposed of offsite. The concrete apron slab installed around the concrete walls shall also be demolished.

c. The existing concrete structure for Manhole No. 12A shall be partially demolished as follows: The cast iron manhole frame and cover shall be removed and disposed of offsite. The two sections of precast concrete risers shall be removed down to the top concrete cover for the manhole as shown on Drawing S3. The concrete apron installed around the cast iron manhole cover shall also be demolished.

d. The existing concrete structure for Junction Chamber No. 2 shall be partially demolished as follows: The cast iron manhole frame and cover shall be removed and disposed of offsite. The concrete top shall also be demolished. The top portion of the concrete walls shall be saw cut all around and removed as shown on Drawing S4. The top portion of the ladder shall be removed and disposed of offsite.

751-3.3 Concrete structures. Concrete structures shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-501 for aircraft traffic areas including Manhole No. 12A and Junction Chamber No. 2. The construction shall conform to the requirements specified in Item P-610 for non-traffic areas including Inlets No. 1 to 14 and 40 to 44. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 Precast concrete structures. Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps that are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches (300 mm). When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 Placement and treatment of castings, frames, and fittings. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.6 Installation of steps. The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures, they shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches (300 mm).

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the Engineer.

751-3.7 Backfilling.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8" in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

b. Backfill shall not be placed against any structure until approved by the Engineer. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.8 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the Engineer. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Partial removal of existing drainage structures, including sawcutting and removal of demolished materials, shall be considered incidental to Item P-101-1, Concrete Pavement Removal, Full Depth.

751-4.2 Partial reconstruction of inlets, junction chambers, and manholes, including reinforcement, forming, frames, grates, and steps shall be measured separately for payment per each structure. Pay item shall include the amount of concrete (P-501) necessary for the slab that the reconstructed inlet is located within. Inlet slabs are defined by the structural detail drawings and are not included in the P-501 PCC pay item.

751-4.3 Inlet Structure Reconstruction shall be paid for by lump sum for each inlet or manhole.

BASIS OF PAYMENT

Payment will be made under:

Item D-751-1	Existing Storm Inlet Partial Reconstruction – per each
Item D-751-2	Storm Manhole #12A Partial Reconstruction – per each
Item D-751-3	Junction Chamber #2 Partial Reconstruction – per each
Item D-751-4	Cast-in-place Storm Structure w/ Grate – per each

MATERIAL REQUIREMENT

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings

ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

END OF ITEM D-751

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ITEM F-162
CHAIN-LINK FENCE

DESCRIPTION

162-1.1 This item shall consist of furnishing and erecting a chain-link fence in accordance with these specifications, the details shown on the plans, and in conformity with the lines and grades shown on the plans or established by the Engineer.

MATERIALS

162-2.1 Fabric. The fabric shall be woven with a 9-gauge galvanized steel wire in a 2" mesh and shall meet the requirements of ASTM A392, Class 2 for permanent fence. Temporary fence shall be Class 1.

162-2.2 Barbed wire. Barbed wire shall be 2-strand 12-1/2 gauge zinc-coated wire with 4-point barbs and shall conform to the requirements of ASTM A121, Class 3.

162-2.3 Posts, rails, and braces. Line posts, rails, and braces shall conform to the requirements of ASTM F1043 or ASTM F1083 as follows:

Galvanized tubular steel pipe shall conform to the requirements of Group IA, (Schedule 40) coatings conforming to Type A, or Group IC (High Strength Pipe), External coating Type B, and internal coating Type B or D.

Roll Formed Steel Shapes (C-Sections) shall conform to the requirements of Group IIA, and be galvanized in accordance with the requirements of ASTM F1043, Type A.

Hot-Rolled Shapes (H Beams) shall meet the requirements of Group III, and be galvanized in accordance with the requirements of ASTM F1043, Type A.

Posts, rails, and braces, with the exception of galvanized steel conforming to ASTM F1043 or ASTM F1083, Group 1A, Type A, or aluminum alloy, shall demonstrate the ability to withstand testing in salt spray in accordance with ASTM B117 as follows:

External: 1,000 hours with a maximum of 5% red rust.
Internal: 650 hours with a maximum of 5% red rust.

The dimensions of the posts, rails, and braces shall be in accordance with Tables I through VI of Federal Specification RR-F-191/3.

162-2.4 Gates. Gate frames shall consist of galvanized steel pipe and shall conform to the specifications for the same material under paragraph 162-2.3. The fabric shall be of the same type material as used in the fence.

162-2.5 Wire ties and tension wires. Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall be 7-gauge marcelled steel wire with the same coating as the fabric type and shall conform to ASTM A824.
All material shall conform to Federal Specification RR-F-191/4.

162-2.6 Miscellaneous fittings and hardware. Miscellaneous steel fittings and hardware for use with zinc-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A153. Barbed wire support arms shall withstand a load of 250 pounds applied vertically to the outermost end of the arm.

162-2.7 Concrete. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 3000 psi.

162-2.8 Marking. Each roll of fabric shall carry a tag showing the kind of base metal, kind of coating, the gauge of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal, and kind of coating.

CONSTRUCTION METHODS

162-3.1 Clearing fence line. All trees, brush, stumps, logs, and other debris which would interfere with the proper construction of the fence in the required location shall be removed a minimum width of 5'-0" on each side of the fence centerline before starting fencing operations. The cost of removing and disposing of the material shall not constitute a pay item and shall be considered incidental to fence construction.

162-3.2 Installing posts. All posts shall be set in concrete at the required dimension and depth and at the spacing shown on the plans.

The concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within seven (7) days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned footing depth, a hole 2" larger than the greatest dimension of the posts shall be drilled to a depth of 12". After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required footing depth. No extra compensation shall be made for rock excavation.

162-3.3 Installing top rails. The top rail shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion.

162-3.4 Installing braces. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

162-3.5 Installing fabric. The wire fabric shall be firmly attached to the posts and braced as shown on the plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than 1" or more than 4" from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6" or less.

162-3.6 Electrical grounds. Electrical grounds shall be constructed where a power line passes over the fence and at 500'-0" intervals. The ground shall be installed directly below the point of crossing. The ground shall be accomplished with a copper clad rod 8'-0" long and a minimum of 5/8" in diameter driven vertically until the top is 6" below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. Installation of ground rods shall not constitute a pay item and shall be considered incidental to fence construction. The Contractor shall comply with FAA-STD-019, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment, Paragraph 4.2.3.8, Lightning Protection for Fences and Gates, when fencing is adjacent to FAA facilities. Grounds shall be incidental to the fence line pay item

162-3.7 Cleaning up. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction. All disturbed areas shall be seeded per T-901.

METHOD OF MEASUREMENT

162-4.1 Chain-link fence will be measured for payment by the linear foot. Measurement will be along the top of the fence from center to center of end posts, excluding the length occupied by gate openings. Fence line pay item shall include warning signs placed and spaced at the requirement of the airport.

162-4.2 Gates will be measured as complete units.

BASIS OF PAYMENT

162-5.1 Payment for temporary chain-link fence will be made at the contract unit price per linear foot. All components of the chain link fence listed in this specification and detailed in the plan set must be included in the linear foot pay item. Pay item shall include removal of fence once no longer needed at the end of construction.

162-5.2 Payment for vehicle gates will be made at the contract unit price for each gate. The price shall be full compensation for furnishing all materials, and for all preparation, erection, and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item. Pay item for gates shall include signs to match existing gate signs at other existing gate locations. The temporary gate with the 30’ opening pay item shall include cost for removal and replacement of the existing fence line to match existing conditions once the gate is no longer needed.

Payment will be made under:

Item F-162-1 – Temporary Chain-Link Fence - per linear foot
Item F-162-2 – Temporary 8’ Chain Link Gate – 20 Foot Opening - per each
Item F-162-3 – Temporary 8’ Chain Link Gate – 30 Foot Opening - per each

MATERIAL REQUIREMENTS

ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A123 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on

Iron and Steel Products

ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric

ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A824 Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence

ASTM A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low Alloy with Improved Formability, and Ultra High Strength

ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes

ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework

ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

ASTM G152 Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

ASTM G153 Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

ASTM G154 Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

ASTM G155 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials

FED SPEC RR-F-191/3

Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)

FED SPEC RR-F-191/4

Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

FAA-STD-019

Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment

END OF SECTION F-162

ITEM T-901
SEEDING

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding, fertilizing, liming, and mulching the areas shown on the plans or as directed by the Engineer in accordance with these specifications.

MATERIALS

901-2.1 Seed. The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as detailed on the plans.

901-2.2 Lime. Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of 1,000 lbs per acre. All liming materials shall conform to the requirements of ASTM C602.

901-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be 10-10-10 commercial fertilizer and shall be spread at the rate of 1,000 lbs per acre.

901-2.4 Soil for repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

901-3.1 Advance preparation and cleanup. After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2" in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5" as a result of grading operations and, if immediately prior to seeding, the top 3" of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5". Clods shall be broken and the top 3" of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 Wet application method.

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 lbs / square inches. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8" solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the

recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20'-0" to 100'-0". One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50'-0" in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify to the Engineer all sources of water at least two (2) weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3", after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 Maintenance of seeded areas. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged

following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

METHOD OF MEASUREMENT

901-4.1 The quantity of seeding to be paid for shall be the number of square yards measured on the ground surface, completed and accepted.

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per square yard, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901-1 – Seeding (Mulched) - per acre

MATERIAL REQUIREMENTS

ASTM C602	Standard Specification for Agricultural Liming Materials
ASTM D977	Standard Specification for Emulsified Asphalt
FED SPEC	JJJ-S-181, Federal Specification, Seeds, Agricultural

END OF ITEM T-901

ITEM T-904
SODDING

DESCRIPTION

904-1.1 This item shall consist of furnishing, hauling, and placing approved live sod on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

904-2.1 Sod. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. At least 70% of the plants in the cut sod shall be composed of the species stated in the special provisions, and any vegetation more than 6" in height shall be mowed to a height of 3" or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than that stated in the special provisions.

904-2.2 Lime. Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 mesh sieve and 50% will pass through a No. 100 mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of 1,000 lbs per acre All liming materials shall conform to the requirements of ASTM C602.

904-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be 10-10-10 commercial fertilizer and shall be spread at the rate of 1,000 lbs per acre.

904-2.4 Water. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

904-2.5 Soil for repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the Engineer before being placed.

CONSTRUCTION METHODS

904-3.1 General. Areas to be solid, strip, or spot sodded shall be shown on the plans. Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made at the specified rates.

904-3.2 Preparing the ground surface. After grading of areas has been completed and before applying fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

904-3.3 Applying fertilizer and ground limestone. Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in the special provisions. If use of ground limestone is required, it shall then be spread at a rate that will provide not less than the minimum quantity stated in the special provisions. These materials shall be incorporated into the soil to a depth of not less than 2" by discing, raking, or other suitable methods. Any stones larger than 2" in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 Obtaining and delivering sod. After inspection and approval of the source of sod by the Engineer, the sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2". Sod sections or strips shall be cut in uniform widths, not less than 10", and in lengths of not less than 18", but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

904-3.5 Laying sod. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be

transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4" immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately 1" below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than one (1) vertical to 2-1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12" in length and have a cross-sectional area of not less than 3/4 square inch. The pegs shall be driven flush with the surface of the sod.

904-3.6 Watering. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface. The contractor will be required to water sodded areas three days per week until the sod is well established, has good color, and is approved by the engineer. The contractor shall water every other day such that the sod is watered at least three times per week. The days missed shall have the payment for sod per square yard reduced at a pro-rata share based up on the number of days calculated for watering (less any rain days) times the number of days missed. It is imperative that the contractor water consistently to ensure proper sod growth.

904-3.7 Establishing turf.

a. General. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work.

b. Protection. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

c. Mowing. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

904-3.8 Repairing. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the Engineer, and shall then be sodded as specified in paragraph 904-3.5.

METHOD OF MEASUREMENT

904-4.1 This item shall be measured on the basis of the area in square yards (square meters) of the surface covered with sod and accepted.

BASIS OF PAYMENT

904-5.1 This item will be paid for on the basis of the contract unit price per square yard (square meter) for sodding, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item T-904-1 - Sodding - per square yard.

MATERIAL REQUIREMENTS

ASTM C602 Standard Specification for Agricultural Liming Materials

END OF ITEM T-904

ITEM T-905
TOPSOILING

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

905-2.1 Topsoil. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2" or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C117.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 Inspection and tests. Within 10 days following acceptance of the bid, the Engineer shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 General. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

905-3.2 Preparing the ground surface. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2" to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2" in any diameter and all litter

or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 Obtaining topsoil. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Engineer. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 Placing topsoil. The topsoil shall be evenly spread on the prepared areas to a uniform depth of 3" after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2") or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil stockpiled from unclassified excavation activities shall be used for topsoiling by the Contractor. Topsoil shall be measured by the number of square yards of topsoil measured in its final position. Topsoiling pay item shall include stripping, placing in stockpile, and final placement of topsoil when grading operations are complete.

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per square yard for topsoiling (obtained on the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-905-1 - Topsoiling - per cubic yard.

TESTING MATERIALS

ASTM C117 Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing

END OF ITEM T-905

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ITEM T-908
MULCHING

DESCRIPTION

908-1.1 This item shall consist of furnishing, hauling, placing, and securing mulch on surfaces indicated on the plans or designated by the Engineer.

MATERIALS

908-2.1 Mulch material. Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Mulch shall be free from noxious weeds, mold, and other deleterious materials. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding, or to surrounding farm land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

a. Manufactured mulch. Cellulose-fiber or wood-pulp mulch shall be products commercially available for use in spray applications.

b. Tackifier. Non-asphaltic tackifier.

908-2.2 Inspection. The Engineer shall be notified of sources and quantities of mulch materials available and the Contractor shall furnish him with representative samples of the materials to be used 30 days before delivery to the project. These samples may be used as standards with the approval of the Engineer and any materials brought on the site that do not meet these standards shall be rejected.

CONSTRUCTION METHODS

908-3.1 Mulching. Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. Spreading of the mulch shall be by mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the area shown on the plans or designated by the Engineer.

Mulch shall be applied via hydro-mulching methods.

908-3.2 Care and repair.

a. The Contractor shall care for the mulched areas until final acceptance of the project. Care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the Engineer, and erecting any barricades that may be shown on the plans before or immediately after mulching has been completed on the designated areas.

b. The Contractor shall be required to repair or replace any mulch that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the Engineer, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

908-4.1 There shall be no separate measurement or separate payment under this section of the specifications. Payment for work performed shall be incidental to Item T-901 - Seeding (Mulched).

END OF ITEM T-908

ITEM L-100 GENERAL PROVISIONS AND REQUIREMENTS FOR ELECTRICAL WORK

DESCRIPTION

100-1.1 SPECIAL REQUIREMENTS FOR ELECTRICAL WORK. These special requirements shall apply for the electrical work. Where the contract special conditions or general provisions also apply, the stricter of the documents shall apply.

100-1.2 AUXILIARIES AND ACCESSORIES. Include all auxiliaries and accessories for a complete and properly operating system, to the satisfaction of the Owner and Engineer.

Provide and install all electrical systems and any necessary appurtenances as per FAA Advisory Circulars, NEC and local codes whether specified or shown on drawings or not. The content of these specifications and contract documents in general only refers to work required above and beyond the requirements of the NEC and applicable local codes.

100-1.3 PROJECT PAY ITEMS. The project pay items are provided to be inclusive of all work to be performed as shown in the contract documents. All work not identified with a specific pay item is to be considered work to complete the project and is to be subsidiary to the cost of project pay items provided.

SUMMARY OF WORK

100-2.1 SUPERVISION AND ATTENDANCE. The Contractor shall provide a resident field superintendent who has had a minimum of four years previous successful experience on projects of comparable sizes and complexity. The Superintendent shall be present at all times that work under this division is being installed or affected.

100-2.2 RECORD DOCUMENTS. The Contractor shall maintain the contract documents, shop drawings and samples at the site, in good order and annotated daily to show all changes made during the construction process, per Section L-106, Submittals, Record Documents and Maintenance Manuals. These shall be available to the Engineer for examination.

100-2.3 SAFETY AND PROTECTION. The Contractor shall be solely and completely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

a. All employees on the work and other persons (including but not limited to the general public) who may be affected thereby,

b. All the work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and

c. Other property at the site, adjacent thereto, or utilized by the Contractor including but not limited to trees, shrubs, lawns, walks, pavements, structures, underground facilities, and other utilities not designated for removal, relocation or replacement in the course of construction regardless of whether or not such other property is indicated in the Contract Documents.

d. Existing underground utilities and systems both shown on the plans and those not shown. The Contractor shall have all utilities and systems field located by the FAA or appropriate authorities having jurisdiction and shall take whatever measures necessary to protect the utilities and systems from damage.

The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss.

All hoisting machinery shall be inspected by a competent person or by a government or private agency recognized by the U.S. Department of Labor. A copy of the written inspection report shall be submitted to the Engineer prior to the start of work requiring the use of this equipment.

The installation and/or removal of lighting equipment may be critical to airport operations; therefore, the Contractor shall follow work schedules established in the plans and specifications or as directed by the Engineer. The system shall be installed in accordance with the National Electrical Code and/or local code requirements.

The Contractor shall provide temporary wiring as required to reconnect existing circuits to provide guidance for aircraft to pass through the construction areas on those taxiways/runways which must remain open. The Contractor shall check all temporary circuits before dark each day to assure that they are operational. In the event of failure, the Contractor shall immediately take steps to restore operation.

The Contractor shall provide all safety rails as required in the performance of the work at building perimeters, at perimeters of floor and/or roof openings and on scaffold systems or platforms in accordance with the above regulations. Maintain safety rails during the duration of the work for this Contract. This Contractor shall be responsible for the removal and replacement of any safety rail necessary for the installation of equipment or materials provided in this work.

Powder-actuated fasteners will not be allowed without express written approval of the Engineer. No fasteners shall pierce the structure until approved by the Engineer.

Clean up of scrap materials and waste of the Contractor to be completed daily or more frequently as needed.

100-2.4 ENGINEERING INSPECTIONS. Items noted by the Engineer, Owner, or their authorized representative during construction and before final acceptance which do not comply with the contract documents will be listed in accordance with the specifications. These items will be sent to the Contractor for action. The Contractor shall have these items corrected.

Items noted after acceptance during the warranty period shall be checked and corrected by the Contractor in a timely manner acceptable to the Owner.

100-2.5 EXISTING CONDITIONS. Investigate the construction site thoroughly and reroute all conduit and wiring in area of new construction in order to maintain continuity of existing circuitry. Existing conduit shown on plans show approximate locations only. The Contractor must verify and coordinate existing site utilities, conduits and piping. The specifications include hand digging within five (5) feet of all existing utilities and all required rerouting in areas of existing utilities, conduits and/or pipes.

The Contractor shall check the construction site and existing conditions thoroughly before bidding. The Contractor shall advise the Engineer of discrepancies or questions noted.

Special attention is called to the fact that work involved in this project is in connection with existing systems/facilities which must remain in operation while work is being performed. Work must be done in accordance with the schedule specified in the contract documents. Schedule work for a minimum outage to the Owner. Request written permission and receive written approval from the Owner a minimum of 72 hours in advance of any shut-down of existing systems. Perform work required at other than standard working hours where outages cannot be approved during regular working hours. Protect existing buildings and equipment during construction as required.

Special attention is called to the fact that there may be piping, fixtures or other items in the existing systems which must be removed or relocated in order to perform the alteration work. All conduit, wiring, boxes, etc. that do not comply with these specifications shall be removed or corrected to comply with these specifications. All unused conduit not removed shall be identified and a pull line shall be installed. Bid shall include all removal and relocation required for completion of the alterations and the new construction.

If any difference is discovered between the existing conditions and the drawings or specifications, the Engineer shall be notified in writing immediately.

100-2.6 SYSTEMS GUARANTEE. The work required under this specification shall include a one (1) year warranty unless required otherwise by these specifications. This warranty shall be by the Contractor to the Owner for any defective workmanship or material which has been furnished under this contract for a period of one year (1) from the date of final acceptance of the system. This warranty shall not include light bulbs in service after one (1) month from date of final acceptance of the system. Explain the provisions of the warranty to the Owner at the "Demonstration of Completed System."

100-2.7 SUBSTANTIAL COMPLETION. All specified work shall be complete prior to final inspection of the work, and all forms and other information requested, including maintenance manuals, shall be submitted to the Engineer for approval one (1) week before the request for substantial completion of the work.

100-2.8 FINAL ACCEPTANCE. All work specified shall be complete after the substantial completion observation, all repairs made, and all required information approved at which time the Owner shall formally accept the project and take possession of all work on a permanent basis.

100-2.9 CONTRACTORS RESPONSIBILITIES. Provide necessary layout, labor, material, equipment, tools, transportation, full time supervision and services required for the satisfactory and timely completion of the work in accordance with the drawings and specifications and contract documents.

Unload, store, protect and re-handle the materials required for this contract until such time that material is in place. Provide protection of materials required of this contract after installation.

Provide all required transportation, erection, maintenance, dismantling and removal of temporary facilities and equipment required by this contract.

Provide all transportation, unloading, distribution, hoisting, rigging, material handling and scaffolding required to install the work of this contract.

Provide all engineering and layout required to perform the work.

Provide temporary electrical power and temporary water and sanitary sewer for the Contractor's field office, Engineer's field office and on-site testing laboratory. Pay all utility company charges. Provide temporary power required for the Contractor's work.

Prior to start of his work the Contractor is to inspect work performed by others on which this work is to be placed on or adjacent to, and report in writing to the Engineer, any condition found to be unacceptable. Failure to make said report shall constitute acceptance of the conditions found and any claims made thereafter due to the unacceptable conditions will not be considered by the Engineer.

Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this work. Work required under other sections, specifications or drawings to be performed by this section shall be coordinated with the respective contractor, and such work performed at no additional cost to the Owner including but not limited to electrical work in support of the mechanical division of the specifications and drawings.

It is the responsibility of the Contractor to coordinate the exact required location of any electrical or electronic equipment, system, or cabinets to be installed in or relocated inside an existing electrical or electronic equipment space. No existing equipment may be relocated in any existing electrical or electronic equipment room without prior coordination and with written approval of the Owner.

Provide and pay for all permits, licenses, fees and inspections required for the performance of the work. The Contractor shall pay all sales, consumer, use and other taxes required to be paid in accordance with the laws of the place of the project.

Provide all tests as required, per the drawings and specifications and submit all test reports to the Engineer.

Provide all excavation, backfill, compaction, shoring and dewatering required for performance of the work.

Provide sleeves for all conduit required as specified.

Protect all work of this contract from damage and intrusion of dirt and foreign objects. Close off open ends of conduit and sleeves on work which is to be completed at a later date. Remove closure material prior to continuance of work.

Prior to Final Inspection, submit to the Engineer, all Record Drawings and Operation and Maintenance Manuals as specified. Instruct Owner's maintenance personnel in the operation and maintenance of the systems as required by the Specifications.

The above is not all inclusive of the work described by the drawings and Specifications, which form the basis for this contract, but is presented for the Contractor's convenience.

100-2.10 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS. Should anything necessary for the clear understanding of the electrical work be omitted from the contract documents, or should the requirements appear to be in conflict, the Contractor shall secure written instructions from the Engineer before proceeding with the work affected thereby; otherwise the Contractor will be deemed to be proceeding at his own risk and expense. It is understood and agreed that the work shall be performed according to the true intent of the contract documents. Refer to Appendix A Figure 1 for a "Request For Information" (RFI) form.

BASIC MATERIAL & METHODS

100-3.1 REQUIREMENTS OF BASIC MATERIALS AND METHODS. The work shall include the furnishing of the systems, equipment and material specified in these specifications and as called for on the drawings, to include: supervision, operations, methods and labor for the fabrication, installation, start-up and tests for the complete electrical installation. Provide the necessary intertrade/Contractor coordination for the installation to be in a neat and workman like manner.

Drawings for the work are diagrammatic, intended to convey the scope of the work and to indicate the general arrangement and locations of the work. The drawings shall not be scaled for exact sizes or locations. Because of the scale of the drawings, certain basic items such as: conduit fittings, access panels, sleeves, pull and junction boxes may not be shown. Where such items are required by Code or by other sections or where they are required for proper installation of the work, such items shall be included. Coordinate final equipment locations with governing architectural and structural drawings. Layout equipment before installation so that all trades may install equipment in the space available.

Equipment Specifications may not deal with minute items such as components, parts, controls and devices which may be required to produce the equipment performance specified or as required to meet the equipment warranties. Where such items are required, they shall be included by the Contractor or the supplier of the equipment, whether or not specifically called for.

Conduit routed through any buildings that interferes with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in the building; do not introduce these into the building at such times or in such manner as to cause damage to the structure. Equipment that requires servicing shall be readily accessible.

Locate all openings required for work performed under this section. Provide sleeves, guards or other approved methods to allow passage of items installed under this section.

Keep cutting and patching to a minimum. Insofar as possible, determine in advance the proper chase size and openings necessary for the work.

Where cutting and patching are required due to an error of the Contractor, or where the Contractor has not given enough advance notice of the need for holes, recesses, and chases, patching shall be performed by those trades skilled in the use of the materials involved and shall be done at the Contractor's expense.

Any cutting of work in place shall be patched and decorated by such mechanics and in such a manner that the quality of workmanship and finish shall be compatible with that of adjacent construction.

The approximate location of building fixtures, wall switches, etc., is indicated on the drawings. Exact locations shall be determined by the Engineer as building work progresses. The indicated locations may be changed by ten (10) feet in any direction without additional cost before the items are installed.

The drawings and specifications describe specific sizes of switches, breakers, fuses, conduits, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters), lights, motors for fans, compressors, pumps, etc.) Wherever the Contractor provides power consuming equipment which differs from drawings and specifications, the wiring and associated circuit components for such equipment shall be changed to proper sizes to match at no additional expense to the Owner.

The basis for new design requires that electrical services, switchgear, panelboard and transformers total calculated connected load not be more than 60% of the service size. The total calculated load requirements for alterations shall not be more than 80%.

~~Furnish to roofer all pitch pans required for electrical items which pierce roof whether or not shown on drawings.~~ Roof penetrations are to be waterproofed in such a manner that roofing guarantees are fully in force. Floor penetrations shall be sealed with fire proof sealant to prevent water from leaking to floor below and to provide a 3 hour fire and smoke barrier. Wall penetrations shall be sealed to provide a 3 hour rated fire seal.

Surface mounted fixtures, outlets, cabinets, conduit, panels, etc., shall have finish or shall be painted as directed by the Engineer. Paint shall be in accordance with other applicable sections of these specifications.

All materials utilized shall be suitable for the environment encountered. No combination of materials shall be used that forms an electrolytic coupling of such nature that in the presence of moisture corrosion is accelerated.

In general, all relays, contactors, starters, motor control centers, switchboards, panelboards, dry type transformers, disconnect switches, circuit breakers, and manual motor starter switches are to be supplied and manufactured by the same manufacturer and shall be submitted and approved as equal to that specified.

Make electrical connections to constant current regulators, transformers, motors, instruments, mechanical equipment, controls and at other locations as required with approximately 3 feet (12" minimum) of Sealtight flexible conduit. The sealtight electrical conduit shall utilize strain relief type connectors by adding a T&B wire mesh grip, WMG-LT series, or approval equal to each sealtight connector. Determine the requirements from drawings, these specifications, and the approved manufacturer drawings.

Provide inserts, hangers, supports, braces, and anchor bolts as necessary for all work called for under these specifications.

All conduits shall contain one copper grounding conductor, in accordance with NFPA 70, NEC Article 250. #6 AWG and smaller shall have green insulation. #4 AWG and larger shall have black insulation with green phasing tape. The only exception is the 5KV airfield lighting conduits and ductbanks.

All galvanized materials shall be hot-dip galvanized after fabrication, conforming to ASTM A 123 and/or A 153, unless noted otherwise.

Unless noted otherwise, all panelboards, motor starters, junction boxes, wireways, etc., shall be spaced off the concrete structure by using a Unistrut P-1060 series square washer or approved equal between the mounting surface and the equipment at each mounting point. Equipment as listed above, mounted on Unistrut or approved equal shall have Unistrut P-1060 series square washer or approved equal installed between the Unistrut channel or approved equal and the equipment at each mounting point. All bolted connections and equipment mountings shall utilize a flat washer, lock washer and hex head A-325 bolting hardware.

Unless noted otherwise, all wire sizes are based on a 135 degrees F (75 degrees C), XHHW 600 volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The

conduit sizes are based on the use of XHHW 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit sizes for other types of wire insulation. In no case shall the conduit size be reduced. The minimum wire size shall be #12 AWG.
All electrical conductors, windings, busbars, etc. shall be high conductivity (98% conductivity) copper.

The Contractor shall furnish and install all required motor overcurrent protection required by the NEC and these drawings and specifications. The overcurrent protection shall be sized according to the motor nameplate data.

100-3.2 ELECTRICAL REFERENCE SYMBOLS. Symbols used on the plans are defined in the Electrical Legend on the Drawings. Not necessarily will all symbols scheduled be applicable to the project.

100-3.3 ACTIVE SERVICES. Existing active services i.e., water, gas, sewer, electric, communications, etc. when encountered, shall be protected against damage. Do not prevent or disturb operation of active services which are to remain. If active services are encountered which require relocation, the Contractor shall make a written request to the Owner for determination of procedures. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the Utility or Municipality or Authority having jurisdiction.

100-3.4 CODES AND FEES. Install in accordance with latest edition of FAA Advisory Circulars, the National Electrical Code and the regulations of governing Federal, State, County, local and other applicable codes, including the Utilities Company. Where a conflict in code requirements occurs the most stringent requirement shall govern. The Contractor shall be responsible and pay all required licenses, fees and inspections including meter installation fee. The cost for such shall be included in the bid price.

The work shall meet the requirements and recommendations of applicable portions of the latest editions of these standards:

a. National Electrical Code (NFPA 70)

b. Life Safety Code (NFPA 101)

c. National Electrical Safety Code (ANSI C2)

d. NEMA Standards (NEMA)

e. Underwriter's Laboratories (UL)

f. Institute of Electrical and Electronics Engineers (IEEE)

g. Lightning Protection Code (NFPA) 780 and UL 96A)

h. AWS D1.1

i. ANSI

j. NFPA

k. Federal Aviation Administration Advisory Circulars (AC)

l. Applicable Local Building Code

m. Certified Ballast Manufacturers (CBM)

The above is not all inclusive of applicable codes and standards, but is presented for the Contractors convenience.

100-3.5 STANDARDS. All materials shall be new and free of defects and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available for certain types of equipment, test data shall be submitted to prove to the Engineer that equipment meets or exceeds available standards. All listed, labeled or approved material shall be used only for the intended purpose.

100-3.6 UTILITY COMPANY FEES, CHARGES, COSTS. It is the Contractor's responsibility to contact the applicable Utility Company(s) to determine if any fees, charges or costs will be due the Utility Company(s) as required by the Utility Company(s) for temporary power, installations, hook-ups, etc. The associated fee, charge or cost for each utility shall be included in the Contractor's bid price.

100-3.7 TESTS. Systems shall be tested by the Contractor and placed in proper working order prior to demonstrating systems to the Owner. Refer to the requirements in each section for other applicable standards.

After work is completed a load balance test shall be made, as required, to demonstrate that with full lighting and mechanical load the balance between phases is within 5%. Unbalance beyond this limit shall be corrected.

System ground and lightning protection system ground shall be tested, as required, to demonstrate that the ground resistance does not exceed twenty-five (25) ohms per ground rod. All testing shall be done by methods approved by the Engineer and prior to the connection of the grounding conductors.

Perform such tests as required by any Authorities having jurisdiction over the site. Refer to specification L-131, Demonstrations, Tests and Performance Verification.

Testing methods shall be acceptable to the Engineer and shall be submitted to the Engineer for review, a minimum of thirty (30) days prior to the scheduled test.

IDENTIFICATION

100-3.8 LAMINATED PHENOLIC PLASTIC NAMEPLATES. The Contractor shall provide nameplates for wiring systems and equipment as called for herein. All nameplates shall have beveled edges and one-half inch (1/2") lettering. If equipment is smaller than ten inches by six inches (10"x 6"), one-quarter inch (1/4") lettering may be used. Smaller lettering may be used with permission of the Engineer.

Nameplates shall be laminated phenolic plastic, black front and back with white core, with lettering etched through the outer covering. White engraved letters on black background. Emergency systems shall use red front and back with white core for nameplates. Attach nameplates with 4-40 stainless steel self tapping screws. Where conditions do not warrant piercing the enclosure "LOCTITE" brand adhesive or approved

equal may be used with permission of the Engineer.

The following items shall be equipped with nameplates: all constant current regulators, pushbutton stations, control panels, system cabinets, terminal cabinets, disconnect switches, panelboards, circuit breakers, contactors or relays in separate enclosures, high voltage boxes and cabinets whether existing or planned by these specifications. Special electrical systems shall be identified at junction and pull boxes, terminal cabinets and equipment racks. Junction boxes shall comply with paragraph 100-3.10, Junction/Pull Box Color Code.

Nameplates shall adequately describe the function of the particular equipment involved. Where nameplates are detailed on the drawings, inscription and size of letters shall be as shown and shop drawing submitted for approval. Nameplates for panelboards and switchboards shall include the panel designation, panel name, circuit designation source of power and voltage and phase of the supply. For example, "Equip YY, Panel A, CKT XX fed from Panel XYZ, 480/277V, 3-phase, 4-wire." The name of the machine on the nameplates for a particular machine shall be the same as the one used on all motor starters, disconnects and pull box station nameplates for that machine. Nameplates shall include as a minimum the following:

a. Equipment Number

b. Equipment Name

c. Power Source w/Circuit Designation

d. Voltage Level and number of phases

All major pull and junction boxes in service areas, tunnels, above accessible ceilings and in accessible chases shall have nameplates identifying the feeder or system.
Systems with conductors exceeding 100 volts to ground shall have voltage identification nameplates with one-half inch (1/2") high letters on all panels, switches, pull boxes and junction boxes.

100-3.9 ADHESIVE BACKED CLOTH MARKERS. All raceways containing conductors exceeding 150 volts to ground shall have adhesive backed cloth/vinyl markers installed at each end and every thirty feet (30') in between identifying the voltage level (Example: "480 VOLTS"). If the conduit is less than ten feet (10') in length one marker is acceptable. The markers shall be installed so they are visible from floors and walkways. Normal power system shall use black letters, emergency systems shall use red letters.

The markers shall be "Brady" brand or approved equal with one-half inch (1/2") letters.

The markers shall be suitable for the environmental conditions encountered.

100-3.10 JUNCTION/PULL BOX COLOR CODE. Circuit numbers and circuit identification shall be printed on junction box and pull box covers using ink markers and shall be plainly visible after paint is applied. The entire box and cover shall be color coded as listed below:

Color Code for Junction Boxes	Krylon Color & Paint # Or Approved Equal	
Normal Power 480/277 Volt	Brown	2501-6
Normal Power 208/120 Volt	Black	1601-6

100-3.11 CONCRETE WORK. Concrete bases and pads for all equipment furnished by the Contractor shall be the responsibility of the Contractor unless noted otherwise.

The Contractor shall furnish all equipment anchor bolts and shall be responsible for their proper installation and accurate location.

100-3.12 EXCAVATING, TRENCHING AND BACKFILLING. The Contractor shall do excavating necessary for light bases, underground wiring, conduit and ductbanks and shall backfill trenches and excavations after work has been inspected. Care shall be taken in excavating that walls and footings and adjacent load bearing soils are not disturbed in any way, except where lines must cross under a wall footing. Where a line must pass under a footing, the crossing shall be made by the smallest possible trench to accommodate the conduit. Excavations shall be kept free from water. No greater length of trench shall be left open in advance of conduit laying than that which is authorized or directed by the Engineer.

Roots shall be removed to a level of eighteen (18") below furnished grades and deeper as required for duct runs, manholes and light pole bases. No roots shall be allowed to remain under the work.

Backfill about the structures shall be placed, where practical, as the work of construction progresses. Backfilling on or against concrete work shall be done only when directed. Backfilling of duct lines shall progress as rapidly as the testing and acceptance of the finished sections of the work will permit and shall be carried to a crown approximately six inches (6") above the existing grades. In backfilling around duct lines, selected material shall be compacted firmly around the duct. Fill and backfill shall be clean and free from vegetable matter and refuse.

All trenches and other excavation left open by necessity shall be barricaded and guarded as required by OSHA or applicable codes and regulations.

100-3.13 WELDING. All welding and weld procedures shall be in accordance with AWS D1.1, Latest Edition. Qualifications of welders and welding operators shall be in accordance with AWS D1.1, Latest Edition. The welder qualification test shall be performed on a 1" A-36 Test Coupon in the 3G and 4G positions. The welder qualification shall be current within 12 months of the work being performed. Weld inspections shall be per the criteria set forth in AWS D1.1 for visual weld inspection.

DESIGNATION OF MATERIALS

100-4.1 CRITERION DESIGNATION OF MATERIALS AND EQUIPMENT. Where a criterion specification is designated for any material or equipment to be installed by the name or catalog number of one specific manufacturer, such designation is intended only for the purpose of establishing the style, quality, performance characteristics, etc., and is not intended to limit acceptability of competitive products. Products of other manufacturers which are approved by the Engineer as similar and equal will be equally acceptable unless specifically otherwise stated.

Where equipment or materials are specified by the use of the name and catalog number of more than one manufacturer, that equipment or material shall be one of those specified. No alternative will be acceptable.

Where no brand name is specified, the source and quality shall be subject to the Engineer's review and acceptance.

When a product is specified to be in accordance with a trade association or government standard, at the

request of the Engineer, the Contractor shall furnish a certificate that the product complies with the referenced standard. Upon request of the Engineer, the Contractor shall submit supporting test data to substantiate compliance.

The Engineer shall be the sole judge of whether the proposed "or equal" is suitable for use in the work.

Each Bidder represents their bid is based upon the materials and equipment described in these specifications. Substitutions will not be considered unless a written request has been submitted to the Engineer in accordance with Item L-106, Submittals, Record Documents and Maintenance Manuals.

If the Contractor desires to use a method or type of equipment other than specified in the contract documents, a written request therefore shall be made to the Engineer. If approval is given, the Contractor will not be excused from producing work in conformity with contract requirements. If a trial use establishes that work does not meet the contract requirements, the Contractor shall take such action as the Engineer determines necessary to correct any deficiency in the work. No change in contract time will be made as a result of changes made under this Subparagraph. By making a request for substitution, the Contractor:

a. Represents that it has personally investigated the proposed substitution and determined the proposed substitution equal or superior in all respects to the specified method or equipment;

b. Represents that it will provide a warranty for the substitution identical in all respects to the warranty for the specified method or equipment;

c. Represents that it will coordinate the installation of the accepted substitute, making changes as may be required for the work to be complete in all respects at no additional cost to the Owner.

PROTECTION OF MATERIALS, EQUIPMENT AND WORK

100-5.1 REQUIREMENT FOR THE PROTECTION OF MATERIALS, EQUIPMENT AND WORK. Materials shall be stored so as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall be subject to reinspection prior to their use in the work. The Contractor shall coordinate the storage of all materials with the Owner and the Engineer. Owner-furnished materials, if any, shall be made available to the Contractor at the location specified herein. All costs of handling, transportation from the specified location to the site of the work, storage and installation of Owner-furnished materials shall be included in the Total Contract Price. All risk of loss or damage to Owner-furnished materials shall pass to the Contractor after delivery of said material to the site of the work. The Owner shall be entitled to deduct from any monies due or to become due to the Contractor any cost incurred by the Owner resulting directly or indirectly from a loss caused in whole or in part by the Contractor's handling, storage or use of Owner-furnished materials.

The Contractor shall protect electrical raceway, cables of any sort, lighting fixtures and associated support systems against damage from movement of equipment and material, welding, flame cutting, and other construction damage. Raceways and supporting structures for raceway and lighting fixtures shall not be used as access scaffolding at any time. Whenever welding or flame cutting operations occur above or near raceways, cables or lighting fixtures not shielded from such operations by concrete floor or other protective covers, the Contractor shall protect the raceways, cables, and lighting fixtures from damage by means of fireproof boards or blankets. Damaged materials shall be repaired or replaced, by and at the Contractor's expense, subject to the Engineer's direction and acceptance.

Surfaces of most equipment, such as panels, switchgear, transformers, constant current regulators and circuit breakers, are finished at the factory. Great care shall be exercised to prevent damage to this original finish during installation of the equipment and during construction work.

If the factory finish is damaged during the course of construction, the entire surface of the damaged component shall be refinished or replaced by and at the expense of the Contractor.

The refinished surface shall be equivalent in every respect to the original surface, including color, texture and smoothness. Refinishing paint, if furnished with the equipment, may be used; otherwise, the paint shall be obtained from the equipment manufacturer.

All cut edges of galvanized materials and marred or scratched galvanized surfaces shall be repaired using LPS-1G cold galvanizing compound or approved equal.

All threaded conduit joints shall use T&B Kopr-shield or Aluma-Shield or approved equal for galvanized and aluminum conduits respectively, as joint compound.

GENERAL CONSTRUCTION REQUIREMENTS

100-6.1 ADDITIONAL REQUIREMENTS. Provide the bracing, shoring, rails, guards, and covers necessary to prevent damage or injury. Do not leave energized electrical items unnecessarily exposed or unprotected. Protect personnel from exposure to contact with electricity. Deliver equipment and materials to the job site in their original, unopened, labeled containers. Store ferrous materials so as to prevent rusting. Store finished materials and equipment so as to prevent staining and discoloring.

All materials stored prior to installation, shall be stored in a bonded and secured facility.

All sheeting, shoring, dewatering and cleaning necessary to keep trenches and their grades in proper condition for the work to be carried on, including the removal of water by mechanical means, shall be the Contractor's responsibility.

METHOD OF MEASUREMENT

100-7.1 The items described in this section are incidental to other sections and shall not be measured for payment.

BASIS OF PAYMENT

100-8.1 No direct payment shall be made for the work described in this specification. The work described in this specification is incidental to other items and shall be paid for in the respective bid item of which it is a component part.

Request for Information
Supplemental Instruction

To: _____ **RFI - 000**

From: _____ Date: _____

Project: _____ AEP File No: 000-0000-000

_____

Reference:

Contract Drawing: _____

Shop Drawing: _____

Specification: _____

Other: _____

Subject:

Description:

By: _____

Reply:

Answered By: _____
Project Manager Date

Cc:

APPENDIX A
FIGURE 1

END OF ITEM L-100

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ITEM L-104

GENERAL ELECTRICAL SAFETY REQUIREMENTS AND TEMPORARY AIRFIELD LIGHTING

104-1.1 PURPOSE. The purpose of this item is to establish the proper safety guidelines necessary to protect aircraft, passengers, crews, the general public, all workers and vehicles involved in their daily tasks. The Contractor is solely responsible for all issues related to the safety program and guidelines and implementation of such programs and guidelines necessary to protect aircraft, passengers, crews, the general public, all workers and vehicles involved in their daily tasks.

104-1.2 FAA ADVISORY CIRCULARS. All applicable requirements of the below listed Advisory Circulars, latest edition, standards and related reading shall be complied with:

150/5200-18	Airport Safety Self-Inspection (Latest Edition)
150/5210-5	Painting, Marking and Lighting of Vehicles used on an Airport (Latest Edition)
150/5340-18	Standards for Airport Sign Systems (Latest Edition)
150/5340-26	Maintenance of Airport Visual Aid Facilities. (Latest Edition)
150/5340-30	Design and Installation Details for Airport Visual Aids (Latest Edition)
150/5370-2	Operational Safety on Airports during construction (Latest Edition)
Occupational Safety and Health Standards for the construction industry 29 CFR Part 1926/1910	
ANSI C2	National Electrical Safety Code (Latest Edition)
NFPA 70	National Electrical Code (Latest Edition)
NFPA 70E	Standard for Electrical Safety Requirements for Employee Work Places (Latest Edition)

The Contractor is responsible for obtaining and using the latest edition of the referenced FAA Advisory Circulars and related standards. This list is not all inclusive but is offered as a convenience to the Contractor.

104-1.3 GENERAL SAFETY PROVISIONS. The Contractor shall take safety and health measures in performing work under this contract. The Contractor shall meet with the Engineer to develop a mutual understanding relative to administration of the safety requirements. The Contractor is subject to applicable federal, state and local laws, regulations, ordinances, codes and orders relating to **safety** and health in effect on the date of this contract. Attention is invited to the regulations issued by the Secretary of Labor pursuant to the Contract Work Hours and Safety Standards Act and the Safety and Health Regulations for construction. The Contractor shall comply with the Secretary's Regulations as applicable and shall comply with specific requirements stated.

As a minimum, work place safety shall comply with NFPA 70E Standard for Electrical Safety Requirements for Employee Work Places, OSHA, federal, state and local requirements. Where a conflict in code requirements occurs the most stringent requirement shall govern.

During the performance of work under this contract, the Contractor shall comply with procedures prescribed for control and safety of persons visiting the project site.

The Contractor is responsible for his personnel and for familiarizing each of his subcontractors with safety requirements.

The Contractor shall advise the Engineer of any special safety restrictions he has established so that the Owner personnel can be notified of these restrictions.

104-1.4 FIRE PREVENTION AND PROTECTION. All tools producing sparks or heat, open-flame heating devices, or operations utilizing such devices, etc., shall be in accordance with the local Fire Department and the Owner's Burn Permit procedures. Work shall not start until all requirements of the Burn Permit procedures are met.

Open-flame heating devices will not be permitted except by approval in writing. Such permission will not be granted unless the Contractor has taken reasonable precautions to make such devices safe. Burning trash, brush or wood on the project site will not be permitted. Approval for use of open fires and open-flame heating devices will in no way relieve the Contractor from the responsibility for any damage incurred because of fires.

Flammable liquids shall be stored and handled in accordance with the Flammable and Combustible Liquids Code, NFPA 30.

Open fires and salamanders will not be permitted in construction areas.

Smoking will not be permitted within the Air Operations Area (AOA). No smoking signs shall be strategically and visibility located near areas such as paint storage, fuel storage, and all other areas.

Welding, flame cutting, melting and other such operations in all operating areas, shall not be permitted until approved at the beginning of each workday by the Engineer. The Engineer may approve longer periods of time for welding and burning in some operating areas if the detailed safety procedures are established beforehand. Operating open flame devices shall not be left unattended in any area.

The Contractor shall provide the necessary firefighting equipment and fire prevention methods and, before operations begin, clear all welding and cutting operations with the Engineer.

A Contractor's employee shall be assigned as fire watch for every welding and burning operation. He shall be equipped with 2 full 15 pound carbon dioxide fire extinguishers and shall check all areas around and below the welding or burning operation for fires. He shall continue this check for at least 60 minutes after the completion of the welding or burning operation.

The Contractor shall discontinue all burning, welding, or cutting operations, one hour prior to the end of the normal work day. The Contractor shall provide a workman to remain at the site for one hour after discontinuing these operations. This workman shall make a thorough inspection of the area for possible sources of latent combustion. Any unsafe conditions shall be corrected.

During operations involving possible fire hazard, the Contractor shall notify the Engineer and not proceed until clearance is obtained in writing. The Engineer may request a standby from the Aircraft Rescue and

Firefighting (ARFF). However, this does not relieve the Contractor of his responsibility for welding and cutting safety.

104-1.5 TEMPORARY EXITS AND ENTRANCES. Such passageways shall provide adequate fire protection and safety of Owner personnel and representatives.

104-1.6 SWITCHING. Electrical switching required for clearance to work on equipment operating from electrical circuits will be performed only by Owner personnel authorized as safety operators for the specific equipment unless otherwise authorized in writing by the Engineer.

104-1.7 REMOVAL OF EQUIPMENT. When permanently removing equipment, the electrical wiring, conduit and control boxes shall be removed to the source of feed, unless otherwise specified or indicated.

After equipment has been removed, the electrical wiring diagrams, schematics, etc., shall be marked to show the change.

Conduit not removed shall have a pull string installed.

104-1.8 OTHER SAFETY REQUIREMENTS. Temporary wiring shall comply with NEC. Indiscriminate use of extension cords, portable cable or junction boxes creating tripping hazards as well as overloaded circuits will not be permitted.

Unplug portable electrical hand tools when not in use. Inadvertent operation of equipment can take place if it is left plugged into an energized receptacle.

Before maintaining or repairing any electrical equipment, it shall be disconnected from the power source.

Do not use any equipment that has frayed cords or three-wire plugs that have had the grounding prongs removed. Faulty equipment and tools shall be repaired by qualified electrical personnel.

Do not use metal ladders when working on electrical equipment.

EXCAVATION

104-2.1 EXCAVATION OPERATIONS. Methods of excavation, means of earth support, and manner of backfill shall be conducted with consideration for the safety of persons and work, and prevention of damage to adjacent pavement, utilities, structures and other facilities, due to settlement, lateral movement, undermining and washout. Excavation shall be performed in a manner to prevent surface water and subsurface or ground water from flowing into excavations, and to prevent water from flooding conduit trench and adjacent or surrounding area.

The Contractor and all his subcontractors performing trench excavation on this contract shall comply with the State Trench Safety Act in which the project is occurring and the Occupational Safety and Health Administration's (OSHA) trench excavation safety standards, 29 C.F.R., subpart P, s.1926.650, including all subsequent revisions or updates to these standards as adopted by the Department of Labor and Employment Security (DLES). The Contractor shall consider all available geotechnical information in his design of the trench excavation safety system. Inspections required by OSHA trench excavation safety standards shall be provided by the Contractor.

PROTECTION OF WORK

104-3.1 PROTECTION OF WORK. Provide adequate stand-by mechanical equipment for emergency

use.

Excavations shall have substantial barricades and be posted with warning signs for the safety of persons. Warning lights shall be provided during hours of darkness.

Barricades shall be erected immediately around manhole openings when covers are removed or opened. For personnel safety and to prevent possible interruption of major utility services encountered during excavation, the following procedures shall be followed:

a. Prior to performing any excavation work or any surface penetrations 6-inches or deeper (such as driving stakes more than 6-inches in the ground) on any ground surface, the Contractor shall obtain from the Engineer, local utilities, etc., the current up-to-date subsurface utility drawing of the particular area to be worked on.

b. All Agencies/Utilities, etc. that may be affected by the excavating shall be contacted by the Contractor so that all lines, pipes, etc., can be marked/staked.

c. The Contractor shall stake out all subsurface utilities i.e., high voltage cables, communication cables, pipe lines, etc., indicated within the scope of the work contemplated. All subsurface utilities shall be located by hand digging; hand digging shall extend for 5-feet on both sides of the subsurface utility.

d. After hand exposure of cable or pipelines, the Contractor shall obtain agreement from the Engineer, Agency/Utility on how much closer to cable or pipe the excavations can be permitted.

e. Detectable marker tape, with metalized foil core, printed with the words "CAUTION ELECTRIC LINE BELOW," "CAUTION WATER LINE BELOW," "CAUTION SEWER LINE BELOW," etc., as applicable, shall be installed 8-inches below grade over the underground utility. Tape shall be in accordance with Item L-108, Installation of Underground Cable for Airports.

f. The Contractor shall notify the Engineer, 72 hours prior to the start of excavation work or surface penetration, to enable the Engineer to review measures being taken to prevent hazard to employees and to prevent possible damage to subsurface utilities. Where emergency conditions preclude the 72 hours advance notification, the Contractor shall nevertheless inform the Engineer of his intention to initiate work.

g. After all existing utilities have been located and marked or staked, the Contractor shall proceed with excavating work, or other surface penetration work. The Contractor however, shall temporarily halt any machine excavation work or other surface penetration when approaching within 5-feet of the staked out subsurface utility until the Contractor has hand excavated down to expose the utility to exactly fix its location.

h. No digging, dirt moving or other heavy equipment shall enter physically any approved construction area before all utilities have been located and properly staked out. It is the Contractor's responsibility to locate all utilities before digging, sawing, coring, boring, etc.. Any damage caused by digging, sawing, boring, coring, etc., is the Contractor's responsibility for repair. Any damage must be reported immediately to the Engineer. No repair shall be attempted without approval.

i. All high voltage cables shall be disconnected before excavation is attempted.

j. To protect subsurface utilities, provide as a minimum, a 1-inch thick steel plate cover over electrical duct, cables and other subsurface utilities when heavy equipment is being used in the area.

k. The requirements listed above shall be considered incidental to the item for which the excavation is required.

SAFETY TAGGING AND LOCKOUT

104-4.1 SAFETY WITH ELECTRICAL CIRCUITS AND EQUIPMENT. No one may work on an energized circuit without written permission from the Contractor's project manager. The Contractor's project manager shall review the circumstances and the necessary safety precautions with the Engineer prior to giving permission for the "hot" work. The Contractor assumes all liability in connection with any work on energized circuits.

No one may disconnect or cause to be disconnected any electrical circuit before permission is requested from and granted by Airport Operations or their authorized representative through the Engineer.

Identification markings on building light and power distribution circuits shall not be relied on for established safe work conditions. Always verify the proper safe "deenergized" conditions with properly operating test equipment.

Before any circuit supplying radar, ILS, weather, VORTAC, airport beacon, runway/taxiway lighting equipment or any other equipment is disconnected, permission must first be granted by Airport Operations or their authorized representative, and, if applicable, FAA Airways Facilities Office.

Work shall not commence on any circuit until:

a. The circuit is correctly identified in the presence of the electrical contractor's superintendent or foreman, the Engineer, Airport Operations, or their authorized representative.

b. After identity of the circuit is established, and the circuit disconnected, the time and date shall be recorded by the Engineer.

c. The switch shall be locked in the open position or opened in a manner, which will prevent accidental restoration.

d. The circuit shall be tagged with an approved warning tag by the electrical contractor's superintendent. The tag shall state, the company's name, the electrician's name responsible for the disconnection, date and time and the project name and project number.

Restoration shall be accomplished and tags removed only by the electrical contractor's superintendent in the presence of Airport Operations, or their authorized representative.

The Engineer shall record time, date and operational status of circuit after restoration.

No circuit shall be disconnected or unplugged before color code identification by taping.

No circuit shall be disconnected at power source before proper safety precautions are taken to prevent accidental restoration.

When possible, circuits shall be restored by the same person who disconnected the circuit. When not possible, Airport Operations or their authorized representative shall perform restoration.

e. As a minimum, the Lock/Tag/Try procedure shall comply with NFPA 70E and the Owner's requirements. At a minimum, the circuit breaker serving the de-energizd lighting circuits shall be open and locked out, the CCR switch should be moved to the off position, the S1 cutout shall be open and locked and the circuit shall be locked out via the existing airfield lighting control system.

TEMPORARY AIRFIELD LIGHTING

104-4.2 TEMPORARY AIRFIELD LIGHTING. Temporary electrical fixtures and conductors are allowable when necessary, but shall be installed as follows:

a. Where temporary lights are to be installed on a paved surface, temporary lights shall be bolted to the pavement in a manner rendering the light stationery and allowing space for conductors to enter or exit and to be spliced.

b. When the above is not practical, lights shall be fastened to a weighted object adaptable for the purpose and of sufficient weight to inhibit movement by jet engine blast.

c. Temporary conductors supplying temporary lights shall be installed in a rigid galvanized steel conduit system and secured every five feet to prevent movement by jet engine blast.

d. All joints or splices in temporary conductors shall have heat shrink tubing with integral sealant applied to secure mechanical and electrical connection and prevent water entry.

e. All plug-in connections shall have heat shrink tubing with integral sealant applied to prevent accidental disconnection and shall be color code taped to expedite quick, efficient disconnection and restoration.

f. Temporary airfield lighting and signage shall conform as closely as possible to permanent locations normally on the taxiway or runway and that shall guide aircraft in a safe path away from all possible accident-prone areas.

The Contractor shall provide four sets of marked-up, ‘As-Built’ temporary lighting plans to the Engineer prior to final temporary lighting and signage connections.

Closed taxiways and runways shall be so marked in a manner acceptable to FAA and the Owner and said marking shall be kept in acceptable condition. This item shall include, at the Engineer’s discretion the temporary removal or covering of airfield signage.

CAUTION: The series lighting circuit must always be complete before a regulator is energized. Normal circuit voltage is less than 5,000 volts, open circuit voltage can be more than 10,000 volts. All personnel shall be instructed to protect the integrity of the lighting circuit. Turn off, lock out and tag the constant current regulator at the vault before opening the circuit. Continuity of the circuit shall be checked before the regulator is reconnected and reenergized.

The installation and/or removal of lighting equipment may be critical to airport operations; therefore, the Contractor shall follow work schedules established in the plans and specifications or as directed by the Engineer. The temporary system shall be installed in accordance with the contract documents, FAA Advisory Circulars and if applicable the National Electrical Code and/or local code requirements.

The Contractor shall provide temporary wiring as required to reconnect existing airfield lighting and signage to provide guidance for aircraft to pass through the construction areas on those taxiways/runways,

which must remain open.

It shall be the Contractor's responsibility to determine that all airfield lighting circuits, except those that are serving closed taxiways or runways, are completely operational, using tower controls (if applicable), at the end of each work shift and shall so certify to the Engineer before leaving the work site. Day shift report of system operation shall be at 4 p.m. Second shift report shall be 1 hour before dark. Any other shift shall report 1 hour prior to the need for airfield lighting or as determined by the Engineer. Should bad weather cause poor visibility, the Engineer may require additional status reports of system operability and may call for the operation of the lighting system at any time. In the event of lighting system failure, the Contractor shall immediately take the necessary steps to restore proper operation.

Whenever the scope of work requires connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. This test shall be performed prior to any activity affecting the respective circuit. The Contractor shall record the results on the forms included in Item L-131 Demonstrations, Tests and Performance Verification. When the circuit is returned to its final condition, the circuit's insulation resistance shall be checked again in the presence of the Engineer. The Contractor shall record the results on the forms included in Item L-131. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs, to the circuit, to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, etc. if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance Manuals, see Item L-106, Submittals, Record Documents and Maintenance Manuals.

TEMPORARY AREA/BUILDING LIGHTING

104-4.3 TEMPORARY ELECTRICAL AND LIGHTING INSTALLATION. Temporary electrical and/or lighting fixtures shall be provided in operational areas of buildings, where required, to maintain public safety and continued airport operations.

Temporary lighting must be installed to ANSI/OSHA standards for impacted area.

Temporary installations shall be approved by Airport Operations or their authorized representative.

The cost of temporary area/building lighting shall be absorbed in and considered incidental to the various work items.

104-4.4 MISCELLANEOUS REGULATIONS. Draw-out type breakers, regardless of operating voltage must be drawn completely out to open position and tagged and locked out per 104-4.1.

In hazardous locations, regardless of class, all electrical tools and extension cords shall be of a type approved for use in such areas.

No counterpoise conductors (or any other conductors) may be joined, connected, or affixed to any terminal, grounding electrode, or other point or attachment by any method except those approved by the Engineer.

All counterpoise or grounding systems, when severed or damaged, shall be immediately repaired by the Contractor in accordance with Item L-108, Installation of Underground Cable for Airports and inspected by the Engineer.

No high voltage switch shall be engaged or disengaged under load.

All backhoes, cranes, etc., shall be enclosed by safety pylons or other approved markers and rope festooned between the pylons, where applicable.

All security gates in use by contractors are the responsibility of the Contractor, and must be used in a fully secure manner. Any damage to a security gate shall be reported immediately to the Engineer.

METHOD OF MEASUREMENT

104-5.1 This item includes all materials, labor, transportation incidentals and services required for the temporary airfield lighting and signage as shown on the plans, complete and in place, and accepted by the Engineer.

BASIS OF PAYMENT

104-6.1 Work of this item shall include temporary airfield lighting equipment and installation, but shall not be limited to, light fixture assemblies with anchor plates, conduit, cabling, sandbags, anchor bolts, connector kits, mounting hardware, tags, ground rods, grounding connections and terminations, phasing and coordination, and all labor, equipment, tools and incidentals necessary to complete in place the item in accordance with these specifications and as indicated on the drawings. Payment shall be made at the contract lump sum price.

Payment will be made under:

L-104-1	Temporary Airfield Lighting Jumpers – Complete	per lump sum

END OF ITEM L-104

ITEM L-105 ALTERATIONS, REMOVAL AND DEMOLITION

GENERAL

105-1.1 DEFINITIONS. Removal shall mean the dismantling of existing materials, components, equipment, and utilities. Removed items shall be handled, prepared for storage, transported to storage areas as specified.

Demolition shall mean the dismantling and disposal of existing materials, components, equipment, and utilities which cannot or will not be reused or which will have no salvage value, or which cannot be reused due to unrepairable damage caused by age, non-demolition related reasons, etc. All demolished items not designated to be turned over to the Owner shall be disposed of in a safe manner and at a location acceptable to the Owner.

All items to be turned over to the Owner shall be properly enclosed or boxed to protect the items from damage and transported by the Contractor to a location on the Owner's property, designated by the Engineer.

The installation and/or removal of lighting equipment may be critical to airport operations; therefore, the Contractor shall follow the work schedule established in the plans and specifications or as directed by the Engineer. The system shall be installed in accordance with the National Electrical Code and/or local code requirements.

The Contractor shall provide temporary wiring as required to reconnect existing circuits to provide guidance for aircraft to pass through the construction areas on those taxiways/runways which must remain open. The Contractor shall check all temporary circuits before dark each day to assure that they are operational. In the event of failure, the Contractor shall immediately take steps to restore operation.

105-1.2 CONDITION OF EXISTING FACILITIES. The Contractor shall verify the areas, conditions, and features necessary to tie into existing construction. This verification shall be done prior to submittal of shop drawings, fabrication or erection, construction or installation. The Contractor shall be responsible for the accurate tie-in of the new work to existing facilities.

Special attention is called to the fact that there may be piping, fixtures or other items in the existing systems which must be removed or relocated in order to perform the alteration work. All conduit, wiring, boxes, etc., that do not comply with these specifications shall be removed or corrected to comply with these specifications. All unused conduit not removed shall be identified and a pull line shall be installed. The work shall include all removal and relocation required for completion of the alterations and the new construction.

Whenever the scope of work require connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Owner and Engineer. The Contractor shall record the results on the forms included in these specifications. When the circuit is returned to its final condition, the circuit's insulation resistance shall be checked again in the presence of the Owner and Engineer. The Contractor shall record the results on the forms included in these specifications. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance Manuals as described in Item L-106, Submittals, Record Documents and Maintenance

Manuals.

105-1.3 OCCUPANCY AND USE OF EXISTING FACILITIES. The Owner will occupy and use the facilities within the areas of work during the entire construction period. The Contractor shall be required to plan and coordinate his activities in order to provide all necessary controls for the abatement of dust, noise, and inconvenience to the Owner personnel during all phases of the work.

105-1.4 VACATING OCCUPIED AREAS. The Owner will remove all portable items of furniture, equipment, and fixtures prior to the start of work.

105-1.5 SAFETY REQUIREMENTS. The Contractor shall conduct alterations and removal operations in a manner that will ensure the safety of persons in accordance with the requirements of CFR 29 PART 1926 and 1910.

105-1.6 CLASSIFICATION OF REMOVED/DEMOLISHED ITEMS. Existing materials and equipment indicated to be removed will be classified as "salvageable" and shall remain the property of the Owner or will be classified as "debris" and shall be disposed of legally off the airport.

Reusable salvaged items:

Salvaged materials and equipment shall be reused in the work as described on the contract drawings, unless noted otherwise.

Items classified as debris shall be legally disposed of off the airport property. The cost of such disposal shall be included in the cost of other items of work.

Retained salvaged items:

Salvaged materials and equipment to be retained by the Owner but not reused in the work shall be turned over to the Owner at a site at the facility to be determined by the Owner. Retained salvaged items shall be stored on Owner property where indicated by the Owner.

105-1.7 TEMPORARY PROTECTION. The Contractor shall provide and maintain the following requirements.

Protection of persons and property shall be provided throughout the progress of the work in accordance with these specifications.

Provide temporary enclosures and partitions prior to starting alterations and removal of work. Such items shall protect existing materials, equipment, and other remaining building or system components from damage by weather and construction operations.

Provide temporary enclosures to isolate space utilized by equipment during construction, from dirt, dust, noise, and unauthorized entry.

Provide temporary exits, entrances, and protected passages where work prevents the use of existing facilities.

Provide weathertight temporary enclosures over and around openings to be made in existing exterior

construction prior to the start of work. The Contractor shall maintain such temporary enclosures until new construction will protect the interior of existing facilities from the elements.

Provide temporary exterior wall construction which will be designed and fabricated to resist an applied horizontal wind pressure of not less than 130 mph.

Provide temporary exterior roof construction which will be capable of supporting an applied vertical live load of not less than 200 psf, uniformly distributed over the entire roof area.

Design and fabricate temporary enclosures to maintain temperatures inside the existing facilities within a range of plus-or-minus 5 degrees F of normal operating conditions.

Provide temporary jet blast structures which will withstand the jet blast with a safety factor of 2.

EXECUTION

105-2.1 DISCONNECTING UTILITIES. Prior to the start of work, the necessary utilities serving each area of alteration or removal will be shut off by the Owner and shall be disconnected and sealed by the Contractor, as required. Lockout/Tag/Try procedures shall be utilized in accordance with Item L-104, General Electrical Safety Requirements and Temporary Airfield Lighting.

105-2.2 TEMPORARY UTILITY SERVICES. The Contractor shall install temporary utility services in satisfactory operating condition before disconnecting existing utilities. Such temporary services shall be maintained during the period of construction and removed only after new permanent services have been tested and are in operation.

105-2.3 REMOVAL WORK. The Contractor shall not disturb the existing construction beyond that indicated or necessary for installation of new work. Temporary shoring and bracing for support of building components to prevent settlement or other movement shall be as indicated and as required to protect the work.

The Contractor shall provide protective measures to control accumulation and migration of dust and dirt in all areas of work, particularly those adjacent to occupied areas. The Contractor shall remove dust, dirt, and debris from the areas of work daily.

105-2.4 SALVAGEABLE MATERIALS AND EQUIPMENT. The Contractor shall remove all salvageable materials and equipment in a manner that will cause the least possible damage thereto. Removed items which are to be retained by the Owner shall be carefully handled, stored, and protected.

The Contractor shall provide identification tags on all items boxed or placed in containers, indicating the type, size, and quantity of materials.

105-2.5 BUILDINGS AND STRUCTURES. The Contractor shall perform removal operations in existing buildings as indicated and as otherwise required to complete the work.

Existing concrete shall be demolished, removed, and disposed of. Square, straight edges shall be provided where existing concrete adjoins new work and at other locations where indicated. Existing steel reinforcement shall be protected where indicated; otherwise, it shall be cut off flush with face of concrete.

The Contractor shall dismantle steel components at field connections and in a manner that will prevent bending or damage.

The use of flame-cutting torches will be permitted only when other methods of dismantling are not practical, and when approved in writing by the Owner or Engineer.

105-2.6 ELECTRICAL EQUIPMENT AND FIXTURES. Wiring systems and components shall be salvaged. Loose items shall be boxed and tagged for identification.

All unused conduit not removed shall have a pull string installed and shall be noted on the record drawings.

Primary, secondary, control, communication, and signal circuits shall be disconnected at the point of attachment to their distribution system.

The Contractor shall remove and salvage electrical fixtures. Incandescent lamps, mercury-vapor lamps, and fluorescent lamps shall be salvaged, boxed and tagged for identification, and protected from breakage.

The Contractor shall remove and salvage switches, receptacles, fixtures, transformers, constant current regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. These items shall be boxed, and tagged for identification according to type and size.

The Contractor shall remove and dispose of conductors and conduits not used in the finished work and shown to be demolished on the plans. The cost of the conduit and cable removal shall be incidental the removal of the edge lights and sign bases.

DEMOLITION

105-3.1 DEMOLITION OPERATIONS. Demolition operations shall be conducted to ensure the safe passage of persons to and from facilities occupied and used by the Owner, and to prevent damage by falling debris or other cause to adjacent buildings, structures, and other facilities.

The sequence of operations shall be such that maximum protection from inclement weather will be provided for materials and equipment located in partially dismantled structures.

105-3.2 MAINTAINING TRAFFIC. Demolition operations and removal of debris to disposal areas shall be conducted to ensure minimum interference with runways, taxiways, aprons, roads, streets, walks, and other facilities occupied and used by the Owner.

Streets, walks, runways, taxiways and other facilities occupied and used by the Owner shall not be closed or obstructed without written permission.

105-3.3 REFERENCE STANDARDS REQUIREMENTS. Demolition operations shall be conducted to ensure the safety of persons in accordance with ANSI A 10.6 Safety Requirements for Demolition.

Demolition shall be conducted in accordance with O.S.H.A., State and local requirements.

DISPOSAL OF DEMOLISHED MATERIALS

105-4.1 GENERAL. The Contractor shall dispose of debris, rubbish, scrap, and other non-salvageable

materials resulting from demolition operations. Demolished materials shall not be stored or disposed of on Airport property.

105-4.2 REMOVAL FROM OWNER PROPERTY. Materials classified as debris shall be transported from Owner property and legally disposed at no additional cost to the Owner. Permits and fees for disposal shall be paid by the Contractor.

METHOD OF MEASUREMENT

105-6.1 This item includes all materials, labor, transportation incidentals and services required for the airfield electrical demolition as shown on the plans. It is the intent of the demolition pay item that all equipment, devices, fixtures, wiring, materials, systems and appurtenances, etc. which are no longer required as a result of the project to be removed shall be measured by the contract unit per each.

BASIS OF PAYMENT

105-7.1 Payment will be made at the contract price per each for required airfield electrical demolition items. This item includes all materials, labor, transportation, incidentals and services required for the demolition as shown on the plans. This item includes any temporary wiring, fixtures, etc. required to maintain the existing airfield lighting systems to the satisfaction of the Owner and Engineer. It is the intent of the demolition pay item that all equipment, devices, fixtures, wiring, materials, systems and appurtenances, etc. which are no longer required as a result of the project be removed.

Payment will be made under:

L-105-1	Demolish Existing Fixture/Base Can in Turf	per each
L-105-2	Demolish Existing Fixture/Base Can in Full Strength Pavement	per each
L-105-3	Demolish Existing Sign and Foundation.	per each
L-105-4	Demolish Existing Handhole/ Manhole	per each
L-105-5	Remove Fixture and Transformer, Install New Steel Cover on Existing Base Can	per each

END OF ITEM L-105

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ITEM L-106

SUBMITTALS, RECORD DOCUMENTS AND MAINTENANCE MANUALS

DESCRIPTION

106-1.1 GENERAL. The items described in this section are applicable to all electrical work by the Contractor. Where the contract special conditions or general provisions also apply, the stricter of the documents shall apply.

106-1.2 SCOPE. This section includes the requirements for submittals, record documents operation and maintenance (O&M) manuals. All submittals and O & M Manuals shall be submitted in book form as described in this item.

SHOW DRAWINGS AND SAMPLES

106-2.1 REQUIREMENTS FOR SHOP DRAWINGS AND SAMPLES. Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor, and which illustrate some portion of the work.

Submittal data for electrical materials and equipment shall consist of shop drawings and/or catalog cuts showing technical data as necessary to evaluate the material or equipment, to include dimensions, wiring diagrams, performance curves, ratings, control sequence and other descriptive data necessary to describe fully the item proposed and its operating characteristics.

Samples are physical examples furnished by the Contractor to illustrate materials, equipment or workmanship, and to establish standards by which the work will be judged. Each sample shall be accompanied by the manufacturer's instructions regarding installation, operation and maintenance and shall be identified by item number, and specification.

The Contractor shall review, stamp with his approval and submit to the Engineer, one (1) reproducible and seven (7) prints of shop drawings, seven (7) copies of submittal books and three (3) sets of samples where required (instead of paper copies of the submittals the contractor may submit one (1)) copy of all documents listed above in a electronic Adobe Acrobat form), as described in this item, within fifteen (15) days of notice to proceed.

If the Contractor desires to deviate from the requirements of the contract documents, the Contractor shall separately submit all deviations from the requirements of the contract documents in shop drawings or samples. The submission shall direct in writing the specific attention of the Engineer to the deviations, and shall contain all required data and supporting documentation necessary for an evaluation of the proposed deviation. Any submission or deviation not identified as heretofore mentioned shall be rejected and require resubmission. Separate written approval of all deviations by the Engineer for all design related deviations and by the Owner for all other deviations is required before the Contractor may perform the work covered by such deviation. By requesting a deviation, the Contractor makes the representations contained in this section.

If approval is given, the Contractor will not be excused from producing work in conformity with contract requirements. If a trial use establishes the work does not meet the contract requirements, the Contractor

shall take such action as the Engineer determines necessary to meet the contract requirements. No change in contract time will be made as a result of changes made under this subparagraph. By requesting a deviation, the Contractor makes the representations contained in this section.

106-2.1.1 Substitutions will only be considered after bid date only if the following conditions are met and allowed by other sections of these specifications.

a. Request for substitution is submitted no later than 15 days after notice to proceed for construction is awarded to the Contractor.

b. Request for substitution includes appropriate credit to the project cost. This credit must be submitted with request for substitution in order for substitution to receive any consideration.

c. Samples are to be submitted for all substituted light fixtures, wiring devices and other items deemed necessary by the Engineer to determine that the substituted item meets all specifications and requirements before approval of substitutions can be made.

d. Samples shall be submitted within 15 days after the award of the contract.

e. Request for substitution shall include the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and that data or any other data or information necessary for the Engineer to determine that the equipment meets all specifications and requirements.

f. Where permitted and approved, the substitution must conform to space requirements. Substitutions that cannot meet space requirements, which is the substitution Installer's responsibility whether approved or not, shall be replaced at the Contractor's expense. Any substitution modifications of related systems, as a result of the substitution, shall be made at the Contractor's expense.

g. The Contractor represents that it has personally investigated the proposed substitution and determined that the proposed substitution is equal or superior in all respects to the specified method or equipment.

h. The Contractor represents that it will provide a warranty for the substitution identical in all respects to the warranty for the specified method or equipment.

i. The Contractor represents that it will coordinate the installation of the accepted substitute, making changes as may be required for the work to be complete in all respects at no additional costs to the Owner.

The Engineer shall be the sole judge of whether the proposed "or equal" is suitable for use in the work.

106-2.1.2 Substitutions will be considered prior to bid date only if all the following conditions are met:

a. A written request has been submitted to the Engineer for approval at least 10 days prior to the bid date.

b. Samples are to be submitted for all substituted light fixtures, wiring devices and other items deemed necessary by the Engineer to determine that the substituted item meets all specifications and requirements before approval of substitutions can be made.

c. Samples shall be submitted within 15 days after the award of the contract.

d. Request for substitution shall include the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and that data or any other data or information necessary for the Engineer to determine that the equipment meets all specifications and requirements.

e. Substitution is approved and included in an addendum.

By approving and submitting shop drawings and samples, the Contractor thereby represents that he/she has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that the Contractor, has checked and coordinated each shop drawing and sample with the requirements of the work of the contract documents.

Unless otherwise stated in the contract documents, the Engineer will review and approve shop drawings and samples within fifteen (15) days after receipt, but only for conformance with the design concept of the project and with the information given in the contract documents. The Engineer's approval of a separate item shall not indicate approval of an assembly in which the item functions.

The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected shop drawings or new samples until approved. The Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections requested by the Engineer on previous submissions.

The Engineer's approval of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the contract documents unless the Contractor has informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written approval to the specific deviation. **The Engineer's review of submittals shall not relieve the Contractor from responsibility for errors or omissions in the shop drawings or samples.**

The submittals will be reviewed for design intent and general compliance with the information contained in the drawings and specifications. The Contractor is responsible for dimensions, quantities, fabrication processes and methods of construction, coordination of the Contractor’s work with that of all trades. The Contractor shall be responsible for satisfactory performance of his work and supplying a complete and operational system.

No portion of the work requiring a shop drawing or sample submission shall be commenced until the submission has been approved by the Engineer. All such portions of the work shall be in accordance with approved shop drawings and samples.

Samples, upon request, shall be submitted after written notice of acceptance and approval has been made of each substitution. The Engineer reserves the right to reject the sample should the sample not meet the requirement of the contract documents.

106-2.2 SUBMITTAL BOOKS. Submittal books shall consist of a hard cover, view type, 3-ring binder sized to hold 8 ½" x 11" sheets.

Each binder is to be adequately sized to comfortably hold required submittals. Minimum spline size to be 1", maximum spline size to be 3" (provide additional binders if 3" size is not sufficient to properly hold submittals). Each binder shall be adequately sized to hold the submittal information plus an additional 25% of the submittal sheet count.

Binder covers to have outer clear vinyl pocket on front and back cover (to hold 8 ½" x 11" sheet) and on spline (to hold spline width x 11" sheet). Binders shall be Wilson Jones Standard Locking D-Ring View Binders or approved equivalent. Provide correct designation of project in each pocket, see "EXAMPLES" Appendix A Figures 1 and 2 included at the end of this section. Description sheet is to be white with black letters, maximum sheet height of 11" high and full width of pocket. Description is to describe project and match project drawing/specification description. Description to include submittal type. One (1) for the Airfield Lighting System materials (black) and one (1) for the Airfield Lighting Control System (blue).

106-2.3 SUBMITTAL BOOK CONTENTS. Submittal books to include:

a. First sheet(s) in book shall be a photocopy of the cover sheet see Appendix A Figure 1.

b. The second sheet shall be a table of contents.

c. Third sheet shall be prepared and filled out by the Contractor and shall list project addresses, see Appendix A Figure 3.

d. Fourth sheet shall also be filled out by Contractor and list project information for project, Appendix A Figure 4.

e. Provide Wilson Jones, reinforced clear, ring binder indexes, 5 tab No. WJ-54125 or approved equivalent with the appropriate specification section number, and a typed index for each section.

f. Submittals consisting of marked catalog sheets or shop drawings shall be inserted in the binder in proper order. Submittal data shall be presented in a clear and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable).

g. Shop Drawings: Drawings to include identification of project and name of Engineer, Contractor, subcontractors and suppliers, data, number sequentially and indicate the following:

(1) Fabrication and erection dimensions.

(2) Arrangements and sectional views.

(3) Necessary details, including complete information for making connections with other work.

(4) Kinds of materials and finishes.

(5) Descriptive names of equipment.

(6) Modifications and options to standard equipment required by the work.

(7) Leave blank area, size approximately 4 x 2 ½ inches, near title block (Engineer's

stamp imprint).

(8) Point-to-point wiring diagrams.

(9) Conduit/raceway rough-in drawings.

(10) See specific sections of specifications for further requirements.

106-2.4 SUBMITTAL BOOKS PRODUCT DATA. Technical data is required for all items as called for in the specifications regardless if item furnished is as specified.

a. Submit technical data verifying that the item submitted complies with the requirements of the specifications. Technical data shall include manufacturer's name and model number, dimensions, weights, electrical characteristics, and clearances required. Indicate all optional equipment and changes from the standard item as called for in the specifications. Furnish drawings, or diagrams, dimensioned and in correct scale, covering equipment, showing arrangement of components and overall coordination.

b. In order to facilitate review of product data, insofar as practicable, they shall be noted, indicating by cross reference the contract drawings, note, and/or specification paragraph numbers where item(s) occur in the contract documents. At the end of each section insert a copy of the applicable specification.

c. When specified in individual specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing in quantities specified for product data. Identify conflicts between manufacturers' instructions and contract documents. The Engineer shall make the decision on which procedure will be followed.

d. When specified in individual specification sections, submit manufacturers' certificate to the Engineer for review in quantities specified for product data. Indicate that material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits and certifications as appropriate. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

e. See specific sections of specifications for further requirements.

106-2.5 PROCESSING SUBMITTALS. Submit a minimum of seven (7) submittal books with separate tag marking on each copy for the Owner (1), Engineer (4), Contractor and Subcontractor (See other sections of these specifications for additional quantity requirements.) A properly organized electronic submittal as a PDF is acceptable in lieu of the books.

The Contractor shall review the submittal books before submitting to the Engineer. No request for payment will be considered until the submittal book has been reviewed and submitted for approval.

Submit under provisions Section 1. of the Special Conditions and this section of the specifications, whichever is the most-strict.

Product Data: For standard manufactured materials, products and items, submit one (1) copy or sets of data (per book). If submittal is rejected, resubmittal shall contain same quantity of new data.

Shop Drawings: For custom fabricated items and systems shop drawings, initially submit a transparency

(suitable for reproduction) together with two (2) prints made therefrom. When submittal is acceptable, furnish one (1) print per book made from the accepted transparency.

Acceptance: When returned to Contractor, the front of each submittal section will be marked with the Engineers stamp. If box marked "Submit Specified Item", or "Rejected" or "Revise and Resubmit" is checked, submittal is not accepted and Contractor is to correct and resubmit as noted. Contractor is to comply with notation making necessary corrections on submittal and resubmit for final record. If submittal is marked "Make Correction Noted" Contractor may begin construction utilizing the submitted item with corrections made. However, the corrected submittal must be resubmitted for record keeping purposes. Contractor is to comply with notation making necessary corrections on submittal and resubmit for final record.

If the submittal is marked "No Exception Taken" the Engineer took no exceptions to the submitted.

If the submittal is marked "Furnished as Noted", the Contractor shall make or note any corrections or requirements identified in the comments. Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the drawings and specifications. This check is only for review of the general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for; confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his or her work with that of all other trades and performing all work in a safe and satisfactory manner.

Note that the approval of shop drawings or other information submitted in accordance with the requirements herein before specified, does not assure that the Engineer, or any other Owner's authorized representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved, the ability of the material or equipment involved or the mechanical/electrical performance of equipment. Approval of shop drawings does not invalidate the plans and specifications if in conflict, unless a letter requesting such a change is submitted and approved on the Engineer's letterhead.

106-2.8 DELAYS. The Contractor is responsible for delays in project time accruing directly or indirectly from late submissions or resubmissions of shop drawings, or product data.

106-2.9 RE-SUBMITTALS. The Engineer shall be reimbursed the cost to review resubmittals subsequent to the second submittal.

RECORD DOCUMENTS

106-3.1 PROGRESS AND RECORD DRAWINGS. Keep one set of blue line prints on the job and neatly mark-up design drawings each day as components are installed. Different colored pencils shall be used to differentiate each system of electrical work. All items on progress drawings shall be shown in actual location installed. Drawings shall be inspected weekly for compliance and accuracy. Progress payments shall be withheld if the marked-up drawings are not current.

All underground ducts, conduits, drains, ground grids, force mains, etc., (all underground utilities) installed by the Contractor or located by the Contractor during the construction of this project shall be surveyed. The data shall be sufficient to accurately relocate the utility at a later date. The data shall include North-South and East-West coordinates and an elevation. This data shall be recorded on the as-built drawings.

All manholes and other structures installed by the Contractor shall be surveyed. The center of the structure shall be located by a North-South and East-West coordinate and an elevation. This data shall be recorded on the as-built drawings.

Change the equipment schedules to agree with items actually furnished. At the end of the project, all changes shall be transferred to a set of reproducible transparencies of the design drawings marked "As Built" and dated and stamped by the Contractor.

Prior to request for final payment, furnish a set of "As Built" sepia originals and four sets of prints along with the marked set defined above to the Engineer for approval. The final sepia originals shall be professionally drafted to indicate "As Built" conditions to the Engineer. The prints shall be stamped "As-Built", signed and dated by the electrical contractor.

The Contractor's failure to produce representative "As Built" drawings in accordance with requirements specified herein, shall be cause for the Engineer to produce such "As-built" drawings and the Contractor shall reimburse the Engineer for all costs to produce a set of "Record" drawings to the Owner's satisfaction.

Complete and sign the Progress and Record Document Certification Form in Appendix A Figure 5 and submit with the Operation and Maintenance Manuals. Submit one form for each Contractor/Subcontractor providing as-built information, include a copy of each form in the O & M Manuals.

OPERATION AND MAINTENANCE MANUALS

106-4.1 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS. Within each major division of work, each specification section in the contract documents which require submission of O & M information shall be individually identified by a typed index tab. The Contractor shall provide four (4) copies of manufacturer's manuals for all installed equipment. As a minimum, it shall contain the following:

a. Safety precautions used while maintaining the equipment.

b. Theory of circuit and system operation.

c. Complete schematic and interconnecting wiring diagrams

d. Complete parts list with each circuit component keyed to designations assigned on schematics and wiring diagrams. Complete information shall be given for each part to permit ordering for replacement purposes. This information shall include the components rating, name of manufacturer and the manufacturer's part number in addition to the following:

e. Recommended preventive maintenance, including care, cleaning, lubrication, service schedules, etc.

f. Troubleshooting procedures.

g. Physical characteristics (weight, size, mounting dimensions, etc.).

h. Installation instructions.

i. Operating instructions.

j. Recommended spare parts and usage for a 1 year period.

k. Submit for checking purposes a specific set of written operating instructions on each item which requires instructions to operate. After approval, provide one copy for insertion in each Operation and Maintenance Manual.

l. Submit for approval maintenance information consisting of manufacturer's printed instructions and parts list for each major item of equipment. After approval, insert information in each Operations and Maintenance Manual. Detailed schematic diagrams shall be furnished for all electrical/electronic equipment.

m. Bill of materials.

n. Physical layout plans.

o. Equipment supplier list.

p. Panel schedules shall be submitted with the respective panel data.

q. Special instructions.

r. Service maintenance contracts including the name, address and 24-hour phone number and contact of manufacturers authorized repair company.

There shall be no "Black Boxes" for which there are no schematic/wiring diagrams.

106-4.2 OPERATION AND MAINTENANCE MANUALS. O & M Manuals shall consist of hard cover, view type, 3-ring binders sized to hold 8 ½" x 11" sheets.

Each binder is to be adequately sized to comfortably hold required submittals. Minimum spline size to be 1", maximum spline size to be 3" (provide additional binders if 3" size is not sufficient to properly hold submittals). Each binder shall be adequately sized to hold the submittal information plus an additional 25% of the submittal sheet count.

Binder covers to have outer clear vinyl pocket on front and back cover (to hold 8 ½" x 11" sheet) and on spline (to hold spline width x 11" sheet). Binders shall be Wilson Jones Standard Locking D-Ring View Binders or approved equivalent. Provide correct designation of project in each pocket, see "EXAMPLES" Appendix A Figures 6 and 7 included at the end of this section. Description sheet is to be white with black letters, maximum sheet height of 11" high and full width of pocket. Description is to describe project and match pocket drawing/specification description. Description to include submittal type. One (1) for Airfield Lighting System Materials (black) and one (1) for the Airfield Lighting Control System (blue).

106-4.3 OPERATION AND MAINTENANCE MANUAL CONTENTS. O & M Manuals to include:

a. First sheet in binder shall be a photocopy of the cover sheet see Appendix A Figure 6.

b. The second sheet shall be a table of contents.

c. The third sheet shall be filled out by the Contractor and shall list project addresses, see Appendix A Figure 3.

d. The fourth sheet shall also be filled out by the Contractor and list project information for project, see Appendix A Figure 4.

e. Provide Wilson Jones, reinforced, clear, ring binder indexes, 5 tab No. WJ-54125 or approved equivalent with the appropriate specification section number, and typed index for each section.

f. Shop Drawings: Shop drawings shall be a copy of the final and approved shop drawings submitted as required in Item L-106-2, Shop Drawings and Samples. These shall be inserted in the binder in proper order. Each catalog sheet shall clearly identify where the product is used and the drawing identification for equipment. Clear vinyl pockets shall be provided for insertion of shop drawings.

g. Product data and/or catalog sheets shall be a copy of the final and approved submittal submitted as required in Item L-106-2, Shop Drawings and Samples. These shall be inserted in the binder proper order. Each catalog sheet shall clearly identify where the product is used and the drawing identification for equipment.

h. Warranty/Guarantee: Provide a copy of the warranty/guarantee and letters of certification, in respective locations in the O & M Manual binder. Original warranty/guarantee is to be incorporated into a separate project warranty book with warranty/guarantees provided for other sections and divisions of the specifications and submitted for Engineer approval.

i. Performance Verification and Demonstration to Owner (See Appendix A Figure 2 form in L-131, Demonstrations, Tests and Performance Verification).

j. Tabulated Data (as required in L-131, Demonstrations, Tests and Performance Verification).

k. Required Check-Out Memos (see Appendix A Figure 1 form in L-131, Demonstrations, Tests and Performance Verification).

l. Progress and Record Drawing Certification (Appendix A Figure 5)

m. Ground Test Information (See Appendix A Figure 3 form in L-131, Demonstrations, Tests and Performance Verification).

106-4.4 PROCESSING O & M MANUALS. Submit four (4) sets of O & M Manuals. The Contractor shall review the manuals before submitting them to the Engineer.

106-4.5 DELAYS. The Contractor is responsible for delays in project time accruing directly or indirectly from late submissions or resubmissions of the Operation and Maintenance Manuals.

106-4.6 RE-SUBMITTALS. The Engineer shall be reimbursed the cost to review Operation and Maintenance Manuals, re-submittals subsequent to the second submittal.

METHOD OF MEASUREMENT

106-5.1 The items described in this section are incidental to other sections and not shall be measured for payment.

BASIS OF PAYMENT

106-6.1 No direct payment shall be made for the work described in this section. The work described in this section is incidental to other items and shall be paid for in the respective bid item of which it is a component part.

"EXAMPLE"

RALEIGH-DURHAM INTERNATIONAL AIRPORT
RALEIGH, NC

TAXIWAY B REHABILITATION

AIRFIELD LIGHTING SUBMITTAL BOOK

March xx, 2018

APPENDIX A - FIGURE 1

"EXAMPLE"

RALEIGH-DURHAM INTERNATIONAL AIRPORT
RALEIGH, NC

TAXIWAY B REHABILITATION

AIRFIELD LIGHTING SUBMITTAL BOOK

March xx, 2018

APPENDIX A - FIGURE 2

PROJECT ADDRESSES

OWNER:
RDU AIRPORT
RALEIGH, NC
919-740-7700

CONSULTING ENGINEERS:
WK DICKSON, Inc.
720 Corporate Center Dr.
Raleigh, NC 27607

WE, pllc
10911 Raven Ridge Rd
Suite 103-76
Raleigh, NC 27614
919-522-0628

GENERAL CONTRACTOR:

SUBCONTRACTORS:

SUPPLIERS:

APPENDIX A - FIGURE 3

PROJECT INFORMATION

Contractor shall fill in the blanks below and insert in the Submittal Books and the Operating and Maintenance Manuals. Submit one (1) sheet for each major division of Work.

Project Name RALEIGH-DURHAM INTERNATIONAL AIRPORT – TAXIWAY B REHABILITATION

Specification Division Number & Name: _____

Subcontractor: _____

Contact: _____ Phone Number: _____

Date Project Bid: _____

Project Start Date: _____

Days Allowed for Construction: _____

Target Completion: _____

Substantial Completion: _____

Certification Date: _____

	DATE SUBMITTED	DATE SUBMITTED
Closeout Documentation Manual:	_____	_____
Operating & Maintenance Manual:	_____	_____
Owner Performance Verification and Demonstrations:	_____	_____
Manufacturer's Performance Verification Memos:	_____	_____
Manufacturer's Test Data:	_____	_____
Record Documents:	_____	_____

PROGRESS AND RECORD DRAWING CERTIFICATION

This form shall be completed and submitted with the Record Documents. Submit one form for each Contractor/Subcontractor providing as-built information. Include a copy of this form in the Closeout Documentation Manual.

Project Name: RALEIGH-DURHAM INTERNATIONAL AIRPORT – TAXIWAY B REHABILITATION_____

Specification Division Number & Name:_____

The Contractor's and Subcontractor's signatures below certify that the attached drawings and specifications were marked and revised as items were installed/changed, during the course of construction, and that these documents represent an accurate "Record-As Built" condition of the work as actually installed.

_____

(Name of General Contractor)

_____

(Signature, Title, Date)

_____

(Name of Subcontractor)

_____

(Signature, Title, Date)

APPENDIX A - FIGURE 5

"EXAMPLE"

RALEIGH-DURHAM INTERNATIONAL AIRPORT
RALEIGH, NC

TAXIWAY B REHABILITATION

AIRFIELD LIGHTING OPERATION AND MAINTENANCE MANUALS

APPENDIX A - FIGURE 6

"EXAMPLE"

RALEIGH-DURHAM INTERNATIONAL AIRPORT
RALEIGH, NC

TAXIWAY B REHABILITATION

OPERATION AND MAINTENANCE MANUAL

APPENDIX A - FIGURE 7

ELECTRICAL MATERIALS SUBMITTAL LIST

Spec. Section Number	Submittal Description	Date Received	Date Returned	Status
L-100	Certification of Electrical Contractor's Experience Copy of Electrical Contractor's applicable State Electrical License Certification of Electrical Superintendent's Experience Electrical Superintendent's resume' and copy of Journeyman Electrician License Electrical Superintendent's References, Airport Name, Contact and phone number Copy of each Journeyman Electrician's License Copy of each Apprentice Electrician's License Existing Facilities Investigation Memorandum Phenolic nameplates - 1 to 1 scale detail of each nameplate SS pop rivets and silicone caulk Adhesive backed cloth markers Color code paint Permanent black marker Self-adhesive clear printed labels w/ black typed letters Welder qualifications Welding procedures Written verification providing proof of correspondence with representatives of all utilities/agencies to locate all existing utilities/systems within the project limits			
L-104	Temporary Airfield Lighting Plan and Procedures Temporary Airfield Lighting, Signage and Cabling			
L-108	Each component shall be identified with the specific pay item of which it is a component part. List of proposed Airfield Lighting Cable Splicers Airfield Lighting Cable Splicer Qualifications Cable Installation Plan Cable Installation Reports All wire, conductors and cable assemblies including manufacturer's minimum cold weather installation temperature, minimum bend radius, maximum pull tension L-824 5kV cable L-824 5kV cable Production Test Reports L-823 Connector Kits Counterpoise Wire Ground Wire			

	Compression butt splices Compression lugs C-Taps Compression tooling, calibration certificate, procedures and manufacturer's recommended practices Penciling tool Mechanical lugs and torquing requirements Torque wrench, calibration certificate and manufacturer's recommended practices Wire nuts Terminal blocks Insulation replacement systems, i.e. tapes, heat shrink tubing, etc. Electrical coatings Joint compound Pull ropes Cable pulling lubricant Color coding materials and/or methods Detectable marker tape with message and color Wire/cable markers Brass ID Tags and cable ties Brass ID Tag stamped samples - 3 samples for each circuit impacted Stainless steel wire mesh strain relief baskets for 5 kV cables Copper-clad steel ground rods Ground rod couplings Ground rod driving studs Exothermic connections Electrical coatings Electrical joint compound Grounding conductors Copper bus bar by size, type and use Ground rod inspection pit			
L-110	Rigid galvanized steel (RGS) conduit Weatherproof conduit hubs Locknuts Grounding bushings w/ insulated throat Bushings w/ insulated throat Condulets, covers and gaskets Expansion fittings Conduit thread compound Long radius RGS bends Cold galvanizing compound Asphaltum paint Schedule 40 PVC conduit Schedule 40 PVC end bells, fittings, terminations, cleaner and solvent cement Schedule 40 PVC duct spacers and duct plugs			

	Expansion fittings Split duct and fittings Inner duct and fittings E-LOC Couplings P-610 concrete mix Cable racks, supports, ties and straps detectable marker tape Drain sumps Each item submitted shall include the contractors proposed installation detail			
L-115	Each component shall be identified with the specific pay item of which it is a component part. Complete assemblies shall be submitted for each pay item. Handholes Junction Boxes Junction Box Plazas Each item's submittal shall include the following as required: Signed and sealed shop drawings by a registered structural P.E. in the applicable state Grounding attachments Covers, frames, rings, etc. Spring assist mechanisms Pulling irons Cable racks Section sealant/mastic Reinforcement bars and wire mesh All accessories Each item submitted shall include the contractors proposed installation detail. All other components not previously listed or as requested by the Engineer.			
L-125	Each component shall be identified with the specific pay item of which it is a component part. Complete assemblies shall be submitted for each pay item. Shop drawings of each airfield lighting component, indicating FAA approval, shall be submitted to the Engineer for review and approval and be approved prior to ordering any materials for this item. This submittal shall include the proposed method of installation for all airfield lighting components. The submittal shall include data on all component parts of the item or system, and shall include the manufacturers list of recommended spare parts for one years use. The manufacturer of the signs proposed shall provide data,			

	certification, and five (5) airport references that each type of proposed fixture, as currently designed unless a new design that has not been required in the United States heretofore, has been in operation under normal airfield conditions a minimum of 3 years with a certified repair requirement rate of no more than three (3) percent. Spare parts guarantee Lamp prices and price guarantee Survey of existing fixtures, base cans Airfield lighting fixture manufacturer qualifications Identification/number markers Reinforcing steel SS bolting hardware including anti-rotational devices Anti-seize compound **L-858Y, R, L Signs** - including as applicable: signs, light bases (base cans), extensions and top sections, covers, gaskets, ground lugs, load rings, anti-rotational fins, spacer rings, flange rings, sign tethers, SS anchor bolts, SS bolting hardware, L-830 isolation transformers, frangible couplings, lamps, installation detail, all components, accessories and incidentals. Replacement Sign Panels Misc Sign Items L-858 sign message schedule Sign load calculation or test results supporting 200mph requirement per AC 150/5345-44 Vinyl die cut labels and sample **L-867B Base Can** **L-867D Base Can** **L-858Y, R, L, B sign panels** **Anti-Seize lube compound** **Spare Parts** Non-reflective cracking fabric Epoxy bonding compound including pavement compatibility statement Rebar P-610 All bolting hardware not previously submitted Each item submitted shall include the contractors proposed installation detail.			

	All other components not previously listed or as requested by the Engineer.			
L-125	Each component shall be identified with the specific pay item of which it is a component part. Complete assemblies shall be submitted for each pay item. Shop drawings of each airfield lighting component, indicating FAA approval, shall be submitted to the Engineer for review and approval and be approved prior to ordering any materials for this item. This submittal shall include the proposed method of installation for all airfield lighting components. The submittal shall include data on all component parts of the item or system, and shall include the manufacturers list of recommended spare parts for one years use. The manufacturer of the lighting fixtures proposed shall provide data, certification, and five (5) airport references that each type of proposed fixture, as currently designed unless a new design that has not been required in the United States heretofore, has been in operation under normal airfield conditions a minimum of 3 years with a certified repair requirement rate of no more than three (3) percent. Spare parts guarantee Lamp prices and price guarantee Survey of existing fixtures, base cans, etc. Airfield lighting fixture manufacturer qualifications Reinforcing steel SS bolting hardware including anti-rotational devices Anti-seize compound **Inpavement Edge Light** - including as applicable: light fixture, L-868B light bases (base cans), extensions and top sections, covers, gaskets, ground lugs, load rings, anti-rotational fins, spacer rings, flange rings, adapter rings, SS bolting hardware, L-830 isolation transformers, frangible couplings, lamps, installation detail, all components, accessories and incidentals. **Elevated Edge Light** - including as applicable: light fixture, L-867B light bases (base cans), extensions and top sections, covers, gaskets, ground lugs, load rings, anti-rotational fins, spacer rings, flange rings, adapter rings, SS bolting hardware, L-830 isolation transformers, frangible couplings, lamps, installation detail, all components, accessories and incidentals. Airfield Signage – including as applicable: sign unit, L-867B light bases (base cans), covers, gaskets, ground lugs, SS bolting hardware, L-830 isolation transformers, frangible			

	couplings, lamps, installation detail, all components, accessories and incidentals. **Anti-Seize lube compound** **Spare Parts** Non-reflective cracking fabric Epoxy bonding compound including pavement compatibility statement Rebar P-610 All bolting hardware not previously submitted Each item submitted shall include the contractors proposed installation detail. All other components not previously listed or as requested by the Engineer.			
L-131	Submit all materials, test equipment, written procedures, forms, and equipment calibration certificates for performing the following tests: Calibration Lab Qualifications Equipment dielectric testing Cable/conductor dielectric testing Qualifications of firm performing dielectric testing Insulation resistance (megger) testing Fixture wiring sequence testing procedure Lighting system burn-in Airfield lighting photometric testing procedure and equipment Qualifications of firm performing airfield lighting photometric testing Constant current regulator test procedures, test equipment, calibration procedures Airfield Lighting Control System and associated equipment Acceptance Testing Torquing of electrical terminations Torquing of anchor bolts Earth resistance testing Ground continuity/resistance testing Exothermic weld tests Equipment and support welding Transformer tests Testing required by equipment manuf. Welding procedures Welder qualifications			

	Pavement sensor testing procedure, commissioning procedure and results All other components not previously listed or as requested by the Engineer.			

END OF ITEM L-106

ITEM L-108 UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables direct buried and furnishing and/or installing power cables within conduit or duct banks in accordance with these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of any cable for FAA facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is covered under Item L-110 "Airport Underground Electrical Duct Banks and Conduits."

EQUIPMENT AND MATERIALS

108-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be approved under the Airport Lighting Equipment Certification Program described in Advisory Circular (AC) 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all

equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain an insulation resistance of 100 megohms minima, (1000V megger) with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

108-2.2 CABLE. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2.

Cable type, size, number of conductors, strand and service voltage shall be as specified on the plans.

108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG solid for counterpoise and No. 6 AWG stranded for ground wire conforming to ASTM B 3 and ASTM B 8, and shall be bare copper wire conforming to the requirements of ASTM D 33.

Ground rods shall be copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 10-feet (305 cm) long nor less than 3/4 in (19 mm) in diameter.

108-2.4 CABLE CONNECTIONS. In-line connections of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The Cast Splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by Minnesota Mining and Manufacturing Company, "Scotchcast" Kit No. 82--B, or as manufactured by Hysol® Corporation, "Hyseal Epoxy Splice" Kit No. E1135, or equivalent, is used for potting the splice is acceptable.

b. The Field-attached Plug-in Splice. Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is acceptable for field attachment to single conductor cable. It shall be the Contractor's responsibility to determine the outside diameter of the cable to be spliced and to furnish appropriately sized connector kits and/or adapters and heat shrink tubing with integral sealant.

c. The Factory-Molded Plug-in Splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The Taped or Heat-Shrinked Splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D 4388 and the plastic tape should comply with Mil Spec. MIL-I-24391 or Fed. Spec. A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made in accordance with the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except the base can ground clamp connector shall be used for attachment to the base can. All exothermic connections shall be made in accordance with the manufacturer's recommendations and listings.

108-2.5 SPLICER QUALIFICATIONS. Every airfield lighting cable splicer shall be qualified in making cable splices and terminations on cables rated above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 CONCRETE. Concrete for cable markers shall conform to Specification Item P-610, "Structural Portland Cement Concrete."

108-2.7 FLOWABLE BACKFILL. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153 "Controlled Low Strength Material".

108-2.8 CABLE IDENTIFICATION TAGS. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 TAPE. Electrical tapes shall be Scotch Electrical Tapes – number Scotch 88 (1-1/2" wide) and Scotch 130C linerless rubber splicing tape (2" wide), as manufactured by the Minnesota Mining and Manufacturing Company, or approved equivalent.

108-2.10 ELECTRICAL COATING. Scotchkote™ shall be as manufactured by Minnesota Mining and Manufacturing Company, or approved equivalent.

108-2.11 EXISTING CIRCUITS. Whenever the scope of work requires, connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Engineer. The test shall be performed in accordance with this item and prior to any activity affecting the respective circuit. The Contractor shall record the results on forms acceptable to the engineer. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the

Engineer. The Contractor shall record the results on forms acceptable to the engineer. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

CONSTRUCTION METHODS

108-3.1 GENERAL. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections, unless otherwise authorized in writing by the Engineer or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed or at least once in each access point where L-823 connectors are not installed.

Provide not less than 3 feet of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least 1 ft vertically above the top of the access structure. This requirement also applies where primary cable passes through empty base cans, junction and access structures to allow for future connections, or as designated by the Engineer.

108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS. This item includes the installation of the cable in duct banks or conduit as described below. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be in accordance with the latest National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and interferences are avoided.

Duct banks or conduits shall be installed as a separate item in accordance with Item L-110, “Airport Underground Electrical Duct Banks and Conduit.” The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to insure that the duct bank or conduit is open, continuous and clear of debris. Mandrel size shall be compatible with conduit size. The Contractor shall swab out all conduits/ducts and clean base can, manhole, etc. interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the base cans and all accessible points of entry to the duct/conduit system shall be

kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc. is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts. The cable shall be installed in a manner to prevent harmful stretching of the conductor, injury to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall be governed by cable manufacturer's recommendations. A non-hardening lubricant recommended for the type of cable being installed shall be used where pulling lubricant is required.

Contractor shall submit pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or the NEC requirements whichever is more restrictive shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 in vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, handholes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 in in size. The cable circuit identification shall match the circuits noted on the construction plans.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 in below finished grade, except as follows:

1) When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 in unless otherwise specified.

2) Minimum cable depth when crossing under a railroad track, shall be 42 in unless otherwise specified.

Dewatering necessary for cable installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay items as part of Item L-108. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-108 Item.

The Contractor shall excavate all cable trenches to a width not less than 6 in. Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 in below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 in sieve. Flowable backfill material may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall insure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

2) Trenching, etc., in cable areas shall then proceed, with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall be 3 in deep, loose measurement, and shall be either earth or sand

containing no mineral aggregate particles that would be retained on a 1/4 in sieve. This layer shall not be compacted. The second layer shall be 5 in deep, loose measurement, and shall contain no particles that would be retained on a 1 in sieve. The remaining 3rd and subsequent layers of backfill shall not exceed 8 in of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 in maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soil, and to the satisfaction of the Engineer. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of in accordance with the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located 6 in above the direct-buried cable or the counterpoise wire if present. A 4 - 6 in wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 in minimum below finished grade.

c. Restoration. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the topsoiling**,** seeding**,** and mulching as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4 - 6 in (100 - 150 mm) thick, extending approximately 1 in (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (60 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word “CABLE” and directional arrows on each cable marking slab. The letters shall be approximately 4 in (100 mm) high and 3 in (75 mm) wide, with width of stroke 1/2 in (12 mm) and 1/4 in (6 mm) deep.

The location of each underground cable connection, except at lighting units, or isolation transformers, or power adapters shall be marked by a concrete marker slab placed above the connection. The Contractor shall impress the word “SPLICE” on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the Engineer. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 SPLICING. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast Splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured in accordance with manufacturer's instructions and to the satisfaction of the Engineer.

b. Field-attached Plug-in Splices. These shall be assembled in accordance with manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 in (37 mm) on each side of the joint.

c. Factory-Molded Plug-in Splices. These shall be made by plugging directly into mating connectors. In all cases, the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 in (37 mm) on each side of the joint.

d. Taped or Heat-Shrinked Splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 in (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 in (75 mm) on each end) is clean. After scraping wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. Throughout the rest of the splice less tension should be used. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately 1 in (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

108-3.6 BARE COUNTERPOISE WIRE INSTALLATION FOR LIGHTNING PROTECTION AND GROUNDING. If shown on the plans or included in the job specifications, bare counterpoise copper wire shall be installed for lightning protection of the underground cables. Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are

installed to contain airfield cables. Where the cable or duct/conduit trench runs parallel to the edge of pavement, the counterpoise shall be installed in a separate trench located half the distance between the pavement edge and the cable or duct/conduit trench. In trenches not parallel to pavement edges, counterpoise wire shall be installed continuously a minimum of 4 in above the cable, conduit or duct bank, or as shown on the plans if greater. Additionally, counterpoise wire shall be installed at least 8 in below the top of subgrade in paved areas or 10 in below finished grade in un-paved areas. This dimension may be less than 4 in where conduit is to be embedded in existing pavement. Counterpoise wire shall not be installed in conduit.

The counterpoise wire shall be routed around to each light fixture base, mounting stake, or junction/access structures. The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 ft (150 m) apart around the entire circuit.

The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode grounding system. The connections shall be made as shown on the plans and in the specifications.

If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

1) A ground rod installed at and securely attached to each light fixture base, mounting stake if painted, and to all metal surfaces at junction/access structures.

2) Install an insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base and to all metal surfaces at junction/access structures. This equipment ground conductor shall also be exothermically welded to ground rods installed not more than 500 feet (150 m) apart around the circuit.

a. Counterpoise Installation Above Multiple Conduits and Duct Banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete cone of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22 ½ degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

b. Counterpoise Installation at Existing Duct Banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.7 EXOTHERMIC BONDING. Bonding of counterpoise wire shall be by the exothermic welding process. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the Engineer, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. For welds at light fixture base cans, all galvanized coated surface areas and "melt" areas, both inside and outside of base cans, damaged by exothermic bond process shall be restored by coating with a liquid cold-galvanizing compound conforming to U.S. Navy galvanized repair coating meeting Mil. Spec. MIL-P-21035. Surfaces to be coated shall be prepared and compound applied in accordance with manufacturer's recommendations.

c. All buried copper and weld material at weld connections shall be thoroughly coated 6 mil of 3M "Scotchkote," or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.8 TESTING. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase and results meeting the specifications below must be maintained by the Contractor throughout the entire project as well as during the ensuing warranty period.

Earth resistance testing methods shall be submitted to the Engineer for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the Engineer. All such testing shall be at the sole expense of the Contractor.

Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The Engineer shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

a. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

b. That all affected circuits (existing and new) are free from unspecified grounds.

c. That the insulation resistance to ground of all new non-grounded series circuits or cable segments is not less than 50 megohms.

d. That the insulation resistance to ground of all non-grounded conductors of new multiple circuits or circuit segments is not less than 50 megohms.

e. That all affected circuits (existing and new) are properly connected in accordance with applicable wiring diagrams.

f. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

g. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by ANSI/IEEE Standard 81, to verify this requirement.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer. Where connecting new cable to existing cable, ground resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Trenching shall be measured by the linear feet (meters) of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory.

When specified, separate measurement shall be made for trenches of various specified widths.

The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

Ground rod installations shall be incidental to the ancillary item for which it is associated (I.E. edge light, counterpoise wire…) If after the incidental ground rod is installed and it does not meeting the 25-ohm maximum, the contractor shall install a supplemental ground rod and the ground rod shall be paid for under a separate payment. The installation of a supplemental ground rod shall be approved by the airport prior to installation. .

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) of cable or counterpoise wire installed in trenches, duct bank or conduit, including ground rods and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack. Cable and counterpoise slack is considered incidental to this item and is included in the contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools,

and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

L-108-1	No. 8 AWG, 5 kV, L-824, Type C Cable	per linear foot
L-108-2	No. 6 AWG, Solid, Bare Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Ground Rods and Ground Connectors	per linear foot
L-108-3	3/4" x 10' Copper Clad Ground Rod - Supplemental	per each
L-108-4	Pavement Sensor Cable - Type IIA	per linear foot

MATERIAL REQUIREMENTS

AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle Cable Connectors
FED SPEC J-C-30	Cable and Wire, Electrical Power, Fixed Installation (cancelled; replaced by A-A-59544 Cable and Wire, Electrical (Power, Fixed Installation))
FED SPEC A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
ASTM B 3	Soft or Annealed Copper Wire
ASTM D 4388	Rubber tapes, Nonmetallic Semiconducting and Electrically Insulating

REFERENCE DOCUMENTS

NFPA No. 70	National Electrical Code (NEC)
MIL-S-23586C	Sealing Compound, Electrical, Silicone Rubber
NN	Building Industry Consulting Service International (BICSI)
ANSI/IEEE Std 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

END OF ITEM L-108

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete) installed in accordance with this specification at the locations and in accordance with the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandreling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables in accordance with the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance

by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 STEEL CONDUIT. Rigid galvanized steel conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standard 6, 514B, and 1242.

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings-shall conform to the requirements of Fed. Spec. W--C-1094, Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

The type of adhesive shall be as recommended by the conduit/fitting manufacturer.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 CONDUIT SPACERS. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads, They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1 inch maximum size coarse aggregate with a minimum 28 day compressive strength of 4000 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A 615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

110-2.7 FLOWABLE BACKFILL. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153 "Controlled Low Strength Material".

110-2.8 DETECTABLE WARNING TAPE. Plastic, detectable, color as noted magnetic tape shall be polyethylene film with a metallized foil core and shall be 6 in (150 mm) wide. Detectable tape is incidental to the respective bid item.

110-2.9 3/4" DRAINAGE PIPE. Drainage pipe shall be Type II, Schedule 40 PVC conduit. The type of adhesive shall be as recommended by the conduit/fitting manufacturer. The connection to the underdrain is incidental to the drainage pipe installation.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 in (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least

3 in (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 in below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 in below the subgrade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 in (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc. interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the base cans, manhole, pull boxes, etc. and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc. is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminate from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet.

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 in below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 in sieve. Flowable backfill may alternatively be used The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for

approval by the Engineer. If not shown on the plans, the warning tape shall be located six in above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared in accordance with the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet.

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed in accordance with Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

All excavation shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the Engineer and compacted in accordance with item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall insure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

2) Trenching, etc., in cable areas shall then proceed with approval of the Engineer, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 DUCT BANKS. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 in (45 cm) below the bottom of the base or stabilized base course

layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 in (45 cm) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (90 cm) beyond the edges of the pavement or 3 feet (90 cm) beyond any underdrains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, proper provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 in (75 mm) thick prior to its initial set. Where two or more conduits in the duct bank are intended to carry conductors of equivalent voltage insulation rating, the Contractor shall space the conduits not less than 1-1/2 in (37 mm) apart (measured from outside wall to outside wall). Where two or more conduits in the duct bank are intended to carry conductors of differing voltage insulation rating, the Contractor shall space the conduits not less than 3 in apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 in (75 mm) thick unless otherwise shown on the plans. End bells or couplings shall be installed flush with the concrete encasement at access points.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 in to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5 ft intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5 ft (150 cm) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 4 - 6 in (75 – 150 mm) wide tape 8 in (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT. Trenches for single-conduit lines shall be not less than 6 in (150 mm) nor more than 12 in (300 mm) wide, and the trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 in (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material

shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 in (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits are at least 18 in (45 cm) below the finished grade.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 2 in (50 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 in (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 in (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 in (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 in to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5 ft intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

110-3.4 MARKERS. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 in (100 - 150 mm) thick extending approximately 1 in (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building.

The Contractor shall impress the word “DUCT” or “CONDUIT” on each marker slab. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 in (100 mm) high and 3 in (75 mm) wide with width of stroke 1/2 in (12 mm) and 1/4 in (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 BACKFILLING FOR CONDUITS. For conduits, 8 in (200 cm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted in accordance with Item P-152 “Excavation and Embankment” except that material used for back fill shall be select material not larger than 4 in in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back, filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface: except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of in accordance with instructions issued by the Engineer.

110-3.6 BACKFILLING FOR DUCT BANKS. After the concrete has cured, the remaining trench shall be backfilled and compacted in accordance with Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 in in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface: except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of in accordance with instructions issued by the Engineer.

110-3.7 RESTORATION. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include topsoiling**,** seeding**,** and mulching shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated, resolution, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Payment will be made under:

L-110-1	1 Way 2-inch Conduit Direct Earth Buried	per linear foot
L-110-2	1 Way 2-inch Conduit in Asphalt Shoulder Pavement	per linear foot
L-110-3	1 Way 2-inch Conduit - Concrete Encased	per linear foot
L-110-4	2 Way 2-inch Conduit - Concrete Encased	per linear foot

L-110-5	4 Way 2-inch Conduit - Concrete Encased	per linear foot
L-110-6	1 Way 3/4 inch Conduit - Drainage Line	per linear foot

MATERIAL REQUIREMENTS

Fed. Spec. W-C-1094	Conduit and Conduit Fittings; Plastic, Rigid (cancelled; replaced by UL 514 Boxes, Nonmetallic Outlet, Flush Device Boxes, & Covers, and UL 651 Standard for Conduit & Hope Conduit, Type EB & A Rigid PVC)
Underwriters Laboratories Standard 6	Rigid Metal Conduit
Underwriters Laboratories Standard 514B	Fittings for Cable and Conduit
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
Underwriters Laboratories Standard 651	Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit (for concrete encasement)

END OF ITEM L-110

ITEM L-111

AIRFIELD LIGHTING SYSTEM TESTING

DESCRIPTION

111-1.1 This item shall consist of furnishing all equipment, materials and appliances necessary for testing of airfield lighting circuit installations and associated systems. Airfield lighting systems include airfield signage systems.

a. The Contractor shall provide all testing as required by this item, including retesting of failed items. The Contractor shall provide all electrical testing to confirm that lighting system installations associated with this project are acceptable. The Owner shall engage an independent agency to perform the repairs. Specified photometric testing, with the Contractor providing all testing support and assistance, shall be made at the Contractor's expense.

b. Requirements under this item shall be coordinated with the Engineer.

c. This section describes the testing and demonstrations furnished by the Contractor. All items furnished and/or installed by the Contractor shall be tested and demonstrated in accordance with these specifications. All equipment and labor required for testing and demonstrations shall be furnished by the Contractor.

d. The Contractor shall perform the necessary inspection and tests for some items concurrently with the installation because of subsequent inaccessibility of some components. The Engineer shall be notified by the Contractor forty-eight (48) hours in advance of any testing.

EQUIPMENT AND MATERIALS

111-2.1 GENERAL. Materials and equipment covered by this item shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer. All equipment, materials, methods and record keeping procedures shall be submitted to the Engineer for review.

111-2.2 TEST EQUIPMENT. All test equipment proposed for use shall have a current calibration. Calibration certifications are current for 1 year from date of calibration. At any time, the Engineer may require the Contractor to have a piece of test equipment recalibrated. The test equipment will be removed from the project until recalibrated. The Contractor shall submit the Calibration Laboratory's qualifications and the test equipment serial numbers and calibration certificates to the Engineer for review.

CONSTRUCTION METHODS

111-3.1 GENERAL. The Contractor shall furnish all necessary equipment and appliances for testing installations as indicated below.

111-3.2 GROUND ROD TESTING.

a. The Contractor shall provide equipment and personnel to measure the resistance to earth for all
b. ground rods installed using Fall of Potential Method. Earth resistance measurement tests shall adhere to recommendations of IEEE Standard 142, latest edition. The Contractor shall submit testing procedure and equipment and report form to the Engineer for approval.

c. Tests shall be administered as each rod is installed. Tests shall be conducted prior to the connection of any grounding or counterpoise conductors. The resistance between each ground rod and absolute earth shall not exceed twenty-five (25) ohms. Any rod, which does not have a resistance to ground of 25 ohms or less, shall be augmented by an additional 10-foot section of rod until the 25 ohm maximum earth resistance requirement is met. Test results shall be submitted to the Engineer for approval.

111-3.3 AIRFIELD LIGHTING CIRCUITS TESTING. The Contractor shall notify the Engineer 72 hours prior to cable testing. All testing shall be conducted in the presence of the Engineer. All test results shall be simultaneously recorded by the Contractor and Engineer. The Contractor shall submit test report information to the Engineer. Test procedures for the following required tests, including field test report forms, shall be submitted to the Engineer for review prior to testing.

a. Testing Requirements:

(1) Testing Required for Existing Circuits and Existing Portions of Circuits to be Extended. The existing circuits to be extended shall be subjected to Low Voltage Tests in accordance with paragraph b.(1) below. Tests shall be performed with the isolation transformers and other lighting system devices connected. Test results shall be submitted to the Engineer for approval prior to extending or revising the existing circuit.

(2) Testing Required for Existing Circuits with Circuit Modifications and/or Extensions Completed. Each existing series circuit that has been modified and/or extended shall be subjected to Low Voltage Tests in accordance with paragraph b.(1) below. Tests shall be performed with the lighting isolation transformers and other lighting system devices connected. Circuits tested shall meet the requirements of paragraph c.(2) below. Any faults indicated by these tests shall be corrected before proceeding with additional testing. Test results shall be submitted to the Engineer for approval.

(3) Testing Required For New Circuits and New Portions of Existing Circuits. Each new series circuit, or new segment of existing circuits being extended, modified, or replaced, shall be tested as follows:

(a) After new cable with new connectors is installed and prior to connecting isolation transformers, the following tests shall be performed:

(i) Low Voltage Continuity and Insulation Resistance (IR) Tests in accordance with paragraph b.(1) below to determine if the total insulation resistance of each circuit is satisfactory so that the series lighting circuit will operate without excessive leakage current when energized. Circuits tested shall meet the requirements of paragraph c.(3)(a) below. Any faults indicated by these tests shall be corrected before proceeding with additional testing. All test results shall be submitted to the Engineer for approval.

(b) New segments of existing circuits meeting the requirements of paragraph a.(3)(a) above shall then have the isolation transformers connected and shall again be subjected to the Low Voltage Continuity and Insulation Resistance (IR) Tests of paragraph b.(1). Any faults indicated by these

tests shall be corrected before energizing the circuit. All test results shall be submitted to the Engineer for approval.

(4) All Circuits. Upon completion of all wiring of each circuit, the Low Voltage Continuity and Insulation Resistance (IR) Tests shall be performed on the completed circuit in accordance with paragraph b.(1) below. All isolation transformers and other lighting system devices shall be connected to the completed circuit. Circuits tested shall meet the requirements of paragraph c.(3)(a) below. Any faults indicated by these tests shall be corrected before proceeding with additional testing. All test results shall be submitted to the Engineer for approval.

b. Testing Procedures:

(1) Low Voltage Tests. Low Voltage Continuity and Insulation-Resistance (IR) Tests

(a) Test Required. As noted in paragraph a. above, circuits and segments of circuits shall be subjected to a low voltage continuity test and to a 1000 volt Insulation-Resistance (IR) (Megger) test. IR tests shall test the insulation resistance to ground and other conductors within the same raceway of each lighting system conductor.

(b) Test Equipment. Contractor shall provide a 1000 volt direct current Insulation Resistance test set for low voltage testing. Insulation Resistance test set shall be a 120V AC device, non-crank type, as manufactured by Associated Research Meg-Check, the James Biddle Megger, General Radio Megohmmeter, or approved equivalent. The Contractor shall be responsible for providing any required 120V AC power source at testing locations remote from available power. Equipment calibration information shall be readily available for review by the Engineer if requested.

(c) Test Procedures. "Lock-Tag-Try Procedure" requirements shall comply with OSHA 1926.417. Test procedures for the required tests, including field test report forms, shall be submitted to the Engineer for approval prior to testing.

(i) Test equipment grounding electrode shall be adjacent to the test equipment and be a part of/connected to the airfield grounding counterpoise/ground rod system.

(ii) Verify that all devices and accessories connected to the cable are rated for the test voltage to be applied.

(iii) Ground other cables in the same conduit as cable under test.

(iv) Clean and isolate “remote” end of cable to be tested.

(v) Ground the cable for a minimum of one (1) minute prior to testing.

(vi) Test cable.

(vii) After testing is complete, cable shall be discharged to the grounding electrode using resistor designed for the purpose. Solidly ground the cable after discharge. Cable shall remain solidly grounded for a minimum of 5 minutes.

(d) Test Results. Cable specimens that do not meet the test criteria given in

paragraphs c. (2) for existing circuits that have been modified and/or extended, and c.(3), for new circuits and new segments of existing circuits, shall be considered unacceptable. Refer to paragraph d. below for cables not meeting testing requirements.

(2) For all Testing. All existing and/or new cables, equipment, and materials damaged during testing shall be repaired and/or replaced by the Contractor at no additional cost to the Owner as directed by the Engineer. Tests shall be performed and faulty installations corrected until satisfactory results are obtained. Exact correction procedures for specific faulty installation circumstances shall be as specified and approved by the Engineer. The Contractor is not responsible for the repair of existing cables that are to be modified or extended that are deemed by the Engineer to be faulty prior to modification or extension unless directed by the Contract Documents.

c. Testing Results:

(1) Existing Circuits and Existing Portions of Circuits to be Extended or Modified. Low voltage continuity test results and insulation resistance test results shall be submitted to the Engineer for determination of suitability for extension or modification and any remedial action that may be appropriate.

(2) Existing Circuits and Existing Portions of Circuits that have been Extended or Modified. Low Voltage Tests shall demonstrate to the satisfaction of the Engineer the following:

(a) All circuits are properly connected in accordance with the applicable wiring diagrams.

(b) All lighting power and control circuits are continuous and free from short circuits.

(c) All circuits are free from unspecified grounds.

(d) The insulation-resistance is equal to or greater than its original value prior to circuit modifications.

(3) New Circuits and New Segments of Existing Circuits.

(a) Low Voltage Tests shall demonstrate to the satisfaction of the Engineer the following:

(i) All circuits are properly connected in accordance with the applicable wiring diagrams.

(ii) All lighting power and control circuits are continuous and free from short circuits.

(iii) All circuits are free from unspecified grounds.

(iv) The insulation-resistance is equal to or greater than 400 megohms for new circuits and new segments of existing circuits. Isolation transformers shall be connected. In addition, new circuits and new segments of existing circuits shall maintain an insulation resistance of not less than 300 megohms, with isolation transformers connected, through the end of the construction warranty period.

(v) Insulation-resistance of cables of approximately the same length installed in same duct bank shall not show a comparison ratio of over 3 to 1.

d. Deficient Testing Results (Circuits Not Meeting Requirements):

(1) Existing Circuits and Existing Portions of Circuits that have been Extended or Modified.

(2) Cables that do not meet the test criteria of paragraph c.(2) above shall be considered unacceptable and shall not be energized until corrected.

(3) If all "Lock-Tag-Try Procedure" requirements established OSHA 1926.417 have been satisfied by the Contractor and the Engineer determines non-complying circuits or segments of circuits are the responsibility of the Owner, then the Contractor shall provide to the Owner, through the Engineer, all test reports identifying location of non-complying cables.

(4) New Circuits and New Portions of Existing Circuits. Cables that do not meet the test criteria of subparagraph c.(3) above shall be considered unacceptable and shall not be energized until corrected.

e. Submittal of Testing Data:

(1) Low Voltage Tests. Contractor shall submit twelve (12) copies of tests reports for approval of the Engineer. Reports shall include all measured data including applied voltage, time length of voltage application and measured megohms from each segment of cable in a circuit.

The Low Voltage Tests data form shall also include, as a minimum:

Date
Cable Number
Start Time
End Time
Operating Voltage
Max. Test Voltage
Cable Routing
Cable Description
Ambient Temperature
Humidity
Relative Humidity
Measure Equip. No.
Equipment Calibration Due Date

111-3.4 SYSTEM TESTS. After the airfield lighting systems installation is complete and at such times as the Engineer may direct, the contractor shall conduct airfield lighting systems operating tests for approval.

a. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Engineer. The Contractor shall furnish all equipment and personnel required for the test.

b. Each applicable control device in the control tower lighting panels shall be operated so that each

control device position is engaged at least ten times. During this process, all lights and associated equipment shall be observed to determine that each control device switch properly commands the corresponding circuit. Radio communication between the operator and the observers shall be provided by the Contractor.

c. The above tests shall be repeated for each individual circuit from the local control switches on the regulators. Each installed or revised lighting circuit shall be tested by operating the lamps throughout the range of applicable steps and shall be operated separately at step 3, step 5 or step 7 as appropriate for full intensity for not less than 8 hours. Visual examination shall be made at the beginning and at the end of this test to determine that the installed airfield light fixtures are illuminating at full intensity.

d. If circuit regulators are installed under project construction, regulator output ampacity shall be adjusted for proper outputs in accordance with manufacturer's recommendations and requirements to insure proper circuit operation.

e. Systems tests shall confirm by demonstration in service that all lighting circuits are in good operating condition to the satisfaction of the Engineer. If the tests are unsatisfactory, lighting systems installed shall be corrected and systems tests shall again be implemented.

METHOD OF MEASUREMENT

111-4.1 The items described in this section are incidental to other sections and shall not be measured for payment.

BASIS OF PAYMENT

111-5.1 No direct payment shall be made for the work described in this section. The work described in this section is incidental to other items and shall be paid for in the respective bid item of which it is a component part.

END OF ITEM L-111

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (handholes, pull boxes, junction cans, etc.) installed in accordance with this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the Engineer. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

115-2.1 GENERAL.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

b. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall conform to the details and dimensions shown on the plans.

Provide precast concrete structures where shown on the plans. Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or Bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 70,600 lb aircraft loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review in accordance with the process defined in the General Provisions.

115-2.3 JUNCTION CANS. Junction Cans shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) cans encased in concrete. The cans shall have a galvanized steel blank cover, gasket, and stainless steel hardware. Covers shall be 1/2" thickness for L-867 and 3/4" thickness for L-868.

115-2.4 MORTAR. The mortar shall be composed of one part of Portland cement and two parts of mortar sand, by volume. The Portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15 percent of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C 6. The water shall be clean and free of deleterious amounts of acid, alkalis or organic material. If the water is of questionable quality, it shall be tested in accordance with AASHTO T-26.

115-2.5 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.6 FRAMES AND COVERS. The frames shall conform to one of the following requirements.

a.	ASTM A 48	Gray iron castings
b.	ASTM A 47	Malleable iron castings
c.	ASTM A 27	Steel castings
d.	ASTM A 283, Grade D	Structural steel for grates and frames
e.	ASTM A 536	Ductile iron castings
f.	ASTM A 897	Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 167 psi and maximum load of 35,300 lb.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A 123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

115-2.7 LADDERS. Not used. ~~Ladders, if specified, shall be galvanized steel or as shown on the plans.~~

115-2.8 REINFORCING STEEL. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A 615, Grade 60.

115-2.9 BEDDING/SPECIAL BACKFILL. Bedding or special backfill shall be as shown on the plans.

115-2.10 FLOWABLE BACKFILL. Flowable material used to backfill shall conform to the requirements of Item P-153 "Controlled Low Strength Material".

115-2.11 CABLE TRAYS. Cable trays shall be of galvanized steel. Cable trays shall be located as shown on the plans.

115-2.12 PLASTIC CONDUIT. Plastic conduit shall comply with Item L-110 - Airport Underground Electrical Duct Banks and Conduits.

115-2.13 CONDUIT TERMINATORS. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.14 PULLING-IN IRONS. Pulling-in irons shall be manufactured with 7/8 in (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2 in diameter with an ultimate strength of 270,000 psi). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 GROUND RODS. Ground rods shall be one piece, copper clad**.** The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 10-feet long nor less than 3/4 in in diameter.

CONSTRUCTION METHODS

115-3.1 UNCLASSIFIED EXCAVATION. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the Engineer without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to the respective L-115 pay item of which it is a component part. Dewatering necessary for L-115 structure installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of Item L-115. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the L-115 Item.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the Engineer. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the Engineer. Structures shall be placed after the Engineer has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 in of sand or a material approved by the Engineer as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is placed.

115-3.3 PRECAST UNIT INSTALLATIONS. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES AND FITTINGS. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written permission is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the Engineer and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

115-3.5 INSTALLATION OF LADDERS. Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.

115-3.6 REMOVAL OF SHEETING AND BRACING. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than six (6) in of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The Engineer may order the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 BACKFILLING. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 in in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

Backfill shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the Engineer may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 CONNECTION OF DUCT BANKS. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 GROUNDING. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 in (154 mm) above the floor. The ground rod shall be installed within 1 ft of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4 in diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of 1 ft above the floor of the structure and separate from other cables. No. 2 AWG bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 CLEANUP AND REPAIR. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound conforming MIL-P-21035. Surfaces shall be prepared and compound applied in accordance with manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 RESTORATION. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 INSPECTION. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test as described by ANSI IEEE Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 Junction Can Plaza Elevation Adjustments. The Contractor shall adjust the elevtion of existing junction can plaza in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each junction can plaza to be adjusted shall be determined in the field and subtracted/added from the verified proposed top elevation.

The Contractor shall remove/extend the existing base can cover and install a L-867D base can extension. The base can extension shall be covered with a temporary cover. Prior to placing new concrete, the existing surface of the concrete foundation surface shall be through rough and pressure cleaned to remove any fines and dirt. After the cleaned surface has completely dried, the contractor shall install concrete form and place the additional concrete the existing concrete foundation to the proper elevation. Finally, the Contractor shall remove the existing concrete forms and reinstall the existing base can covers.

115-3.14 Duct Extension to Existing Ducts. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following additional items are specifically included in each unit.

All Required Excavation, Dewatering

Sheeting and Bracing

All Required Backfilling with On-Site Materials

Restoration of All Surfaces and Finished Grading, Sodding

All Required Connections

Dewatering If Required

Temporary Cables and Connections

Ground Rod Testing

115-4.2 Junction Can Plaza adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the Engineer.

Payment will be made under:

L-115-1	Electrical Junction Can Plaza – 2 Base Cans Raised to Proposed Grade	per each
L-115-2	Electrical Junction Can Plaza – 3 Base Cans Raised to Proposed Grade	per each
L-115-3	Electrical Junction Can Plaza – 5 Base Cans Raised to Proposed Grade	per each
L-115-4	Electrical Junction Can Plaza – 8 Base Cans Raised to Proposed Grade	per each
L-115-5	Electrical Junction Can Plaza – 9 Base Cans Raised to Proposed Grade	per each
L-115-6	Electrical Junction Can Plaza – 11 Base Cans Raised to Proposed Grade	per each
L-115-7	Electrical Junction Can Plaza – 12 Base Cans Raised to Proposed Grade	per each
L-115-8	Electrical Junction Can Plaza – 16 Base Cans Raised to Proposed Grade	per each
L-115-9	L-867D Junction Can Pull Box - Installed in Turf	per each
L-115-10	L-867D Junction Can Pull Box - Installed in Asphalt Shoulder Pavement	per each

MATERIAL REQUIREMENTS

ANSI/IEEE Std 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle Cable Connectors
FED SPEC J-C-30	Cable and Wire, Electrical Power, Fixed Installation (cancelled; replaced by AA-59544 Cable and Wire, Electrical (Power, Fixed Installation))
ASTM B.3	Soft or Annealed Copper Wire
ASTM B.8	Concentric-Lay-Stranded Copper Conductor, Hard, Medium-Hard, or Soft

END OF ITEM L-115

ITEM L-125 INSTALLATION OF AIRPORT LIGHTING SYSTEMS

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable FAA Advisory Circulars. The systems shall be installed at the locations and in accordance with the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units. This item shall also include the removal, storage, and/or reinstallation of existing items in accordance with the dimensions, designs, and details shown on the plans.

EQUIPMENT AND MATERIALS

125-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, latest edition.

b. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

c. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

d. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section. The Engineer reserves the right to reject any and all equipment, materials or procedures, which, in the Engineer's opinion, does not meet the system design and the standards and codes, specified herein.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

125-2.2 TAPE. Electrical tapes shall be Scotch Electrical Tapes – number Scotch 88 (1-1/2" wide) and Scotch 130C linerless rubber splicing tape (2" wide), as manufactured by the Minnesota Mining and Manufacturing Company, or approved equivalent.

125-2.3 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1 inch maximum size coarse aggregate with a minimum 28 day compressive strength of 4000 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A 615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

125-2.4 CONDUIT. Conduit shall conform to Item L-110, Airport Underground Electrical Duct Banks and Conduits.

125-2.5 CABLE. Cable shall conform to Item L-108, Underground Power Cable for Airports.

125-2.6 CONNECTORS. L-823 connectors used to splice the L-824 primary cable shall conform to Item L-108, Underground Power Cable for Airports. Equipment shall be provided with the appropriate number of connecting lead plugs.

125-2.7 BASE CANS. Provide the size and type of base can as indicated on the plans and details. Base cans shall conform to the requirements of FAA AC 150/5345-42, latest edition. Coordinate bolt hole patterns for bases with fixtures to be installed. The base cans are considered part of the light fixture or sign and no separate payment shall be made for the base can.

125-2.8 ISOLATION TRANSFORMERS. Isolation transformers shall be of rating compatible with associated light fixture or sign and shall conform to the requirements of FAA AC 150/5345-47, latest edition. The isolation transformers are considered part of the light fixture or sign and no separate payment shall be made for the isolation transformer.

125-2.9 GROUND RODS. Ground rods shall be one piece, copper clad**.** The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 10-feet (305 cm) long nor less than ¾-in (19 mm) in diameter. The ground rods are considered part of the light fixture or sign and no separate payment shall be made for the ground rods.

125-2.10 IDENTIFICATION TAGS. Identification tags shall be as indicated on the details in the plans. The identification tags are considered part of the light fixture or sign and no separate payment shall be made for the identification tags.

125-2.11 LOW FREQUENCY RADIO-FREQUENCY IDENTIFICATION (RFID) TAG. MALMS glasstag low frequency RFID tags shall be as indicated on the details in the plans. The RFID tags shall be 4 x 34 mm and of glass material. The RFID micro chip shall be NXP Hitag S256 and have a frequency of 134.2 kHz. The RFID tag shall be MALMS Tailor Made Systems Ltd product code TMS3204, no approved equals. The RFID Tags are considered part of the light fixture or sign and no separate payment shall be made for the identification tags.

125-2.12 TAXIWAY EDGE LIGHTS. Taxiway edge lights shall conform to the requirements of FAA AC 150/5345-46, latest edition TYPE L-861T. Taxiway edge fixture lamps shall be LED type with properly sized transformer at the locations indicated on the plans. Taxiway edge lights shall be installed at the locations indicated in the plans in accordance with the details.

125-2.13 GUIDANCE SIGNS. Guidance signs shall conform to the requirements of FAA AC 150/5345-44, latest edition TYPE L-858 Y, R, L, and B. Guidance signs shall be of the size and type as indicated on the details in the plans with LED type light engines. The signs shall be installed at the locations indicated in the plans in accordance with the details with the messages as shown on the sign schedule.

125-2.14 TAXIWAY CENTERLINE LIGHT. Taxiway centerline lights shall conform to the requirements of FAA AC 150/5345-46, latest edition TYPE L-852 C and K, style 3 (low profile). Taxiway centerline fixture lamps shall be LED type with properly sized transformer at the locations indicated on the plans. Taxiway edge lights shall be installed at the locations indicated in the plans in accordance with the details.

125-2.15 OBSTRUCTION LIGHTS. Not used. ~~Obstruction lights shall conform to the requirements of FAA AC 150/5345-43, latest edition. Obstruction fixture lamps shall be L-810, LED type. The fixtures shall be installed at the locations indicated in the plans.~~

125-2.16 SURFACE SENSOR The Surface Sensor shall be a single solid state electronic device that is installed in the runway or taxiway pavement at the locations shown on the plans. Exact sensor placement shall be as shown on plans with guidance from the equipment supplier (Viasala, Inc). The sensor shall come with a limited lifetime warranty.

The sensor shall be constructed of materials which have thermal characteristics similar to common pavement materials. The top of the sensor shall approximate the runway or taxiway pavement color. It shall be installed with epoxy sealer so the top is flush with the surrounding runway or taxiway surface.

The sensor shall be thermally passive, providing stable operation over a temperature range from -30°C to 50°C (-22°F to 122°F). The sensor and cable shall withstand a temperature range of -37°C to 80°C (-35°F to 175°F) without sustaining damage. Its performance shall not be degraded by weather conditions, traffic, or ice control chemicals.

The sensor shall be supplied with 150 feet (46 mm) of attached molded cable that is waterproofed and sealed as an integral part of the assembly. The sensor shall electronically sample the following pavement conditions:

Surface temperature at the sensor head.
Dry pavement condition.
Wet pavement condition above 0°C (32°F).
Wet but not frozen pavement condition at or below 0°C (32°F).
Snowy or icy pavement condition at or below (32°F).

In addition, the pavement sensors shall supply data for determining the following pavement surface conditions when sufficient moisture is present:

- Freezing point temperature of the moisture/ice-control-chemical solution present on the surface of the pavement sensor for commonly used ice-control-chemicals.

- Depth of the moisture/ice-control-chemical-solution present on the surface of the pavement sensor up to a depth of 0.5 inches (12 mm).

- Percentage of ice particles present in the moisture/ice-control-chemical solution resident on the surface of the pavement sensor.

The submittals shall include actual field test documentation which substantiates pavement sensor performance. Each sensor shall be capable of operating at extended cable lengths, up to 2500 feet (762 mm) from the RPU. The new pavement sensor system shall be integrated into the master pavement sensor. The master pavement sensor is manufactured by Vaisala, Inc.

125-2.17 CONSTANT CURRENT REGULATORS. The constant current regulators (CCR) shall be L-829 switchgear type, air cooled, ferro-resonant, dry type, with 120 volt AC internal control, sized as indicated on the contract drawings. The input power shall be 480 Volt single phase for all regulators. The output shall be 6.6 AMP. The units shall have integral primary switches and shall be five (5) brightness steps for all runway circuits and three (3) brightness steps for all taxiway circuits. The regulators shall have local control switches for ON/OFF and all brightness steps and a digital display of electrical outputs, inputs and KVA. Each regulator shall have integral input and output lightning protection. The Constant Current Regulator shall be integrated into the with existing computer system. The manufacturer of the existing CCR Switchgear unit is ADB Safegate, Inc. and there is no approved equal. The CCR will be owner furnished equipment and Contractor installed. Only the CCR will be provide and all ancillary equipment shall be furnished and installed by the Contractor.

125-2.18 UPDATE AIRFIELD LIGHTING CONTROL SYSTEM. The existing airfield lighting controls system shall be updated for the following task:

1. Relocate two existing 7.5KW CCR is spare slots on the existing switchgear type CCR units and install two new 10KW CCRs for existing taxiway circuits
2. The two relocated 7.5KW CCRs shall be set up as spare CCRs.
3. Update graphics panel so show all existing and new taxiway centerline lights on Taxiway B

The existing Airfield Lighting Control System is manufactured by ADB Safegate, Inc.

125-2.19 BASIS OF DESIGN. The airfield lighting systems are designed using the below listed maximum fixture wattages. Approved airfield lighting fixtures with higher wattages are permissible provided the Contractor assumes all costs for the redesign of the airfield lighting and necessary power distribution systems and all costs incurred furnishing and installing any additional equipment. In no case shall the Contractor be allowed to reduce the size of the constant current regulators or the power distribution systems.

L-861T Taxiway Edge Light - LED (Elevated)		21 W
L-804 Taxi-Holding Position Light - LED (WIG-WAG)		105 W
L-852C Taxiway Centerline Light - Unidirectional (narrow beam) - LED		21 W
L-852C Taxiway Centerline Light - Bidirectional (narrow beam) - LED		27 W
L-852K Taxiway Centerline Light - Unidirectional (wide beam) – LED		21 W
L-852K Taxiway Centerline Light - Bidirectional (wide beam) – LED		27 W
L-858Y,R,L - LED		
Location, Information, Boundary, Destination Mandatory Sign	1 Module	100 VA
	2 Module	100 VA
	3 Module	110 VA
	4 Module	110 VA

CONSTRUCTION METHODS

125-3.1 GENERAL. The installation and testing details for the airport lighting systems shall be as specified in the latest revision of the applicable FAA Advisory Circulars. Light fixtures, markers, and signs shall conform to the details and dimensions shown in the plans.

125-3.2 PLACING EQUIPMENT. The light fixtures, markers, and signs shall be installed at the approximate location indicated in the plans. Assemble the equipment in accordance with the manufacturer's instructions.

Existing signs, where indicated on the drawings, shall be removed and relocated to a new foundation. Existing sign foundations of signs removed or relocated shall be demolished in their entirety. The removed sign, if not designated for relocation, shall be returned to the Owner.

Existing light fixtures, where indicated on the drawings, shall be removed; including fixture, base can or stake, and isolation transformer. The removed light fixture and transformers shall be returned to the Owner and transported to a site on the airport as directed by the Airport.

125-3.3 MAINTENANCE OF AIRPORT LIGHTING SYSTEMS. The Contractor shall maintain the airport lighting systems during the various phases of the work as shown on the phasing plan(s) or as directed by the Engineer. The Contractor shall be responsible for all temporary connections in the field or at the regulator necessary for operation of the circuits during construction.

125-3.4 RESTORATION. After the backfill is completed, the contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. The restoration shall include topsoiling, seeding, and mulching. The Contractor shall grade around structures as required to provide positive drainage away from the structure. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacement until final acceptance. All restoration shall be considered incidental to the item for which it applies.

125-3.5 INSPECTION. Inspect each light fixture, marker, and sign to determine that it is installed correctly, at the proper height, in line with the other fixtures, level, and properly oriented.

Check all fixture, marker, and sign securing screws or bolts to ensure that they have been tightened per manufacturer's recommendations. Use an anti-seize compound on bolts made of stainless steel.

Check each fixture, marker, and sign to determine that the lenses and panels are clean and unscratched.

Check identification numbers for each light fixture and sign to determine that the number at the installation is assigned in the plans or by the Owner's direction.

Check equipment covered by FAA specifications to determine if the manufacturers have supplied certified equipment. Also check equipment for general conformance with the specification requirements.

Check base plates for damage during installation and refinish according to manufacturer's instructions.

125-3.6 TESTING. Require the Contractor to furnish all necessary equipment and appliances for testing the underground cables, counterpoise, and safety ground in accordance with Item L-108, Underground Power Cable for Airports.

Test the installations by operating the system continuously for at least 1/2 hour. During this period, change the intensity of variable intensity components to ensure proper operation at least 10 times.

METHOD OF MEASUREMENT

125-4.1 Taxiway edge lights will be measured for payment on a unit basis per each, installed as completed units in place, accepted, and ready for operation.

125-4.2 Taxiway Centerline lights will be measured for payment on a unit basis per each, installed as completed units in place, accepted, and ready for operation.

125-4.4 Guidance signs will be measured for payment on a unit basis per each, installed as completed units in place, accepted, and ready for operation.

125-4.5 Constant Current Regulators will be measured for payment on a unit basis per each, installed as completed units in place, accepted, and ready for operation.

125-4.6 Pavement Sensor System will be measured for payment on a unit basis per each, installed as completed units in place, accepted, and ready for operation.

BASIS OF PAYMENT

125-5.1 Payment will be made at the contract unit price for each complete Taxiway Edge Light, Taxiway Edge Marker, Obstruction Lights, and Guidance Sign, of the type indicated, installed and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Taxiway edge light units include fixtures, stems, frangible couplings, base cans, base plates, gaskets, isolation transformers, grounding connections, ground rods, excavation, backfill, restoration, testing, and incidental items required to provide a functioning unit in accordance with the Contract Documents.

Taxiway Centerline edge light units include fixtures, flange ring, spacer rings, base cans, base plates, gaskets, isolation transformers, grounding connections, ground rods, excavation, backfill, restoration, testing, and incidental items required to provide a functioning unit in accordance with the Contract Documents.

Guidance sign units include modules of the type specified, foundations, base cans, cover plates, gaskets, isolation transformers, conduit and conduit hubs, grounding connections, ground rods, excavation, backfill, restoration, testing, and incidental items required to provide a functioning unit in accordance with the Contract Documents.

125-5.3 Payment will be made at the contract unit price for each Taxiway Edge Light removed. This price shall be full compensation for the disconnection from the electrical system, removing and disposing of all materials, site restoration, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

125-5.4 Payment will be made at the contract lump sum price for Maintenance of Airport Lighting Systems. This price shall be full compensation for temporary jumpers, connections, conduit, and for all labor,

equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Payment will be made under:

L-125-1	L-852C(L) - LED In-Pavement Taxiway Centerline Light Uni-Directional - Narrow Beam	per each
L-125-2	L-852C(L) - LED In-Pavement Taxiway Centerline Light Bi-Directional - Narrow Beam	per each
L-125-3	L-852K(L) - LED In-Pavement Taxiway Centerline Light Uni-Directional - Wide Beam	per each
L-125-4	L-852K(L) - LED In-Pavement Taxiway Centerline Light Bi-Directional - Wide Beam	per each
L-125-5	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Shoulder Pavement	per each
L-125-6	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Full Strength Pavement	per each
L-125-7	L-804(L) Elevated Guard Light installed in Full Strength Pavement	per each
L-125-8	L-804(L) Elevated Guard Light installed in Asphalt Shoulder Pavement	per each
L-125-9	L-868B Blank Base Can with 3/4" Steel Cover	per each
L-125-10	L-867B Blank Base Can with 3/8" Steel Cover	per each
L-125-11	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Turf	per each
L-125-12	L-861T(L) LED Elevated Taxiway Edge Light - Installed in Existing Shoulder	per each
L-125-13	L-858 LED Sign, 2-Module	per each
L-125-14	L-858 LED Sign, 3-Module	per each
L-125-15	L-858 LED Sign, 4-Module	per each
L-125-16	Type IIA Pavement Sensor	per each
L-125-17	Install 10KW L-828 Constant Current Regulator	per each
L-125-18	Coordinate Updating of Existing ALCMS	per lump sum

MATERIAL REQUIREMENTS

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series to Series Isolation Transformers for Airport Lighting Systems

END OF ITEM L-125

ITEM L-131

DEMONSTRATIONS, TESTS AND PERFORMANCE VERIFICATION

DESCRIPTION

131-1.1 GENERAL. This item includes the furnishing of all labor, materials, equipment and services necessary to provide demonstrations, testing and performance verification necessary to show electrical system compliance to these specifications.

DEMONSTRATIONS

131-2.1 CHECK-OUT MEMO. Where required by the plans and specifications, provide manufacturer assistance during the testing, start-up, performance verification, demonstrations and Owner training. Complete the Check-Out Memo contained in Appendix A, Figure 1.

131-2.2 Demonstrate the essential features of the following electrical systems as related to this project:

- Electrical systems control and equipment
- Electrical power equipment
- Panelboards
- Distribution panels
- Main panels, power panels
- Circuit Breakers
- Wiring systems
- Grounding systems
- Low-voltage controls
- Airfield lighting fixtures
- Constant Current Regulators
- Local Control Panel
- Pavement Sensor

131-2.3 The demonstration shall be held upon completion of all systems, including testing, at a date to be agreed upon in writing by the Owner or his designated representative. The demonstration shall be held by the Contractor in the presence of the Owner and the Manufacturer's Representative.

131-2.4 Prior to acceptance of the work, the Contractor shall demonstrate to the Owner, or his designated representative, all features and functions of all systems and shall instruct the Owner in the proper operation of the systems. After testing is completed satisfactorily, each system shall be demonstrated once.

The demonstration shall consist of not less than the following:

a. Point out the actual location of each component of the system and demonstrate its function and its relationship to other components within the system.

b. Demonstrate the electrical systems by actual "start-stop" operation showing how to work controls, how to reset protective devices, how to replace fuses, and what to do in an emergency. Indicate each items relationship to the riser diagrams and drawings.

c. Demonstrate communication, signal, alarm and detection systems by actual operation of the systems and show how to reset signal, alarm and detection devices.

The Contractor shall furnish the necessary trained personnel to perform the demonstration and instructions, and shall arrange to have the manufacturer's representatives present to assist with the demonstrations.

All functional and operational testing of protective interlocking, automatic controls, instrumentation, alarm systems, and all other field testing of the main systems will be completed before the systems are demonstrated.

131-2.5 Submit six (6) copies of the Performance Verification and Demonstration to Owner Form (Appendix A, Figure 2), signed by the Contractor, subcontractor and Owner and insert one copy in each Operation and Maintenance Manual and the original shall be inserted in the Project Closeout Documentation Manual.

TESTS AND PERFORMANCE

131-3.1 TESTS AND PERFORMANCE VERIFICATION. Operate system for a 3-day period. Do performance verification work as required to show that the system is operating correctly in accordance with design. Supply instruments required to read data. Adjust system to operate at the required performance levels. Tabulate data for submission. Submit data on 8-1/2-inch x 11-inch sheets with time and name of checker. Where specific performance verification information is called for in the specifications, use copies of the sheets provided for recording readings. Data shall be submitted and approved before Check-Out Memos are signed or a request for final inspection is made. Submit data in Operation and Maintenance Manuals.

At completion of construction after all performance verification and testing information has been gathered, submitted, and approved, provide one copy of this information to the Manufacturer's representative of the equipment. Work required under this section shall include having the representative examine the performance verification information, check the equipment in the field while it is operating, and sign a Check-Out Memo for a record. Submit six (6) copies of the Check-Out Memo on each major item of equipment. Approved memos shall be inserted in each Operation and Maintenance Manual with the performance verification information. Memos shall be submitted and approved before instruction to Owner or a request for final inspection.

131-3.2 TESTS. After cables are in place, but before being connected to devices and equipment, the system shall be tested for shorts, opens, intentional and unintentional grounds by means of an approved type of "megger." Airfield lighting cables shall be tested in accordance with Item L-108 Installation of Underground Cable for Airports.

The tests shall be performed and recorded in the presence of the Engineer and the Owner and the test results shall be placed in the Operation and Maintenance Manuals. All wires in conduit that are shorted or unintentionally grounded shall be replaced.

Take readings of voltage and amperage at building main disconnect switch and at main for each panel, at primary side of each lighting transformer and at the end of the longest branch circuit at each panel. The above readings shall be taken (1) “no load” conditions and (2) at “full load” conditions with all equipment using electricity. Tabulate readings, complete “Voltage and Amperage Readings/Tabulated Data” form (see Appendix A, Figure 3) and submit in the O&M Manuals.

The resistance between ground and absolute earth shall be measured by the Contractor before equipment is placed in operation. Testing shall be performed on all ground rod installations before connecting the grounding conductor. The resistance between each ground rod and absolute earth shall not exceed twenty-five (25) ohms. Testing shall be three (3) point method in accordance with IEEE recommended practice and witnessed by the Engineer and Owner. Record data on the Ground Test Information form contained in Appendix A, Figure 4. All ground rods shall be tested.

Perform such tests as required by authorities having jurisdiction over the site, or other tests/inspections as required by other sections of this specification.

There are no approved "repair" procedures for items that have failed testing other than complete replacement. Any other corrective measures shall be approved by the Engineer. The addition of ground rod sections to the ground rods shall be considered replacement for this item.

131-3.3 CORRECTION OF ERRORS. The Contractor shall immediately correct any errors or omissions in his work which are discovered during testing. This shall include but not be limited to, improper phasing resulting in reverse rotation, misinterpretations, incomplete grounding, damaged equipment or materials, or incomplete work the Contractor has already verified as being complete. The Contractor shall immediately replace, repair, or complete these errors and omissions as soon as they are brought to his attention, even if this requires disruption of his scheduled construction activities or work on an overtime basis. Failure to take immediate action or an excessive number of errors or omissions shall make the Contractor liable for the time lost by the Owner's operating forces, and any other personnel.

METHOD OF MEASUREMENT

131-4.1 The items described in this section are incidental to other sections and shall not be measured for payment.

BASIS OF PAYMENT

131-5.1 No direct payment shall be made for the work described in this section. The work described in this section is incidental to other items and shall be paid for in the respective bid item of which it is a component part.

CHECK-OUT MEMO

This form shall be completed and a copy provided to the Owner at the Owner's Performance Verification and Demonstration meeting. A copy shall also be included in the specification section of the O & M Manual for the equipment checked.

Project Name: Raleigh-Durham International Airport - Taxiway B Rehabilitation
Type of Equipment Checked: _____
Equipment Number: _____
Name of Manufacturer: _____

Signature below by the manufacturer's authorized representative signifies that the equipment has been satisfactorily tested and checked out on the job by the manufacturer.

1. The attached Test Data and Performance Verification information was used to evaluate the equipment installation and operation.

2. The equipment is properly installed, has been tested by the manufacturer's authorized representative, and is operating satisfactorily in accordance with all requirements, except for items noted below.*

3. Written operating and maintenance information has been presented to the Contractor, and gone over with him in detail.

4. Sufficient copies of all applicable operating and maintenance information, parts lists, lubrication checklists, and warranties have been furnished to the Contractor for insertion in the Operating and Maintenance Manuals.

Checked By: _____
(Print or Type Name of Manufacturer's Representative)

_____
(Address and Phone No. of Representative)

_____
(Signature and Title of Representative)

_____
(Date Checked)

Witnessed By: _____
(Signature and Title of Contractor Representative)

* Exceptions noted at time of check-out (use additional page if necessary):

APPENDIX A, FIGURE 1

PERFORMANCE VERIFICATION AND DEMONSTRATION TO OWNER

This form verifies that the Owner has been given a demonstration of the proper operation on the equipment or systems noted below:

Project Name: Raleigh-Durham International Airport - Taxiway B Rehabilitation

Specification Division Number & Name: _____

Equipment/System Demonstrated: _____

Along with a complete demonstration of the equipment/system, these items have been reviewed at this demonstration and shall be included in the Operating and Maintenance Manuals, under the appropriate specification section:

1) Written operating instructions.
2) Test data and performance verification information as required by the installer and/or manufacturer.
3) Maintenance information published by manufacturer or equipment.
4) Check-out Memo signed by manufacturer's representative.
5) Printed warranties by manufacturer of equipment.
6) Explanation of the warranty/guarantee on the system.
7) Prints showing actual "As Built" conditions.

_____
(Name of Contractor)

_____
(Signature, Title, Date)

_____
(Name of Subcontractor)

_____
(Signature, Title, Date)

Demonstration of the system/equipment in operation and of the maintenance procedures has been successfully completed.

OWNER

_____
(Signature, Date)

_____
(Owner's Department)

APPENDIX A, FIGURE 2

VOLTAGE AND AMPERAGE READINGS/TABULATED DATA

This form may be used to record voltage and amperage readings (within the panel and from the farthest point, please check the appropriate item below). Copy of this completed form shall be included in the specification section of the O & M Manual for the equipment from which readings are taken.

Project Name: Raleigh-Durham International Airport - Taxiway B Rehabilitation

Specification Division Number & Name: _____

Switchgear/Panel Number: _____

Readings taken within panel: _____ from farthest point: _____

Full Load Amperage Readings:

Date: _____ Time: _____

Phase: A _____ B _____

C _____ N _____

Full Load Voltage Readings:

Date: _____ Time: _____

Phase: A to N _____ A to B _____

B to N _____ A to C _____

C to N _____ B to C _____

No Load Voltage Readings:

Date: _____ Time: _____

Phase: A to N _____ A to B _____

B to N _____ A to C _____

C to N _____ B to C _____

Contractor's Representative: _____

Resident Project Representative: _____

Owner's Representative: _____

APPENDIX A, FIGURE 3

GROUND TEST INFORMATION

GROUND LOCATION:_____

_____

PRIOR TO CONNECTION TO SYSTEM:

GROUND:_____ (OHMS)

WEATHER CONDITIONS FOR PREVIOUS WEEK:_____

_____

AFTER CONNECTION TO SYSTEM:

GROUND:_____ (OHMS)

CONTRACTOR'S REPRESENTATIVE:_____

_____

DATE:_____

APPENDIX A, FIGURE 4

CABLE INSULATION RESISTANCE TEST RECORD

Circuit Description:_____

_____

_____

Date:_____ Time:_____

Phase A to Ground _____Megohms

Phase B to Ground _____Megohms

Phase C to Ground _____Megohms

Neutral to Ground _____Megohms

Phase A to B _____Megohms Phase A to Neutral _____Megohms

Phase A to C _____Megohms Phase B to Neutral _____Megohms

Phase B to C _____Megohms Phase C to Neutral _____Megohms

Weather Conditions:_____

_____

Temperature:_____

Circuit Condition Prior to Test:_____

_____

Tested By:_____ Date:_____

Witnessed By:_____

Owner's Authorized Representative:_____

Date:_____

APPENDIX A, FIGURE 5

END OF ITEM L-131