PROJECT MANUAL
(Including Bid Documents and Technical Specifications)
FOR THE
ARFF BUILDING REPLACEMENT

PREPARED FOR:

NAPLES AIRPORT AUTHORITY

BID DOCUMENTS
Volume 1 of 2
FEBRUARY 2019
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### DIVISION 01 – GENERAL REQUIREMENTS

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INVITATION TO BID

NOTICE IS HEREBY GIVEN that the City of Naples Airport Authority (NAA) invites sealed bids from qualified Contractors to perform the following work, which is described in detail in the Bid Documents.

BID TITLE:  ARFF BUILDING REPLACEMENT
NAPLES MUNICIPAL AIRPORT

BID OPENING LOCATION:  Naples Municipal Airport
160 Aviation Drive North
2nd Floor Larson Conference Room
Naples, Florida 34101

BID SUBMITTAL DEADLINE:  Tuesday, March 12, 2019 at 2:00 p.m. E.D.T.

The NAA is seeking sealed bids for the services of a qualified, licensed, and experienced contractor to provide all necessary equipment, materials, tools, permits, labor, supervision, and installation for the ARFF Building Replacement (Project). The Project generally includes clearing and grubbing, erosion control, earthwork, asphalt and concrete paving, building construction, utility installation and relocation, landscaping, and miscellaneous additional infrastructure items necessary to complete the work and ancillary and incidental activities necessary to complete the work in accordance with the plans, specifications and requirements referenced therein.


All interested prime contractors are strongly urged to attend a Pre-Bid Conference scheduled for Tuesday, February 19, 2019 at 10:30 a.m. E.D.T. in the Larson Conference Room, address above.

Questions during the bid period may be submitted until 5:00 pm, Friday, March 1, 2019 to Tom Roda at thomas.roda@atkinsglobal.com. No questions will be accepted after that time. Bidders shall not contact City of Naples Airport Authority employees or agents, City of Naples elected officials, or the Engineer to discuss the project. Answers to all questions will be compiled into an addendum and posted on www.flynaples.com not later than Monday, March 4, 2019.

Prospective Bidders shall make sure that bids are mailed or delivered to the City of Naples Airport Authority, (address above) no later than the deadline specified, using the forms furnished with and conforming to the requirements of the Bid Documents. A bid bond or certified cashier’s check payable to the City of Naples Airport Authority, equal to five percent (5%) of the total bid amount must be enclosed with the bid. The NAA assumes no responsibility for bids received after the bid submittal time or at any location other than that specified, no matter what the reason. Late bids will not be opened and will not be considered for award. No bidder may withdraw his bid within a period of ninety (90) days after the actual date of opening thereof.

All Bidders must be licensed in accordance with Florida Laws. The NAA recognizes fair and open competition as a basic tenet of public procurement. Respondents doing business with the NAA are prohibited from discriminating on the basis of race, color, creed, national origin, handicap, age.
or sex. The NAA has a progressive Disadvantaged, Minority, and Women-Owned Business Enterprises Program in place and encourages Disadvantaged, Minority, and Women-Owned Business Enterprises to participate in its bid process.

The NAA reserves the right to waive any formalities, technicalities, or irregularities in; or reject any or all Bids in part or in whole; or to re-advertise for Bids and award or refrain from awarding the Contract for the Work.

The NAA adheres to the American with Disabilities Act and will make reasonable modifications for access to Airport services, programs and activities. Please call (239) 643-0733 for further information. Requests must be made at least 48 hours in advance of the event in order to allow the NAA time to provide the requested services.

City of Naples Airport Authority,
Naples, Florida

Kerry Keith, Director of Airport Development

Publish Date: February 10, 2019

END SECTION 00 11 16
SECTION 002113
INSTRUCTIONS TO BIDDERS

1.01 BID SUBMITTAL

Bids shall be submitted to the location and at the time specified in the Invitation to Bid. Mailed bids must be received no later than the stated time. It is the bidder's responsibility to guarantee that bid submissions arrive by the stated time. The City of Naples Airport Authority (NAA or Owner) will not be responsible for any delays caused by the postal service.

Bidders shall submit all required data in accordance with the Bid Documents. Failure to meet these requirements may cause the Owner to deem the submission as non-responsive and exclude it from evaluation.

All Bids will remain subject to acceptance for ninety (90) calendar days after the day of the Bid opening, but the Owner may, in its sole discretion, release any Bid and return the Bid security prior to that date.

One (1) original and two (2) copies (collated in sets) of the bid form supplied by the Owner and all required bid submittal data including any Bidder’s specifications, drawings, etc., shall be enclosed within a sealed envelope with the words, “Sealed Bid: ARFF Building Replacement” and the Bidder's name and address clearly shown on the outside thereof. Submittals received with less than the specified number of copies or not submitted on the provided bid forms may be disqualified as non-responsive.

1.02 COPIES OF BIDDING DOCUMENTS

Complete sets of the Bid Documents may be obtained as stated in the Invitation to Bid. Complete sets of Bid Documents must be used in preparing Bids. The Owner assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents. The Owner, in making copies of Bid Documents available, does so only for the purpose of obtaining Bids for the Work and does not confer a license or grant for any other use.

1.03 ADDENDA

All questions about the meaning or intent of these Bid Documents are to be directed, in writing, to appropriate contact person identified in the Invitation to Bid. Interpretations or clarifications considered necessary in response to such questions will be issued by Addenda mailed or delivered to all parties recorded as having received the Bid Documents. Questions received less than ten (10) days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Addenda may also be issued to modify these Bid Documents as deemed advisable by the Owner.

It is the Bidder’s responsibility to ascertain if any addenda have been issued, to obtain all such addenda and return executed addenda with the bid. Acknowledgement of receipt of addenda shall be made on the Bid Form. The failure of a Bidder to submit acknowledgement of any addenda that affects the bid price(s) may be considered an irregularity and may be cause for rejection of the bid.
Bidders requiring clarification or having a dispute with the documents must advise the Owner of the nature of the required clarification or basis of the dispute, in writing, prior to the date of the bid opening. If no written contact has been made by this specified date, the Bidder waives the right to any future consideration and accepts the documents as published and/or revised by the Owner. Note: Any use of brand names (manufacturer) in this invitation or the specifications is for Bidder convenience only and shall not limit this offering. Equal or better equipment and alternate bids may be given consideration.

1.04 CONTRACT DURATION

The project will consist of three (3) work areas / phases as stipulated in the drawings. The following is a summary of the project components and their associated schedules:

Work Area A: consists of the ARFF Building, parking lot, and driveways outside the temporary AOA fence. The time allotted for substantial completion of this work shall be 270 calendar days.

Work Area B: consists of grading, paving, and misc. work within the object free area of the existing apron. Work in this area will require closure of portions of the apron. The time allotted for substantial completion of this work shall be 30 calendar days after beginning.

Work Area C: consists of grading, paving, and misc. work within the object free area of Taxiway A. Work in this area will require closure of portions of Taxiway A. The time allotted for substantial completion of this work shall be 30 calendar days after beginning.

Additional project elements overlap various work areas. Work can be done in Work Areas A and B concurrently. Work can be done in Work Areas A and C concurrently. Work may not be done in Work Areas B and C concurrently. The Contractor shall work with the Engineer and Owner to establish an acceptable sequence of Work that addresses the various Work Area requirements.

Project Closeout will be conducted after the completion of all work areas. This phase will allow for the accomplishment of the substantial completion punch list, finalization of record documents, submittal of closeout paperwork, and other items as defined within the Contract Documents for the completion of the project. A period of 45 calendar days after substantial completion will be allotted for project closeout.

The total contract duration will be 330 calendar days from notice to proceed to substantial completion plus an additional 45 calendar days for project closeout.

1.05 DISADVANTAGED BUSINESS ENTERPRISE

A Disadvantage Business Enterprise (DBE) goal of 8.95 percent has been established for this project. The bidder/offer is required to make a good faith effort to achieve this goal as defined in Appendix A, Title 49 Code of Federal Regulations (CFR) Part 26. For work to be counted towards this goal the contractor providing the work shall be listed as a certified DBE or W/MBE under the FDOT Unified Certification Program.
1.06 **FUNDING REQUIREMENTS**

Funding for this project is being provided by the Florida Department of Transportation (FDOT) and the Owner. As such, the requirements of the State of Florida, including but not limited to Chapter 287, Florida Statutes, and all administrative regulations shall apply to this project as if herein written out in full. The successful Bidder will be required to furnish a Public Construction Bond in conformance with Florida Statute 255.05 in the full amount of the contract price.

1.07 **LIQUIDATED DAMAGES**

Bidder is notified that the Owner considers time of the essence regarding this Agreement and that Owner will suffer financial loss if the work is not completed within the Contract Duration plus any extensions thereof allowed in accordance with the General Conditions. Accordingly, instead of requiring any such proof, Owner has established as liquidated damages for delay, Contractor shall pay Owner **$2,000.00 for each day** that expires after the time specified for substantial completion that the Project is not complete. These are not penalties for completing the work after the Contract Time but rather a reimbursement for costs lost by the Owner due to the Project not being completed on schedule.

1.08 **EXPARTE COMMUNICATION**

Please note that to insure the proper and fair evaluation of a bid, the Owner prohibits exparte communication (i.e., unsolicited) initiated by the Bidder to the City or Authority Official(s) or Employee(s) evaluating or considering the bids prior to the time a bid decision has been made. Communication between Bidder and the Owner will be initiated by the appropriate Official or Employee in order to obtain information or clarification needed to develop a proper and accurate evaluation of the bid. Exparte communication may be grounds for disqualifying the offending Bidder from consideration or award of the bid, then in evaluation, or any future bid.

1.09 **PUBLIC ENTITY CRIMES**

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list.

1.10 **FLORIDA PUBLIC RECORDS LAW**

Bid submittal information shall be subject to Chapter 119, Florida Statutes, generally known as the “Florida Public Records Law.” The Owner cannot regard any document, information or data as proprietary or confidential unless so exempted by Florida Statutes. Documents received with proprietary or confidential information may be resealed and returned without further consideration or obligation.
1.11 SUSPENSION AND DEBARMENT CERTIFICATION

By submitting a bid in response to this Invitation to Bid, you are certifying that your company, pursuant to 49 CFR Part 29: (1) is not presently suspended or debarred as, and/or listed on the U.S. General Services Administration’s System for Award Management (SAM) as such; and (2) will at all times remain eligible to bid for and perform the services subject to the requirements set forth herein and other applicable laws. Bidder agrees that any contract awarded to Bidder will be subject to termination by the City if Contractor or its subcontractors fail to comply or maintain such compliance.

1.12 DRUG-FREE WORKPLACE CERTIFICATION

By submitting a bid in response to this Invitation to Bid, you are certifying that your company is a drug-free workplace in accordance with Florida Statute 287.087.

1.13 CONFLICT OF INTEREST / STATEMENT OF NON-COLLUSION

The award hereunder is subject to Chapter 112, Florida Statutes. All respondents must disclose with their bid the name of any officer, director, or agent who is also an employee of the City of Naples or NAA. Further, all respondents must disclose the name of any City of Naples or NAA employee who owns, directly or indirectly, an interest of five percent (5%) or more of the respondent’s firm or any of its branches.

The respondent shall certify that he/she has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the bid and that the respondent is not financially interested in, or otherwise affiliated in a business way with any other respondent on the same land or improvements.

1.14 BONDING

A certified check or bid bond shall accompany each bid. The certified check or bid bond shall be for an amount not less than five percent (5%) of the bid price and shall be made payable to the Owner as a guarantee that the Bidder will not withdraw for a period of one hundred eighty (180) days after bid closing time.

In the event the contract is awarded to the Bidder, he/she will, within ten (10) days thereafter, enter into a written contract with the Owner. The successful Bidder shall also furnish within ten (10) days a public construction bond in complete accordance with section 255.05 of the Florida statutes in an amount equal to the contract price, as a guarantee of good faith that the Bidder will execute the work in accordance with the terms of the contract and that the Bidder shall make payments for all labor, material and supplies used directly or indirectly for the work. Failure to do so will constitute forfeiture of the bid security as liquidated damages.

The Public Construction Bond shall be secured from and countersigned by an agency of a surety company recognized in good standing, licensed and authorized to do business in the State of Florida and found to be acceptable to the Owner.
1.15 INSURANCE AND SAFETY REQUIREMENTS

All insurance shall be secured from or countersigned by an agent or Surety Company recognized in good standing and authorized to do business in the State of Florida.

The Contractor shall, within ten (10) days of notification of award and prior to commencement of work, take out and maintain in full force and effect minimum insurance coverage as specified in the attached requirements. This insurance shall remain in force and effect throughout the duration of the contract.

A certificate of existing insurance coverage should be submitted with the bid as proof of insurability. If the current coverage does not meet the bid requirements then the Bidder should request an affidavit of insurability from the Bidder’s insurance agent certifying the requirements can and will be met. Failure to provide adequate insurance coverage may be cause for disqualification as non-responsive to the bid requirements.

The Contractor agrees to accept and abide by the Owner’s safety regulations in complete accordance with the requirements of the Contract Documents.

1.16 HOLD HARMLESS / INDEMNIFICATION AGREEMENT

The Contractor agrees to indemnify and hold harmless the Owner in complete accordance with the Contract Documents. This agreement shall be signed, notarized and returned with the bid submittal. Failure to provide the Hold Harmless Indemnification Agreement may be cause for disqualification as non-responsive to the bid requirements.

1.17 EXAMINATION OF CONDITIONS AFFECTING WORK

Each bidder is invited to visit the site of the proposed construction. A tour of the site may be planned after the Pre-Bid Conference. Any other visit to the site is to be coordinated with and at the direction of the Airport. At no time is the prospective bidder to enter the proposed construction site without the express consent of the Owner.

Prior to submitting a Bid, each Bidder shall examine and thoroughly familiarize themselves with all existing conditions including all applicable laws, codes, ordinances, rules and regulations that will affect his work. Bidders shall visit the site, examine the grounds and all existing buildings, utilities and roads and shall ascertain by any reasonable means all conditions that will in any manner affect work. Bidders shall request from the Owner any additional information deemed necessary to be fully informed as to exactly what is to be expected prior to submitting a Bid.

Before submitting a Bid each Bidder will be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.
On request, the Owner will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests, and studies as each Bidder deems necessary for submission of a Bid. Bidder must fill all holes and clean up and restore the site to its former conditions upon completion of such explorations, investigations, tests, and studies.

1.18 ACCURACY OF TECHNICAL DATA

Bidders may rely upon the general accuracy of the "technical data" contained in reports of explorations and tests of subsurface conditions provided with the bid documents. However, any interpretations, opinions, or information contained in such reports or otherwise relating to the subsurface conditions at the site shall be utilized at the Bidder's own risk.

Drawings of physical conditions in or relating to existing surface and subsurface structures have been utilized in preparation of these Bid Documents. Bidder may rely upon the general accuracy of the "technical data" contained in such drawings but neither upon other data, interpretations, opinions, or information shown or indicated in such drawings or otherwise relating to such structures, nor upon the completeness thereof for the purposes of bidding or construction.

Information and data shown or indicated in these Bid Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to Owner by Owners of such Underground Facilities or others, and the Owner does not assume any responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Project Manual.

1.19 INTERPRETATIONS

Each Bidder shall carefully examine the plans and the Contract Documents and all addenda or other revisions and thoroughly familiarize themselves with the detailed requirements prior to submitting a Bid. Should a Bidder find discrepancies or ambiguities in, or omission from Bid documents, or should he be in doubt as to their meaning, he shall at once and in any event not later than ten (10) days prior to bid date, notify the contact identified in the Invitation to Bid who will send written addenda to all bidders.

1.20 SUBSTITUTE AND "OR-EQUAL" ITEMS

The Contract, if awarded, will be on the basis of materials and equipment described in the drawings or specified and equipment described in the drawings or specified in the specifications without consideration of possible substitute or "or-equal". Whenever it is indicated in the drawings or specified in the specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Owner, application for such acceptance will not be considered by Owner until after the Effective Date of the Agreement. The procedure for submission of any such application by Contractor and consideration by Owner is set forth in the General Conditions and may be supplemented elsewhere in the Project Manual.
1.21 MODIFICATIONS AND/OR WITHDRAWAL OF BIDS

Bids which have been submitted may not be modified or withdrawn after submission unless the bidder makes his request in writing or in person and such request is received prior to the time and date fixed for the opening of bids. Negligence on the part of the bidder in the preparation of his Bid shall not be grounds for the modification or withdrawal of a Bid after the time set for bid opening.

1.22 DISQUALIFICATION OF BIDDERS

Any of the following reasons may be considered as sufficient for the disqualification of a bidder and the rejection of his proposal or proposals:

A. More than one proposal for the same work from an individual, firm or corporation under the same or different name or evidence that the bidder has a financial interest in the firm of another bidder for the same work.

B. Evidence of collusion among bidders. Participants in such conclusion will receive no recognition as bidders for any future work of the City until such participant shall have been reinstated as a qualified bidder.

C. Uncompleted work that in the judgment of the City might hinder or prevent the prompt completion of additional work if awarded.

D. Failure to pay or satisfactorily settle all bills due for labor and material on former contracts in force at the time of advertisement for bids.

E. Default under previous contract.

1.23 AWARD OF CONTRACT

The Owner at its sole discretion reserves the right to waive technicalities or irregularities, to reject any or all bids, and/or to accept that bid which is in its best interest. The award of this bid, if made, may be based on considerations other than total cost and may be awarded based on various considerations, including without limitation; Bidder’s experience and/or qualifications, past experience, past performance, administrative cost, standardization, technical evaluation and oral and/or written presentations as required. The Owner reserves the right to accept all or part, or to decline the whole, and to award this bid to one (1) Bidder.

The Owner reserves the right to negotiate with the apparent low bidder if necessary to accommodate grant funding requirements. There is no obligation to buy. The bid, if awarded, will be in the judgment of the Owner the most responsive to the Owner’s needs.

END OF SECTION 00 21 16
SECTION 00 41 00
BID FORM

Project: ARFF Building Replacement
Naples Municipal Airport

Bidding Contractor Company Name: __________________________

Company Address: __________________________

City: __________________________ State: ___________________ Zip: ______________

FL Contractor License No.: __________________________ Expiration Date: ______________

FL Contractor License Classification: __________________________

Telephone: (______) _________________________ Fax: (______) _____________________

The following Bid Form is in strict accordance with the City of Naples Airport Authority Invitation to Bid for the Project. The bid will be for all work outlined in the Bid Documents for the Project.

1. The undersigned declares that no person in the employ of City of Naples Airport Authority, Naples, Florida (herein referred to as Owner, NAA, or the Authority) is pecuniarily interested in this proposal, or in the contract or the work which he proposed to do; that he has carefully examined the contract and the specifications and has informed himself fully in regard to all conditions pertaining to the site where the work is to be done and carefully estimated on the work.

2. The undersigned understands that the Owner, its agents, and employees, are not to be in any manner held responsible for the accuracy of, or bound by, any estimates or plans of underground structures relating to the work, and that if any have been given or made, they are to be considered solely as a base for filling out and preparing proposals.

3. The undersigned proposes to furnish all labor, equipment and material required for the above-named Project at the airport known as Naples Municipal Airport, Naples, Florida, in accordance with the accompanying specifications and plans prepared for the Owner for the sums specified herein, subject to additions and deductions according to the specifications and in all respects to the terms thereof.

4. It is understood that all workmanship and materials under all items of work are guaranteed for one year from the date of final acceptance, unless otherwise specified.

5. It is understood that the Owner reserves the right to accept or reject any or all bids and waive formalities. The Owner reserves the right to award any, all, or none of the alternate or additive alternate bid items. The Owner reserves the right to modify or delete various items listed in the Bid Schedule in order to make use of all available funding. Such modifications shall be made solely at the Owner’s discretion.

6. The bidder’s attention is called to the fact that the estimate of quantities of work to be done and materials to be furnished under these Specifications, as shown on the proposal form is approximate and is given only as a basis of calculation upon which the award of the contract is
to be made. The Owner reserves the right to increase or diminish any or all the above-mentioned quantities of work or to omit any of them as it may deem necessary. The Contractor further agrees to accept the "Unit Bid" Prices in compensation for any additions or deductions caused by variation in quantities due to more accurate measurement, or by any changes or alterations in the plans or specifications of the work. Payment will be made by Owner for actual quantities.

7. It is agreed that the description for each item, being stated, implies although it does not mention, all incidentals and that the prices stated are intended to cover all such work, materials, and incidentals and constitute bidders obligations as described in the specifications, and any details not specifically mentioned, but evidently included in the contract shall be compensated for in the item which most logically includes it.

8. The bidder agrees that this proposal will remain valid and in full force and effect for a minimum period of ninety (90) days following the official bid opening date.

9. The bidder agrees that within fifteen (15) days of receipt of written notice of any award of the contract that he will execute the contract contained in the Proposal, in accordance with the bids as accepted, and will furnish the required performance bond, payment bond and insurance affidavits with good and sufficient surety or sureties, as required by the specifications.

10. The bidder further agrees that if awarded the contract, he will commence the work within ten (10) days of the date of receipt of a "Notice to Proceed" and that he will fully complete the work ready for use within the number of calendar days stipulated in the Contract Documents. If the undersigned fails to complete any phase of the work within the given time frame and if he fails to complete all of the work on or before the expiration of the allowed calendar days, then and in that event, he further expressly agrees that, for each day that any phase of the work under this contract remains uncompleted thereafter the Owner may deduct from the contract price herein specified the stipulated sum of liquidated damages and retain for failure of the undersigned to complete this contract on or before the expiration of the scheduled critical time frames.

11. The undersigned, as Bidder, does hereby declare that having familiarized himself with the local conditions affecting the cost of the work, contract documents, including the "Procurement and Contracting Requirements", "General Requirements", "Technical Specifications", and the "Drawings", together with any Addenda to such construction documents as listed herein, hereby proposes to furnish all materials, equipment, tools, incidentals and other means of construction and perform all work required in strict accordance with the provisions of documents noted above for the consideration of prices quoted herein.

12. The undersigned affirms that in making such bid, neither he nor any company that he may represent, nor anyone in behalf of him or his company, directly or indirectly, has entered into any combination, collusion, undertaking or agreement with any other bidder or bidders to maintain the prices of said work, or any compact to prevent any other bidder or bidders from bidding on said contract or work and further affirms that such bid is made without regard or reference to any other bidder or bid and without any agreement or understanding or combination either directly or indirectly with any other person or persons with reference to such bidding in any way or manner whatsoever.

13. The undersigned affirms that they have completed all the blank spaces in all "Bid Schedules" with an amount in words and numbers and agrees that where a discrepancy occurs between the prices quoted in words and in numbers, the written words shall take precedence and govern when determining final costs or award of contract.
14. The undersigned affirms that wages not less than the minimum rates or wages, as predetermined for this project by the U.S. Secretary of Labor, were used in the preparation of this bid.

15. The Trench Safety Standards that will be in effect during the construction of this project are: Laws of Florida, Chapters 90-96, Trench Safety Act, and OSHA Rules and Regulations, 29 CFR 1926.650 Subpart P. The undersigned assures that the entity will comply with the applicable Trench Safety Standards and agrees to indemnify and hold harmless the City of Naples Airport Authority and Engineer, and any of their agents or employees from any claims arising from the failure to comply with said standard.

16. The undersigned attaches hereto a certified check, cashier's check, treasurer's check, bank draft on any national or state bank, or Bid Bond in the sum of 5% of amount bid payable to the City of Naples Airport Authority as required in the Invitation to Bid, and the undersigned agrees that in case he fails to fulfill his obligations under the foregoing Bid and Contract, the Owner may, at its option, determine that the undersigned has abandoned his rights and interests in such bid and that the cashier's check or Bid Bond accompanying his bid has been forfeited. Otherwise, the check shall be returned to the undersigned upon the execution of the Contract and the acceptance of the bonds and insurance, or upon rejection of his bid.

17. The undersigned acknowledges receipt of the following Addenda:

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18. For all work required in accordance with the applicable plans, specifications and other contract documents, including the cost of the required bonds and insurance, the undersigned submits a total bid breakdown as shown in the Bid Schedule.

19. The legal status of the undersigned is:

   a. A corporation duly organized and doing business under the laws of the State of ________, for whom, ______________, bearing official title of ________________________, whose signature is affixed to this bid, is duly authorized to execute contracts.

      If foreign corporation: date of qualification in (state): ________________.

      Name and address of processing agent ________________________________

      ________________________________________________________________

   b. A partnership, all of the members of which, with addresses are: (designate general partners as such).

      If all partners are non-residents of ________ (state), designate name and address of
agent for service of process located in ______________ (state)

c. An individual, whose signature is affixed to this bid. (if non-resident of __________ (state),
resident agent for the service of process must be designated.) ________________________________

____________________________________________________________________

The bidder shall fill out the appropriate form (a., b., or c.) and strike out the other two.

Dated and signed at ________, ________, this ___ day of ________, 20__

Name of Contractor: ________________________________

Authorized Signature: ____________________________

Printed Name: ________________________________

Title: ________________________________

Email: ________________________________
BID FORM (CONT.)
PROPOSAL AFFIDAVIT

The following affidavit must be executed in order that your Quotation may be considered.

STATE OF ________________________________

COUNTY OF ________________________________

________________________________________________________________________ of lawful age, being first duly sworn, upon his oath deposes and says: That he executed the accompanying Quotation on behalf of the Contractor therein named, and that he had lawful authority so to do, and said Contractor has not directly or indirectly, entered into any agreement, expressed or implied, with any Contractor or Contractors, having for its object the controlling of the price or amount of such quotation or any quotations, the limiting of the Quotation or Contractors, the parceling or farming out to any Contractor or Contractors or to other persons of any part of the contract or any of the subject matter of the Quotations, or of the profits thereof, and that he has not and will not divulge the sealed Quotation to any person whomsoever, except those having a partnership or other financial interest with him in said Quotation or Quotations, until after the sealed Quotation or Quotations are opened.

Signed: ________________________________

Subscribed and sworn to before me this ____ day of __________, 20__.  

My Commission Expires: ________________________________

________________________________________

Notary Public
BID FORM (CONT.)

BIDDER’S QUALIFICATIONS

Each bidder shall furnish the following completed form with their bid. Use additional pages as necessary.

1. Communications regarding questions about the bid shall be addressed to: __________

2. Regarding General Contractor:
   a. Company Name: ____________________________
   b. Business Address: ____________________________
   c. Telephone Number: ____________________________
   d. Date Organized: ____________________________
   e. Where Incorporated: ____________________________
   f. How many years have you been engaged in the contracting business under the present firm name? ______
   g. What is the type of construction work in which you are principally engaged? ______
   h. Credit Available for this Contract: $___________
   i. Contracts now in hand, Gross Amount: $___________
   j. Have you ever refused to sign a contract at your original bid? ______
   k. Have you ever been declared in default on a contract? ______
   l. What percentage of the work do you intend to subcontract? _____% 
      (NOTE: The Owner expects that the general contractor will self-perform a minimum of 33% of the project work. Therefore, intent to subcontract more than 67% of the project work could be grounds for determining a bid is non-responsive.)

3. Enclose a copy of the General Contractor’s latest financial statement. This should include a balance and income statement for your most recent fiscal year.

4. Provide information on up to three (3) projects of this nature that you have completed in the last three (3) years, and give the name, address and telephone number of a reference from each. Also give the completion date, the original contract bid price and the completed cost of each project listed.
5. List projects presently under construction by your firm, the dollar volume of the contract, and the percentage completion of the contract.

6. Provide a list the equipment and materials the General Contractor has available for this project.

7. Provide a list of firms that will utilized to complete the work and the responsibilities of each. Clearly identify firms that are certified as a DBE or MBE through the FDOT Unified Certification Program.

8. Include a copy of the FDOT certification letter for any team member firms that are certified as a DBE or MBE through the FDOT Unified Certification Program.
STATE OF __________________________
COUNTY OF _________________________

Being first duly sworn, deposes and says that he is
(Sole owner, a partner, president, secretary, etc.) of
____________________________________

The party making the foregoing Proposal or BID that such BID is genuine and not collusive or
sham; that said BIDDER has not colluded, conspired, connived, or agreed, directly or indirectly,
with any BIDDER or person, to put in a sham BID, or that such other person shall refrain from
bidding, and has not in any manner, directly or indirectly sought by agreement or collusion, or
communication or conference, with any person, to fix the Bid Price of affiant or any other BIDDER,
or to fix any overhead, profit or cost element of said Bid Price, or of that of any other BIDDER, or
to secure any advantage against OWNER any person interested in the proposed Contract; and
that all statements in said Proposal or Bid are true; and further, that such BIDDER has not, directly
or indirectly submitted this BID, or the contents thereof, or divulged information or date relative
thereto to any association or to any member or agent thereof.

____________________________________(Bidder)

Sworn to and subscribed before me this _____ day of ________________, 20__

Notary Public in and for
____________________________________ County,

____________________________________(Notary)

My Commission Expires:
____________________________________, 20__
BID FORM (CONT.)
SWORN STATEMENT PURSUANT TO SECTION 287.133(3)(A)
FLORIDA STATUTES ON PUBLIC ENTITY CRIMES

1. This sworn statement is submitted to ________________________________
   [print name of the public entity]
   by ________________________________________________________________
   [print individual's name and title]
   for ________________________________________________________________
   [print name or entity submitting sworn statement]
   whose business address is ____________________________________________
   ________________________________________________________________
   (If applicable) its Federal Employer Identification Number (FEIN) is ____________
   (If the entity has no FEIN, include the Social Security Number of the individual signing this sworn
   statement: _________________________________.)

2. I understand that a "public entity crime" as defined in Paragraph 287.133(1)(g), Florida
   Statutes, means a violation of any state or federal law by a person with respect to and directly
   related to the transaction of business with any public entity or with an agency or political
   subdivision of any other state or of the United States, including, but not limited to, any bid or
   contract for goods or services to be provided to any public entity or an agency or political
   subdivision of any other state or of the United States and involving antitrust, fraud, theft,
   bribery, collusion, racketeering, conspiracy, or material misrepresentation.

3. I understand that "convicted" or "conviction" as defined in Paragraph 287.133(1)(b), Florida
   Statutes, means a finding of guilt or a conviction of a public entity crime, with or without an
   adjudication of guilt, in any federal or state trial court of record relating to charges brought by
   indictment or information after July 1, 1989, as a result of a Jury Verdict, nonjury trial, or entry
   of a plea of guilty or nolo contendere.

4. I understand that an "affiliate" as defined in Paragraph 287.133(1)(a), Florida Statutes, means:
   a. A predecessor or successor of a person convicted of a public entity crime; or
   b. An entity under the control of any natural person who is active in the management of the
      entity and who has been convicted of a public entity crime. The term "affiliate" includes
      those officers, directors, executives, partners, shareholders, employees, members, and
      agents who are active in the management of an affiliate. The ownership by one person of
      shares constituting a controlling interest in another person, or a pooling of equipment or
      income among persons when not for fair market value under an arm's length agreement,
      shall be a prima facie case that one person controls another person. A person who
      knowingly enters into a joint venture with a person who has been convicted of a public
      entity crime in Florida during the preceding 36 months shall be considered an affiliate.

5. I understand that a "person" as defined in Paragraph 287.133(1)(e), Florida Statutes, means
   any natural person or entity organized under the laws of any state or of the United States with
the legal power to enter into a binding contract and which bids or applies to bid on contracts
for the provision of goods or services let by a public entity, or which otherwise transacts or
applies to transact business with a public entity. The term "person" includes those officers,
directors, executives, partners, shareholders, employees, members, and agents who are
active in management of an entity.

6. Based on information and belief, the statement which I have marked below is true in relation
to the entity submitting this sworn statement. [Indicate which statement applies.]

_____ Neither the entity submitting this sworn statement, nor any of its officers, directors,
executives, partners, shareholders, employees, members, or agents who are active in the
management of the entity, nor any affiliate of the entity has been charged with and convicted
of a public entity crime subsequent to July 1, 1989.

_____ The entity submitting this sworn statement, or one or more of its officers, directors,
executives, partners, shareholders, employees, members, or agents who are active in the
management of the entity, or an affiliate of the entity has been charged with and convicted of
a public entity crime subsequent to July 1, 1989. However, there has been a subsequent
proceeding before a Hearing Officer of the State of Florida, Division of Administrative Hearings
and the Final Order entered by the Hearing Officer determined that it was not in the public
interest to place the entity submitting this sworn statement on the convicted vendor list. [Attach
a copy of the final order.]

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER
FOR THE PUBLIC ENTITY IDENTIFIED IN PARAGRAPH I (ONE) ABOVE IS FOR THAT
PUBLIC ENTITY ONLY AND, THAT THIS FORM IS VALID THROUGH DECEMBER 31 OF THE
CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT I AM REQUIRED TO
INFORM THE PUBLIC ENTITY PRIOR TO ENTERING INTO A CONTRACT IN EXCESS OF
THE THRESHOLD AMOUNT PROVIDED IN SECTION 287.017, FLORIDA STATUTES, FOR
CATEGORY TWO OF ANY CHANGE IN THE INFORMATION CONTAINED IN THIS FORM.

____________________________
Signature

Sworn to and subscribed before me this _____ day of _______________, 20__.

Personally known __________ OR Produced identification ________________
(type of identification)

Notary Public - State of __________________________
Signature of Notary Public

My Commission Expires __________________________
Printed name of notary public
For purposes of determining any possible conflict of interest, all bidders/proposers, must disclose if any City of Naples commissioner, employee(s), elected official(s), or if any of its agencies is also an owner, corporate officer, agency, employee, etc., of their business.

Indicate either “yes” (a city employee, elected official, or agency is also associated with your business), or “no.” If yes, give person(s) name(s) and position(s) with your business

YES _________ NO ____________

NAME(S) POSITION(S)
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

FIRM NAME: ________________________________

BY (PRINTED): _______________________________

BY (SIGNATURE): _______________________________

TITLE: _______________________________

ADDRESS: ___________________________________

PHONE NO: _______________________________
BID FORM (CONT.)
DRUG-FREE WORKPLACE CERTIFICATION

The below signed bidder certifies that it has implemented a drug-free workplace program. In order to have a drug-free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection 1.

4. In the statement specified in subsection 1, notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, to any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

DATE: _______________________

COMPANY: ____________________ SIGNATURE: __________________

ADDRESS: ____________________ NAME: ________________________
_____________________________ (Typed or Printed)

PHONE #: ____________________

NAME: ________________________
(Typed or Printed)

ADDRESS: ____________________ TITLE: ________________________

PHONE #: ____________________
BID FORM (CONT.)
INDEMNIFICATION AND HOLD HARMLESS

To the fullest extent permitted by law, Contractor shall indemnify and hold harmless the NAA, its officers and employees from liabilities, damages, losses, and costs including but not limited to reasonable attorney fees, to the extent caused by the negligence, recklessness, or intentional wrongful conduct of the Contractor and other persons employed or utilized by the Contractor in the performance of this Agreement.

Bidder's Company Name   Authorized Signature - Manual

Physical Address   Authorized Signature - Typed

Mailing Address   Title

Phone Number   FAX Number

Cellular Number   After-Hours Number(s)

Date
BID FORM (CONT.)
INSURANCE COMPLIANCE

This form is to be completed and signed by the Bidder’s insurance agent/carrier certifying that the Bidder’s policy either meets the insurance requirements as specified in the bid documents for this project, or that the insurance company has reviewed the bid requirements and certifies that the Bidder was quoted any price increase due to required coverage.

CONTRACTOR

I certify that the insurance requirements have been reviewed.

Company Name

Address

Representative

Name

Title

Phone Number

INSURANCE COMPANY

I certify that the insurance requirements have been reviewed with the above contractor.

Company Name

Address

Representative

Name

Title

Phone Number
BID FORM (CONT.)
DISADVANTAGE BUSINESS ENTERPRISE
UTILIZATION STATEMENT

The undersigned bidder/offeror has satisfied the requirements of the bid specification in the following manner. (Please mark the appropriate box)

0 The bidder/offeror is committed to a minimum of ______% DBE utilization on this contract.

0 The bidder/offeror, while unable to meet the DBE goal of the instructions to bidders, hereby commits to a minimum of ______% DBE utilization on this contract and also submits documentation, as an attachment, demonstrating good faith efforts (GFE).

The undersigned hereby further assures that the information included herein is true and correct, and that the DBE firm(s) listed herein has agreed to perform a commercially useful function in the work items noted for each firm. The undersigned further understands that no changes to this statement may be made without prior approval from the Civil Right Staff of the Federal Aviation Administration.

Bidder's/Offeror's Firm Name

________________________________________  __________
Signature  Date

DBE UTILIZATION SUMMARY

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Contract Amount</th>
<th>DBE Amount</th>
<th>Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBE Prime Contractor</td>
<td>$_________ x 1.00 =</td>
<td>$_________</td>
<td>______%</td>
</tr>
<tr>
<td>DBE Subcontractor</td>
<td>$_________ x 1.00 =</td>
<td>$_________</td>
<td>______%</td>
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<tr>
<td>DBE Supplier</td>
<td>$_________ x 0.60 =</td>
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<td>Total Amount DBE</td>
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<tr>
<td>DBE Goal</td>
<td>$_________</td>
<td>______%</td>
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</table>

* If the total proposed DBE participation is less than the established DBE goal, Bidder must provide written documentation of the good faith efforts as required by 49 CFR Part 26.
BID FORM (CONT.)
DISADVANTAGE BUSINESS ENTERPRISE
LETTER OF INTENT

(This page shall be submitted for each DBE firm)

Bidder/Offer
Name:__________________________________________
Address:________________________________________
City:_________ State:_________ Zip:_________

DBE Firm:
DBE Firm:_____________________________________
Address:_______________________________________
City:_________ State:_________ Zip:_________

DBE Contact Person:
Name:_________________________ Phone: (____)_______

DBE Certifying Agency:_________________________ Expiration Date:_________

Each DBE Firm shall submit evidence (such as a photocopy) of their certification status.

Classification:  □ Prime Contractor  □ Subcontractor  □ Supplier
               □ Joint Venture  □ Manufacturer

<table>
<thead>
<tr>
<th>Work item(s) to be performed by DBE</th>
<th>Description of Work Item</th>
<th>Quantity</th>
<th>Total</th>
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</tbody>
</table>

The bidder/offeror is committed to utilizing the above-named DBE firm for the work described above. The estimated participation is as follows:

DBE contract amount: $_________ Percent of total contract:_______%

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

By: ____________________________________________________________
    (Signature)  (Title)
CONTRACTOR’S CERTIFICATION OF NON-SEGREGATED FACILITIES

The contractor certifies that it does not maintain or provide, for its employees, any segregated facilities at any of its establishments and that it does not permit employees to perform services at any location, under its control, where segregated facilities are maintained. The contractor certifies that it will not maintain or provide, for its employees, segregated facilities at any of its establishments and that it will not permit its employees to perform services at any location, under its control where segregated facilities are maintained. The 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 contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontractors exceeding $10,000.00 which are not exempt from the provisions of the equal opportunity clause and that he will retain such certifications in his files.

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

____________________________________________________________________________
Name and Title (Please type)

Date_________________________ Signature ________________________________

Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.
BID FORM (CONT.)
CONTRACTOR’S CERTIFICATION OF ELIGIBILITY

The bidder 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 bid that is will include this clause without modification in all lower tier transactions, solicitations, bids, proposals, contracts, and subcontracts. Where the bidder/offer/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this solicitation/proposal.

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

____________________________________________________________________________
Name and Title (please print)

____________________________________________________________________________
Signature Date

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

END OF SECTION 00 41 00
<table>
<thead>
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<th>PAY ITEM</th>
<th>APPL. SPEC SECTION</th>
<th>ITEM DESCRIPTION</th>
<th>UNIT</th>
<th>QTY.</th>
<th>UNIT PRICE IN WORDS (DOLLARS AND CENTS)</th>
<th>UNIT PRICE IN NUMBERS</th>
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<td>27</td>
<td>L-100-2</td>
<td>Site Locating, Duct Tracing and Pot Horing</td>
<td>LS</td>
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<td>28</td>
<td>L-104-1</td>
<td>Temporary Airfield Lighting During Construction</td>
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<td>29</td>
<td>L-108-1</td>
<td>No. 8 AWG, 5 kV, L-824C Cable, Installed in Duct Bank or Conduit</td>
<td>LF</td>
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<td>30</td>
<td>L-108-2</td>
<td>No. 2 AWG, Bare Solid Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit</td>
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<td>1,000</td>
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<td>31</td>
<td>L-108-3</td>
<td>3/4&quot; x 10' Ground Rod, Copper-Clad Steel</td>
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<td>L-110-1</td>
<td>1-Way, 2-Inch Schedule 40 PVC, Concrete Encased Electrical Conduit</td>
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<td>L-110-2</td>
<td>4-Way, 2-Inch Schedule 40 PVC, Concrete Encased Electrical Duct Bank</td>
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<td>L-115-1</td>
<td>Electrical Handhole</td>
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<td>L-125-1</td>
<td>L-852T(L) LED In-Pavement TW Edge Light</td>
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<td>160-4</td>
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<td>285-7-1</td>
<td>Optional Base Course 1, 4-Inch Limerock</td>
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<td>334-1</td>
<td>Superpave Asphaltic Concrete, SP-12.5 Surface Course</td>
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<td>Superpave Asphaltic Concrete, SP-12.5 Base Course</td>
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<td>41</td>
<td>350-3</td>
<td>Plain PCC Pavement, 9-Inch Depth</td>
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<td>425-1</td>
<td>FDOT Type F Ditch Bottom Inlet</td>
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<td>430-1</td>
<td>18-Inch RCP, Class III</td>
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<td>24-Inch RCP, Class III</td>
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<td>430-3</td>
<td>24-Inch Mitered End Section</td>
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<td>47</td>
<td>520-1</td>
<td>Type F Concrete Curb and Gutter</td>
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<td>530-3</td>
<td>Riprap (Rubble)</td>
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<td>Sod (Argentine Bahia)</td>
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<td>51</td>
<td>700-1</td>
<td>Single Post Sign</td>
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<td>710-1</td>
<td>Painted Pavement Markings, Landside</td>
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<td>328400-1</td>
<td>Irrigation System</td>
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<td>329300-1</td>
<td>Landscaping</td>
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<td>2-1/2-Inch PVC Water Main</td>
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<td>331100-2</td>
<td>8-Inch PVC Water Main</td>
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<td>57</td>
<td>331100-3</td>
<td>4-Inch PVC Fire Main</td>
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<td>331100-4</td>
<td>8-Inch PVC Fire Main</td>
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<td>59</td>
<td>331100-5</td>
<td>2-1/2-Inch Backflow Preventer</td>
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<td>60</td>
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<td>8-Inch RPZ Backflow Preventer</td>
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<td>62</td>
<td>333313-1</td>
<td>Connect to Existing Lift Station</td>
<td>LS</td>
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<td>63</td>
<td>333313-2</td>
<td>6-Inch PVC Sanitary Main</td>
<td>LF</td>
<td>275</td>
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</table>

SUBTOTAL

TOTAL BID IN WORDS

TOTAL BID IN NUMBERS

DATE SUBMITTED

COMPANY

REPRESENTATIVE NAME

TITLE

ADDRESS

EMAIL

SIGNATURE
Note: The following is a sample agreement between the City of Naples Airport Authority and the Contractor. The actual agreement will be provided by the City upon Notice of Award.

THIS SERVICE AGREEMENT (this “Agreement”) is made effective as of the _____ day of ________________, 2019 (the “Effective Date”) by and between the CITY OF NAPLES AIRPORT AUTHORITY, a political subdivision of the State of Florida (“the Authority”), and ______________________ (“Contractor”) authorized to transact business in the State of Florida (“Professional”) (the Authority and Professional each individually a “Party” and collectively the “Parties”).

RECITALS

A. The Authority anticipates instructing Contractor to perform and provide all of the specific services and work for the ARFF Construction Project, described in Exhibit A attached hereto and made a part of this Agreement (the “Work”).

B. Contractor is willing and fully competent to perform such Work pursuant to the terms and conditions set forth in this Agreement.

TERMS

NOW, THEREFORE, in consideration of the mutual representations, warranties, covenants and agreements set forth in this Agreement, and other valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Authority and Contractor agree as follows:

1. General. This Agreement sets forth the general terms and conditions under which Contractor shall perform and provide the Work for the Authority at the Authority’s direction from time to time. The precise Work to be performed by Contractor for the Authority, and the deadline for satisfactory completion of all of the Work by Contractor (the “Deadline For Satisfactory Completion”), are fully described and set forth in Exhibit A attached hereto and made a part of this Agreement.

2. Term. This Agreement is effective from the Effective Date until terminated as provided herein. Notwithstanding anything in this Agreement to the contrary, the Authority shall have the exclusive right to terminate this Agreement at any time and for any reason whatsoever in its sole discretion upon thirty (30) days written notice to Contractor.

3. Termination Event. Notwithstanding anything in this Agreement to the contrary, upon the occurrence of any of the following events (each individually a “Termination Event”), all of the rights and privileges granted to Contractor shall, at the Authority’s sole option, cease to exist and this Agreement shall automatically terminate:

(a) Contractor fails to strictly comply with, fulfill, perform, keep, or observe any of its other obligations, covenants, or conditions under this Agreement within two (2) days after written demand from the Authority, time being of the essence;
(b) Contractor makes any misrepresentation under this Agreement or other instrument or document delivered pursuant hereto;

(c) The appointment of a receiver to take possession, or the attachment, execution, or other judicial seizure, of this Agreement or all or any part of Contractor’s assets or business;

(d) A general assignment by Contractor for the benefit of creditors;

(e) The Authority determines, in its sole reasonable discretion, that Contractor is or will be unable to pay its debts as they become due in the ordinary course of Contractor’s business; or

(f) Any voluntary or involuntary petition, or similar pleading, under any bankruptcy act shall be filed by or against Contractor or any voluntary or involuntary proceeding in any court shall be instituted to declare Contractor insolvent or unable to pay its debts. In the event that under applicable law the trustee in bankruptcy or Contractor has the right to affirm this Agreement and continue to perform the obligations of Contractor hereunder, such trustee or Contractor shall, in such time period as may be permitted by the bankruptcy court having jurisdiction, cure all defaults of Contractor hereunder outstanding as of the date of the affirmation of this Agreement and provide to the Authority such adequate assurances as may be necessary to ensure the Authority of the continued performance of Contractor's obligations under this Agreement. Further, the Authority shall receive all the protections available to creditors under the United States Bankruptcy Code including, but not limited to, Section 365 thereof, as amended from time to time.

(g) Any refusal by Contractor to allow public access to all documents, papers, letters, or other material made or received by Contractor in conjunction with Agreement, unless the records are exempt from s. 24(a) of Art. I of the Florida State Constitution and Florida Stat. s. 119.07(1).

(h) No right, power, or remedy conferred upon or reserved to the Authority by this Agreement is intended to be exclusive of any other right, power, or remedy, but each and every such right, power, and remedy shall be cumulative and concurrent and shall be in addition to any other right, power, and remedy given hereunder or now or hereafter existing at law or in equity or by statute.

4. Duties of Contractor. Contractor shall perform and complete all of the Work on or before the Deadline For Satisfactory Completion to the satisfaction of the Authority in a good and workmanlike manner in accordance with generally accepted standards of practice in the State of Florida and all other applicable laws, regulations, and governmental requirements. In addition, Contractor shall:

(a) Furnish all of the labor, management, information, assistance and other services required to perform the Work;

(b) Furnish such equipment, products and supplies, if any, as may be specifically required to perform the Work;

(c) Deliver to the Authority all reports, analyses, documents and other instruments as may be reasonably requested from time to time by the Authority relating to the performance of the Work and Contractor's other obligations under this Agreement;

(d) Provide the Authority with prompt notification of any anticipated delays in the performance of the Work;

(e) Designate one or more individuals to act on behalf of Contractor with respect to the Work and with whom the Authority may confer with respect to the Work;
(f) Furnish such performance bonds, if any, as may be specifically required or reasonably requested by the Authority. If required or requested, such performance bond shall guarantee Contractor’s obligations under this Agreement. The Authority shall not be required to reimburse the cost of any performance bond to Contractor; and

(g) At all times conduct itself in a reasonable and cooperative manner in the discharge of its obligations under this Agreement. Contractor shall be responsible and liable for insuring strict compliance by Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees, invitees and trespassers with each and every term and condition of this Agreement. If Contractor shall fail to perform any of its obligations under this Agreement, the Authority may, in its sole discretion, without waiving or affecting its option to terminate this Agreement or any other rights hereunder, perform or hire a third party to perform the same without thereby becoming liable to Contractor or any other person, and all payments made or costs incurred by the Authority in connection therewith shall be immediately repaid by Contractor to the Authority, with interest thereon at the highest lawful rate. Nothing contained herein shall be construed as requiring the Authority to expend monies or perform any obligations of Contractor hereunder.

Contractor covenants and agrees with the Authority that should Contractor at any time become aware of any act, occurrence, or omission on the part of the Authority, its commissioners, officers, employees, agents, insurers, attorneys, representatives, successors, and assigns, which Contractor believes or has reason to suspect would give rise to a claim by Contractor for bad faith, negligence, fraud or any other form of liability against the Authority, Contractor will advise the Authority in writing of such claim or potential claim within a reasonable period of time not to exceed thirty (30) days of discovery, or Contractor shall be deemed to have waived the claim and be forever barred from asserting that claim or a related claim against the Authority. The purpose of this provision is to promptly advise the Authority of any potential claim and to allow the Authority to immediately investigate, and if necessary, remedy the alleged claim. Contractor agrees that its failure to notify the Authority within a reasonable period of time not to exceed thirty (30) days shall be a complete bar to the pursuit of the claim against the Authority and the Authority’s past and present commissioners, officers, employees, agents, insurers, attorneys, representatives, successors, and assigns, in both their individual and representative capacities.

5. Ownership of Documents and Intellectual Property. All drawings, blueprints, models, reports, analyses, documents, instruments, intellectual property, and other information prepared by Contractor in connection with the Work (the “Property”) shall be the property of the Authority. In the event that Contractor fails to perform its obligations hereunder or is no longer performing its obligations under this Agreement, all Property shall remain the sole and exclusive Property of the Authority.

6. Compensation and Written Invoices.

(a) The Authority shall pay Contractor for the performance and completion of the Work at the rates and in the manner set forth in Exhibit A attached hereto and made a part of this Agreement. Upon completion and acceptance of the Work in accordance with the terms and conditions of this Agreement to the satisfaction of the Authority, Contractor shall send the Authority a written invoice detailing the authorized charges for such Work. All such written invoices are payable within sixty (60) days of receipt by the Authority.

(b) All invoices, bills, fees, or other compensation for services or expenses shall be submitted in detail sufficient for the Authority to pre-audit and post-audit.

(c) Bills for any travel expenses shall be submitted in accordance with Florida Statutes s. 112.061. A state agency may establish rates lower than the maximum provided in s. 112.061.
(d) Contractor agrees to pay each subcontractor under this Agreement for satisfactory performance of its obligations no later than 30 days from the receipt of each payment Contractor receives from the Authority. Contractor agrees further to return retainage payments to each subcontractor within 30 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 Authority.

7. **Licenses.** Contractor represents and warrants to the Authority that it has the expertise in the type of services that shall be required to complete the Work so that Contractor can complete the Work in accordance with the terms and conditions of this Agreement. Contractor agrees to obtain and maintain throughout the entire term of this Agreement all such licenses and permits as are required to transact business in the State of Florida, Collier County, and the City of Naples, including but not limited to, all licenses and permits required by the respective state boards and other governmental agencies responsible for regulating and licensing the services to be provided by Contractor in performing the Work. The personnel, employees, agents, suppliers, subcontractors, licensees or invitees assigned by Contractor to perform the Work shall be qualified to perform the assigned duties and shall be individually licensed and permitted to perform such duties if required by applicable law. Upon request of the Authority, Contractor shall provide the Authority with copies of all applicable licenses and permits of Contractor and Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees and invitees required under this Section 7.

8. **Non-Discrimination.** Contractor shall operate in compliance with all requirements imposed by Title 49 CFR Sub Title A, Office of the Secretary, Part 21, Non-discrimination in Federally Assisted Programs of the Department of Transportation - Effectuation of Title IV of the Civil Rights Act of 1964. Contractor shall not discriminate against any person on the basis of race, color, gender, national origin, age, disability, religion or marital status, in connection with the performance of Work under this Agreement. Contractor shall comply with all applicable sections of Public Law 101-336, commonly known as the Americans with Disabilities Act. Contractor shall furnish its services on a fair, equal and not unjustly discriminatory basis, and Contractor shall charge fair, reasonable and not unjustly discriminatory prices for performing the Work.

9. **Insurance.** Contractor shall comply with each of the following insurance requirements and obligations:

(a) Contractor shall obtain comprehensive general liability insurance, including, without limitation, coverage against claims for bodily injury, death, liability, and property damage by reason of, caused by, or resulting from the Work performed by, or any other acts or omissions of, Contractor, any of Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees, invitees or trespassers, and anyone claiming by or through Contractor, and insure Contractor’s indemnification obligations to the Authority under Section 10, with a combined single limit of not less than One Million And 00/100 Dollars ($1,000,000.00) as the result of any one occurrence. Contractor’s comprehensive general liability insurance shall also include premises and operation, contractors, products and completed operations and contractual liability.

(b) Contractor shall obtain worker’s compensation insurance covering all employees meeting statutory limits in compliance with the applicable state and federal laws. The coverage must include employees’ liability with the minimum limit of One Hundred Thousand And 00/100 Dollars ($100,000.00) for each accident. If exempt, Contractor shall obtain and submit to the Authority a “Certificate of Exemption from Florida Workers' Compensation Law” in lieu of such workers’ compensation insurance coverage.
(c) Contractor shall obtain automobile liability insurance for all automobiles owned, used or hired by Contractor, any of Contractor’s agents, employees, contractors, subcontractors, licensees, invitees or trespassers, and anyone claiming by or through Contractor, with a combined single limit of not less than One Million And 00/100 Dollars ($1,000,000.00) as the result of any one occurrence.

(d) All of the insurance required under this Section 9 shall be obtained by Contractor prior to the commencement of the Work and shall thereafter, until the termination of this Agreement, be continually maintained by Contractor at its sole cost and expense. The Authority shall be included as an additional insured on all of Contractor’s policies of general liability insurance. Renewal certificates evidencing all of the insurance required under this Section 9 shall be sent by Contractor to the Authority thirty (30) days prior to the expiration date of each applicable insurance policy. Each insurance policy required under this Section 9 shall provide that the Authority shall receive at least thirty (30) days prior written notice in the event of any cancellation or modification of any insurance coverage. All insurance coverage of Contractor shall be in addition to, and shall in no way be construed or interpreted to be a limitation of, Contractor’s indemnification obligations to the Authority under Section 10. It is expressly agreed that Contractor’s policies of insurance required under this Section 9 shall be primary over any insurance which the Authority may maintain or carry, and that Contractor shall obtain from its insurers an endorsement waiving any other insurance clauses which may be in conflict with this provision, and evidence of such waiver shall be indicated on all insurance policies or certificates of insurance furnished to the Authority. Contractor shall be responsible and liable for insuring that all of Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees or invitees who perform any of the Work carry and comply the same insurance coverages and requirements required of Contractor under this Section 9. Upon the request of the Authority, Contractor shall deliver to the Authority copies of all insurance policies of Contractor and Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees and invitees (and certificates of insurance for the same).

10. Indemnification. Contractor covenants and agrees, in accordance with F.S. Sections 725.06 and 725.081, to save and keep harmless and indemnify the Authority and the Authority’s past and present commissioners, officers, employees, agents, insurers, attorneys, representatives, successors, and assigns, in both their individual and representative capacities, of, from and against any and all liabilities, losses, damages, costs, expenses, causes of action, suits, penalties, claims, demands, and judgments of every kind and nature, including, without limitation, attorneys’ fees and expenses of defense (through all appeals), arising out of or caused by Contractor’s negligence or intentional misconduct in connection with (i) any act or omission of Contractor or Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees or invitees who perform any of the Work carry and comply the same insurance coverages and requirements required of Contractor under this Section 9. Upon the request of the Authority, Contractor shall deliver to the Authority copies of all insurance policies of Contractor and Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees and invitees (and certificates of insurance for the same).

This Section 10 shall also pertain to any claims brought against the Authority by any of Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees or invitees and anyone claiming by or through Contractor. Contractor’s obligations under this Section 10 shall not be limited in any way by Contractor’s limit of, or lack of, sufficient insurance protection.

---

1 Applies to construction contracts only
2 Statutory limitation applies to construction contracts only
11. **Rules and Regulations.** Contractor shall comply with each of the following:

   (a) any and all (i) City Of Naples Airport Authority Rules And Regulations For Naples Municipal Airport, Naples, Florida as amended, (ii) regulatory or compliance regulations and (iii) all other procedures or rules on file in the offices of the Executive Director of the Authority or as hereafter promulgated, established, or amended from time to time by the Authority in its sole discretion (collectively the “Airport Rules And Regulations”). The Airport Rules And Regulations are incorporated by reference and made a part of this Agreement. Upon request, Contractor shall have the right to review any of the Airport Rules and Regulations during regular business hours at the offices of the Executive Director of the Authority; and

   (b) any and all applicable laws, statues, ordinances, codes, rules, regulations, orders, and governmental requirements.

12. **No Waiver.** The failure of the Authority to enforce at any time or for any period of time any one or more of the provisions of this Agreement shall not be construed to be and shall not be a waiver of any such provision or provisions or of its right thereafter to enforce each and every such provision. The waiver by the Authority of a breach of any provision of this Agreement shall not be deemed a continuing waiver or a waiver of any subsequent breach of the same or any other provision hereof.

13. **Severability.** The invalidity of any one or more of the provisions contained in this Agreement shall not affect the enforceability of any or all of the remaining provisions hereof, all of which are inserted conditionally on their being valid in law, and, in the event that any one or more of the provisions contained in this Agreement shall be declared invalid, this Agreement shall be construed as if such invalid provisions had not been inserted.

14. **No Assignment.** Contractor shall not voluntarily, involuntarily, or by operation of law assign, transfer, or otherwise encumber this Agreement, or any rights or privileges of Contractor hereunder, in whole or in part, without first obtaining in each and every instance the prior written consent of the Authority, which consent may be granted or withheld in the Authority’s sole discretion for any reason whatsoever. Any assignment, transfer, or encumbrance contrary to the foregoing shall be a material default under this Agreement and shall be null and void at the Authority’s election.

15. **Independent Contractor.** Neither Contractor nor Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees or invitees shall be deemed to be a servant, employee, partner, or joint venturer of the Authority. Contractor shall perform the Work and its obligations under this Agreement as an independent contractor. Neither Contractor nor Contractor’s personnel, employees, agents, suppliers, subcontractors, licensees or invitees shall hold themselves out as having the power or authority to bind or create liability for the Authority. Contractor shall not be treated as an employee for FICA, FUTA, federal, state or local income tax withholding purposes, and Contractor shall be responsible for its own (and its personnel, employees, agents, suppliers, subcontractors, licensees and invitees) appropriate employment, social security and other tax payments, as well as any statutorily required insurance coverages.

16. **Notices.** All notices and communications under this Agreement shall be in writing and shall be given by personal delivery, facsimile (with receipt confirmed) or by registered or certified first class United States mail, return receipt requested, to the respective parties as follows:

   If to the Authority: City of Naples Airport Authority  
   Attention: Kerry Keith
With Copy to the Authority’s Attorney:

William L. Owens
Bond, Schoeneck & King, PLLC
4001 Tamiami Trail North, Suite 250
Naples, Florida 34103
Phone: (239) 659-3800
Facsimile: (239) 659-3812

If to Contractor:  Business: ___________________________________________
Attention: ___________________________________________
Address: ____________________________________________
City, State, ZIP: ______________________________________
Phone: __________________ FAX: ______________________
Email: ______________________________________________

Notice shall be deemed given upon personal delivery or upon receipt. Either party may change its
mailing address, phone number and fax number by giving written notice to the other party in accordance
with the requirements of this Section 17.

18. Attorneys’ Fees. In the event of any controversy, claim, dispute or litigation relating to
this Agreement, or the breach hereof, the prevailing party shall be entitled to recover from the losing party
the prevailing party’s costs and expenses, including, without limitation, reasonable attorneys’ fees.

19. Governing Law and Venue. This Agreement shall be interpreted under, and its
performance governed by, the laws of the State of Florida (excluding any conflict of law rule or principle
that would refer to the laws of another jurisdiction). Each party hereto irrevocably submits to the
jurisdiction of the Circuit Court of the State of Florida, Collier County, in any action or proceeding arising
out of or relating to this Agreement, and each party hereby irrevocably agrees that all claims in respect of
any such action or proceeding must be brought and/or defended in such court; provided, however, that
matters which are under the exclusive jurisdiction of the Federal courts shall be brought in the Federal
District Court for the Middle District of Florida. Each party hereto consents to service of process by any
means authorized by the applicable law of the forum in any action brought under or arising out of this
Agreement, and each party irrevocably waives, to the fullest extent each may effectively do so, the defense
of an inconvenient forum to the maintenance of such action or proceeding in any such court.
CONTRACTOR AND THE AUTHORITY HEREBY IRREVOCABLY AND UNCONDITIONALLY
WAIVE, TO THE FULLEST EXTENT IT MAY LEGALLY AND EFFECTIVELY DO SO, TRIAL BY
JURY IN ANY SUIT, ACTION OR PROCEEDING ARISING UNDER THIS AGREEMENT.

20. Section Headings. None of the Section headings of this Agreement shall be construed as
a limitation upon the provisions hereof, said Section headings having been inserted as a guide and partial
index and not as a complete index of the contents of any Section or other provision of this Agreement.
Whenever the singular or plural number, masculine or feminine or neuter gender is used in this Agreement,
it shall equally include the other.
21. Counterparts. This Agreement may be executed in any number of counterparts, each such counterpart being deemed to be an original instrument, and all such counterparts shall together constitute the same agreement. Delivery of an executed signature page by facsimile transmission shall be as effective as delivery of a manually signed counterpart.

22. No Modification. No modification or change to this Agreement shall be valid or binding upon the parties unless in writing and executed by the party or parties intended to be bound by it.

23. Encumbrances. Contractor’s rights and privileges under this Agreement are subject and subordinate to any and all rights, liens, licenses, tenancies, mortgages, uses and other encumbrances which may now or hereafter bind the Authority or encumber the Naples Municipal Airport, and to all renewals, modifications, and extensions thereof. Contractor shall, upon request of the Authority, execute any subordination documents which the Authority may deem necessary, but no such document shall be required to effectuate this subordination.

24. Further Assurances. From and after the execution and delivery of this Agreement, Contractor shall cooperate with the Authority in taking such actions, executing such instruments and granting such rights as may be reasonably necessary or requested by the Authority to effectuate the purposes of this Agreement and to perfect the rights and privileges granted and the obligations assumed hereunder.

25. No Third Party Beneficiary Intended. This Agreement is made solely for the benefit of Contractor and the Authority, and their respective successors and permitted assigns, and no other person or entity shall have or acquire any right by virtue of this Agreement. Authority and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents (as defined in Exhibit A).

26. Florida Procurement Laws

(a) Convicted Vendor List. A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in s. 287.017 for CATEGORY TWO for a period of 36 months following the date of being placed on the convicted vendor list.

(b) Discriminatory Vendor List. An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity.

(c) Invoice Compliance. All invoices, bills, fees or other requests for compensation for services or expenses shall be submitted in detail sufficient for a proper preaudit and post audit thereof.
(d) **Travel Expenses.** Bills for any travel expenses shall be submitted in accordance with Florida Stat. 112.061. A state agency may establish rates lower than the maximum provided in s. 112.061.

(e) **Public Records Access.** The Authority may unilaterally cancel this Agreement if Contractor refuses to allow public access to all documents, papers, letters, or other materials made or received by Contractor in conjunction with this Agreement, unless the records are exempt from s. 24(a) of Art. I of the Florida State Constitution and s. 119.07(1).

(f) **Anti-Collusion Statement.** By signing and submitting a bid, Contractor agrees and acknowledges that it has not divulged to, discussed or compared his/her bid with any other bidders and has not colluded with any other bidders or parties to a bid whatsoever (NOTE: including there have been no premiums, rebates or gratuities paid or permitted either with, prior to, or after any delivery or personal contact). Any such violation will result in the cancellation this Agreement.

(g) **Duty to Cooperate with Inspector General.** Contractor agrees to comply with s.20.055(5), Florida Statutes and to incorporate in all subcontracts the obligation to comply with s.20.055, Florida Statutes.

(h) **Any state funds provided for the purchase of or improvements to real property are contingent upon the Contractor or Authority granting to the state of Florida a security interest in the property at least to the amount of state funds provided for at least five (5) years from the date of purchase or the completion of the improvements or as further required by law.**

(i) The State of Florida’s performance and obligation to pay under this contract is contingent upon an annual appropriation by the Legislature.

(j) Contractor hereby certifies that it is not participating in a boycott of Israel, on the Iran Petroleum Energy Sector List, and it does not have business operations in Cuba or Syria.

27. **Federal Aviation Administration Required Contract Provisions.** For the purposes of this Section 27, “the sponsor” means the Authority.

(a) **General Civil Rights Provision.** 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 Contractor and subtier contractors from the bid solicitation period through the completion of the Agreement. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

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

(c) **Compliance with Nondiscrimination Requirements.** During the performance of this Agreement, Contractor, for itself, its assignees, and successors in interest agrees as follows:
(i) **Compliance with Regulations:** 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.

(ii) **Non-discrimination:** Contractor, with regard to the work performed by it during the Agreement, 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. 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.

(iii) **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by 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 Contractor of Contractor’s obligations under this Agreement and the Nondiscrimination Acts And Authorities on the grounds of race, color, or national origin.

(iv) **Information and Reports:** 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, 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.

(v) **Sanctions for Noncompliance.** In the event of Contractor’s noncompliance with the Non-discrimination provisions of this Agreement, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

- Withholding payments to Contractor under the contract until Contractor complies; and/or
- Cancelling, terminating, or suspending the Agreement, in whole or in part.

(vi) **Incorporation of Provisions:** Contractor will include the provisions of paragraphs (i) through (vi) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. 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 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, Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(d) **Title VI List of Pertinent Nondiscrimination Acts and Authorities.** During the performance of this Agreement, Contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

(i) Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);

(ii) 49 CFR part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);

(iii) The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

(v) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
(vi) Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
(vii) The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
(viii) Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;
(ix) The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
(x) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
(xi) Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, Contractor must take reasonable steps to ensure that LEP persons have meaningful access to Contractor’s programs (70 Fed. Reg. at 74087 to 74100);
(xii) Title IX of the Education Amendments of 1972, as amended, which prohibits Contractor from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

(e) Federal Fair Labor Standards Act (Federal Minimum Wage). Federal Fair Labor Standards Act (Federal Minimum Wage). This Agreement incorporates by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers. Contractor has full responsibility to monitor compliance to the referenced statute or regulation. Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

(f) Occupational Safety And Health Act Of 1970. This Agreement incorporates by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. Contractor retains full responsibility to monitor its compliance and their subcontractor’s compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). 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.

(g) The Contractor for itself, its heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of Authority facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the Contractor will use the premises in compliance with all other requirements imposed by or pursuant to the List of Discrimination Acts And Authorities. In the event of
breach of any of the above nondiscrimination covenants, the Authority will have the right to terminate the licenses, leases, permits, etc. and this Agreement and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if the licenses, leases, permits, etc. and this Agreement had never been made or issued.

(h) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program. The following clauses is included in agreements entered into by Authority pursuant to the provisions of the Airport Improvement Program grant assurances: The Contractor for itself, its heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the Contractor will use the premises in compliance with all other requirements imposed by or pursuant to the List of discrimination Acts And Authorities. In the event of breach of any of the above nondiscrimination covenants, the Authority will have the right to terminate the Contractor's access to the Authority and this Agreement and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if the access and this Agreement had never been made or issued.

28. Florida Public Records Laws

(i) IF CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO CONTRACTOR’S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE AUTHORITY’S CUSTODIAN OF PUBLIC RECORDS AT (239) 643-0733, administration@flynaples.com and/or 160 Aviation Drive North, Naples, Florida 34104.

(ii) Contractor acknowledges and agrees that Contractor shall be required to comply with Florida’s Public Records Laws, Chapter 119, Florida Statutes. Specifically, Contractor hereby covenants and agrees that it shall:

(a) keep and maintain public records required by the Authority to perform the services under this Agreement;

(b) upon request from the Authority’s custodian of public records, provide the Authority with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by law;
(c) ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the term of this Agreement and following completion of this Agreement if Contractor does not transfer the records to the Authority; and

(d) upon completion of this Agreement, transfer, at no cost, to the Authority all public records in possession of Contractor or keep and maintain public records required by the Authority to perform the services under this Agreement. If Contractor transfers all public records to the Authority upon completion of this Agreement, Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If Contractor keeps and maintains public records upon completion of this Agreement, Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the Authority, upon request from the Authority’s custodian of public records, in a format that is compatible with the information technology systems of the Authority.

29. Truth in Negotiation Certificate. The wage rates and other factual unit costs supporting the compensation are accurate, complete, and current at the time of contracting and the original contract price and any additions thereto will be adjusted to exclude any significant sums by which the Contractor determines the contract price was increased due to inaccurate, incomplete, or noncurrent wage rates and other factual unit costs.

30. Prohibition Against Contingent Fees. The Contractor warrants that he or she has not employed or retained any company or person, other than a bona fide employee working solely for the Contractor to solicit or secure this agreement and that he or she has not paid or agreed to pay any person, company, corporation, individual, or firm, other than a bona fide employee working solely for the Contractor any fee, commission, percentage, gift, or other consideration contingent upon or resulting from the award or making of this agreement. For the breach or violation of this provision, the Authority shall have the right to terminate the Agreement without liability and, at its discretion, to deduct from the contract price, or otherwise recover, the full amount of such fee, commission, percentage, gift, or consideration.

31. Entire Agreement. This Agreement and all Contract Documents, represent the entire agreement between Contractor and the Authority and supersedes all prior agreements, oral or written, and all other communications relating to the subject matter hereof. Each party has had the opportunity to review with counsel the form of this Agreement and to negotiate same. Therefore, any ambiguity in this Agreement shall not be construed against either party by virtue of having drafted this Agreement. No course of prior dealings between the parties and no usage of trade shall be relevant or admissible to supplement, explain, or vary any of the terms of this Contract. No other representations, understandings or contracts have been made or relied upon in the making of this Contract other than those specifically set forth herein.
IN WITNESS WHEREOF, the parties have executed this Service Agreement as of the day and year first above written.

AUTHORITY:

CITY OF NAPLES AIRPORT AUTHORITY, a political subdivision of the State of Florida

By: ________________________________
Print Name: _________________________
Print Title: _________________________

CONTRACTOR:

By: ________________________________
Print Name: _________________________
Print Title: _________________________

Approved as to form and legal sufficiency by:

__________________________________
Name: ______________________________
Counsel to the Authority
Exhibit A

Description of Work: The Work generally consists of providing all necessary equipment, materials, tools, permits, labor, supervision, and installation for the ARFF Building Replacement (Project). The Project generally includes clearing and grubbing, erosion control, earthwork, asphalt and concrete paving, building construction, utility installation and relocation, landscaping, and miscellaneous additional infrastructure items necessary to complete the work and ancillary and incidental activities necessary to complete the work in accordance with the plans, specifications and requirements referenced therein. This Agreement and the Plans and Specifications are “Contract Documents.” Project will also include all ancillary and incidental activities necessary to complete the work in accordance with the specifications and drawings. In addition to all of the obligations hereunder, the precise Work to be performed by Contractor for the Authority is more fully described and set forth in the following attached hereto and made a part of this Agreement (collectively “Contract”): (i) the Proposal Forms, dated (submittal date), 2019, extracted from the Specifications and Contract Documents for ARFF Building Replacement RFB at Naples Municipal Airport, dated February 10, 2019 (Attachment 1); any Addenda or Attachments.

Deadline for Satisfactory Completion: Except as otherwise provided in this Agreement, the Deadline For Satisfactory Completion of all of the Work and suitability for use is ________________ days from receipt of Notice to Proceed, as specified in Specifications and Contract Documents for ARFF Building Replacement Project RFB at Naples Municipal Airport, dated February 10, 2019.

Rates and Manner of Compensation: Notwithstanding anything in this Agreement to the contrary, compensation shall be based on the actual work awarded and satisfactorily performed for those items listed in the Proposal at the prices contained in the Proposal, subject to modification by change order or for reductions or withholding in accordance with the Plans and Specifications and Proposal; provided, however, Contractor agrees that in no event shall the total compensation paid to Contractor for satisfactory completion of all Work under this Agreement exceed $ ______________________________.

Other Provisions and Obligations of Contractor: None

END SECTION 00 52 00
THIS PAGE LEFT INTENTIONALLY BLANK
By this bond, we, ___________________________________________________________

As Principal, and __________________________________________________________, a corporation, as

Surety, are bound to THE CITY OF NAPLES AIRPORT AUTHORITY, herein called the Owner, in the sum of __________________________________ Dollars $ ____________________, for payment of which we bind ourselves, our heirs, personal representatives, successors and assigns, jointly and severally.

THE CONDITION OF THIS BOND is that if Principal:

1.) Performs the contract dated ___________________   ______, 20__ between Principal and Owner for construction of ____________________________________________________ the contract being made a part of this bond by reference, at the times and in the manner prescribed in the contract, and

2.) Promptly make payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in the contract; and

3.) Pays Owner all losses, damages, expenses, costs and attorney’s fees, including appellate proceedings, that Owner sustains because of default by Principal under the contract; and

4.) Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this bond is void; otherwise it remains in full force.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

Any changes in or under the contract documents and compliance or noncompliance with any formalities connected with the contract or the changes does not effect Surety’s obligation under this bond.

Dated this ________ day of __________________, 20__

Continued on next page:
FLORIDA PUBLIC CONSTRUCTION BOND (CONTINUED)

Signed, sealed and delivered in the presence of:

___________________________________
(Printed or Typed)

Two Witnesses as to Principal

Signed, sealed and delivered in the presence of:

___________________________________
(Printed or Typed)

Two Witnesses as to Surety

“Principal”
By: _______________________________

___________________________________
(Principal or Typed)

Phone (_____) ____________________

“Surety”
By: _______________________________

___________________________________
(Printed or Typed)

Phone (_____) ____________________

Address ___________________________

Countersigned by “Licensed Resident Florida Agent” at ____________________________

On this ________ day of ________________________, 20__

Agency ___________________________ By _______________________________

Resident Agent

Address ___________________________

___________________________________
(Printed or Typed)

Phone (_____) ____________________ FL License # _______ - _______ - _______

Continued on next page:
Bond # __________

FLORIDA PUBLIC CONSTRUCTION BOND (CONTINUED)

State of ________________________________.

County of ________________________________.

I HEREBY CERTIFY that on this day before me, the undersigned officer duly authorized to take acknowledgments, personally appeared
______________________________,

known to me to be the _____________________________ of
____________________________

______________________________________________,

Principal herein, described in and who executed the foregoing and acknowledged execution of same.

WITNESS my hand and official seal in the State and County

aforesaid on this ____________ day of ____________________, 20__.  

______________________________________________

NOTARY PUBLIC

My Commission Expires:

END OF SECTION 006100
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SECTION 00 72 00
FAA GENERAL PROVISIONS
SECTION 10 DEFINITION OF TERMS

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

10-01 AASHTO. The American Association of State Highway and Transportation Officials, the successor association to AASHO.

10-02 Access road. The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public highway.

10-03 Advertisement. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-04 Airport Improvement Program (AIP). A grant-in-aid program, administered by the Federal Aviation Administration (FAA).

10-05 Air operations area (AOA). For the purpose of these specifications, the term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.

10-06 Airport. Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; and airport buildings and facilities located in any of these areas, and includes a heliport.


10-08 Award. The Owner’s notice to the successful bidder of the acceptance of the submitted bid.

10-09 Bidder. Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-10 Building area. An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.

10-11 Calendar day. Every day shown on the calendar.

10-12 Change order. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, must be within the scope of the contract.
10-13 Contract. The written agreement covering the work to be performed. The awarded contract shall include, but is not limited to: Advertisement, Contract Form, Proposal, Performance Bond, Payment Bond, any required insurance certificates, Specifications, Plans, and any addenda issued to bidders.

10-14 Contract item (pay item). A specific unit of work for which a price is provided in the contract.

10-15 Contract time. The number of calendar days or working days, stated in the Instructions to Bidders proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.

10-16 Contractor. The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.

10-17 Contractor's laboratory. The Contractor’s quality control organization in accordance with the Contractor Quality Control Program.

10-18 Construction Safety and Phasing Plan (CSPP). The overall plan for safety and phasing of a construction project developed by the airport operator or developed by the airport operator’s consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

10-19 Drainage system. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

10-20 Engineer. The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering and observation of the contract work and acting directly or through an authorized representative.

10-21 Equipment. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-22 Extra work. An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.

10-23 FAA. The Federal Aviation Administration of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or his or her duly authorized representative.


10-25 Force account. Force account work is planning, engineering, or construction work done by the Sponsor’s employees.
10-26 **Inspector.** An authorized representative of the Engineer. Owner assigned to make all necessary observations and/or tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-27 **Intention of terms.** Whenever, in these specifications or on the plans, the words “directed,” “required,” “permitted,” “ordered,” “designated,” “prescribed,” or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words “approved,” “acceptable,” “satisfactory,” or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

10-28 **Laboratory.** The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer. Also referred to as “Engineer’s Laboratory” or “quality assurance laboratory.”

10-29 **Lighting.** A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

10-30 **Major and minor contract items.** A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.

10-31 **Materials.** Any substance specified for use in the construction of the contract work.

10-32 **Notice to Proceed (NTP).** A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.

10-33 **Owner.** The term “Owner” shall mean the party of the first part or the contracting agency signatory to the contract. Where the term “Owner” is capitalized in this document, it shall mean airport Sponsor only.

10-34 **Passenger Facility Charge (PFC).** Per 14 CFR Part 158 and 49 USC § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.”

10-35 **Pavement.** The combined surface course, base course, and subbase course, if any, considered as a single unit.

10-36 **Payment bond.** The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.
10-37 **Performance bond.** The approved form of security furnished by the Contractor and his or her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

10-38 **Plans.** The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.

10-39 **Project.** The agreed scope of work for accomplishing specific airport development with respect to a particular airport.

10-40 **Proposal.** The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-41 **Proposal guaranty.** The security furnished with a proposal to guarantee that the bidder will enter into a contract if his or her proposal is accepted by the Owner.

10-42 **Runway.** The area on the airport prepared for the landing and takeoff of aircraft.

10-43 **Specifications.** A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.

10-44 **Sponsor.** A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.

10-45 **Structures.** Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

10-46 **Subgrade.** The soil that forms the pavement foundation.

10-47 **Superintendent.** The Contractor’s executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

10-48 **Supplemental agreement.** A written agreement between the Contractor and the Owner covering (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25%, such increased or decreased work being within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

10-49 **Surety.** The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.
10-50 Taxiway. For the purpose of this document, the term taxiway means the portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport’s runways, aircraft parking areas, and terminal areas.

10-51 Work. The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor’s performance of all duties and obligations imposed by the contract, plans, and specifications.

10-52 Working day. A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor’s control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor’s forces engage in regular work will be considered as working days.

END OF SECTION 10
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20-01 Advertisement (Notice to Bidders). See Invitation to Bid.

20-02 Qualification of bidders. Each bidder shall furnish the Owner satisfactory evidence of his or her competency to perform the proposed work as required in the Proposal Form. Such evidence of competency, unless otherwise specified, shall consist of statements covering the bidder’s past experience on similar work, a list of equipment that would be available for the work, and a list of key personnel that would be available. In addition, each bidder shall furnish the Owner satisfactory evidence of his or her financial responsibility. Such evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder’s financial resources and liabilities as of the last calendar year or the bidder’s last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether his or her financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder’s financial responsibility has changed, the bidder shall qualify the public accountant’s statement or report to reflect the bidder’s true financial condition at the time such qualified statement or report is submitted to the Owner.

Unless otherwise specified, a bidder may submit evidence that he or she is prequalified with the State Highway Division and is on the current “bidder’s list” of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above. Each bidder shall submit “evidence of competency” and “evidence of financial responsibility” to the Owner at the time of bid opening.

20-03 Contents of proposal forms. The Owner shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached. The plans, specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

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

   a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.
   b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.
   c. Documented record of Contractor default under previous contracts with the Owner.
   d. Documented record of unsatisfactory work on previous contracts with the Owner.

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

The Contractor may reasonably expect a variation in estimated quantities such that the total payment for the completed Work may vary from the total amount of the Contract based on the estimated quantities defined in the proposal. The Contractor will not be allowed any claims for anticipated profits, for loss of profits, or for any damages because of a difference between the estimate of any item defined in the Proposal and the amount of the item actually required or for the elimination of any part of the Work.

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

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from his or her examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

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

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

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

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 49 CFR § 18.36(b)(8). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.
20-09 Irregular proposals. Proposals shall be considered irregular for the following reasons:
   a. If the proposal is on a form other than that furnished by the Owner, or if the Owner’s form
      is altered, or if any part of the proposal form is detached.
   b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of
      any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.
   c. If the proposal does not contain a unit price for each pay item listed in the proposal, except
      in the case of authorized alternate pay items, for which the bidder is not required to furnish
      a unit price.
   d. If the proposal contains unit prices that are obviously unbalanced.
   e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

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

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

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

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

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

20-14 Disqualification of bidders. A bidder shall be considered disqualified for any of the
following reasons:
   a. Submitting more than one proposal from the same partnership, firm, or corporation under
      the same or different name.
   b. Evidence of collusion among bidders. Bidders participating in such collusion shall be
disqualified as bidders for any future work of the Owner until any such participating bidder
has been reinstated by the Owner as a qualified bidder.
c. If the bidder is considered to be in “default” for any reason specified in the subsection 20-04 titled ISSUANCE OF PROPOSAL FORMS of this section.

END OF SECTION 20
FAA GENERAL PROVISIONS
SECTION 30 AWARD AND EXECUTION OF CONTRACT

30-01 Consideration of proposals. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder’s proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder’s proposal for any of the following reasons:

a. If the proposal is irregular as specified in the subsection 20-09 titled IRREGULAR PROPOSALS of Section 20.

b. If the bidder is disqualified for any of the reasons specified in the subsection 20-14 titled DISQUALIFICATION OF BIDDERS of Section 20.

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

30-02 Award of contract. The award of a contract, if it is to be awarded, shall be made within 90 calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

Award of the contract shall be made by the Owner to the lowest, qualified bidder whose proposal conforms to the cited requirements of the Owner.

No award shall be made until the FAA has concurred in the Owner’s recommendation to make such award and has approved the Owner’s proposed contract to the extent that such concurrence and approval are required by 49 CFR Part 18.

30-03 Cancellation of award. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with the subsection 30-07 titled APPROVAL OF CONTRACT of this section.

30-04 Return of proposal guaranty. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the subsection 30-01 titled CONSIDERATION OF PROPOSALS of this section. Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder’s proposal guaranty will be returned. The successful bidder’s proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in the subsection 30-05 titled REQUIREMENTS OF CONTRACT BONDS of this section.

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

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

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

30-08 Failure to execute contract. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the 15 calendar day period specified in the subsection 30-06 titled EXECUTION OF CONTRACT of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the Owner.

END OF SECTION 30
FAA GENERAL PROVISIONS
SECTION 40 SCOPE OF WORK

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

40-02 Alteration of work and quantities. The Owner reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded contract quantities, provided that the aggregate of such alterations does not change the total contract cost or the total cost of any major contract item by more than 25% (total cost being based on the unit prices and estimated quantities in the awarded contract). Alterations that do not exceed the 25% limitation shall not invalidate the contract nor release the surety, and the Contractor agrees to accept payment for such alterations as if the altered work had been a part of the original contract. These alterations that are for work within the general scope of the contract shall be covered by “Change Orders” issued by the Engineer. Change orders for altered work shall include extensions of contract time where, in the Engineer’s opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25% limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

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

40-03 Omitted items. The Engineer may, in the Owner’s best interest, omit from the work any contract item, except major contract items. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with the subsection 90-04 titled PAYMENT FOR OMITTED ITEMS of Section 90.

40-04 Extra work. Should acceptable completion of the contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original contract or previously issued change orders or supplemental agreements, the same shall be called “Extra Work.” Extra Work that is within the general scope of the contract shall be covered by written change order. Change orders for such Extra Work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the Engineer’s opinion, is necessary for completion of such Extra Work.
When determined by the Engineer to be in the Owner's best interest, the Engineer may order the Contractor to proceed with Extra Work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. Extra Work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a Supplemental Agreement as defined in the subsection 10-48 titled SUPPLEMENTAL AGREEMENT of Section 10.

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

40-05 Maintenance of traffic. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration.

   a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to his or her own operations and the operations of all subcontractors as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in the subsection 70-15 titled CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS in Section 70.

   b. With respect to his or her own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport.

   c. When the contract requires 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, 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 be responsible for the repair of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

   d. Landside MOT shall be in accordance with FDOT Standard Index 600 unless otherwise outlined in the drawings.

   e. The Contractor shall give a minimum of 72-hours advanced notice of any proposed operation to affected police, fire, and other emergency response departments. The Contractor shall give reasonable notice of his proposed operations to owners and tenants of private properties which will be affected by the construction operations.

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

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract.

Except as provided in the subsection 40-07 titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this section, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

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

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

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

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

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

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

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

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

END OF SECTION 40
50-01 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.

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

If the 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 Owner shall keep the FAA advised of the Engineer’s determinations as to acceptance of work that is not in reasonably close conformity to the contract, plans, and specifications. Change orders
or supplemental agreements must be reviewed by the FAA. The Engineer may consult with the FAA for the determination to accept materials that are not in strict conformance with the specification requirements.

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

50-03 Coordination of contract, plans, and specifications. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. 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.

50-04 Cooperation of Contractor. The Contractor will be supplied with three (3) copies each of the plans and specifications. The Engineer will also supply the contractor with a PDF version they can used to plot additional copies at their own cost. 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.

50-05 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.

**50-06 Construction layout and stakes.** Refer to specification P-104 Project Survey and Stakeout for construction layout requirements. The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either their own or the Contractor’s guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

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): [__]. 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.

Construction Staking and Layout includes but is not limited to:

- a. Clearing and Grubbing perimeter staking
- b. Rough Grade slope stakes at 100-foot (30-m) stations
- c. Drainage Swales slope stakes and flow line blue tops at 50-foot (15-m) stations

Subgrade blue tops at 25-foot (7.5-m) stations and 25-foot (7.5-m) 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-foot (7.5-m) stations and 25-foot (7.5-m) 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-foot (30-m) stations.
- b. Between Lifts at 25-foot (7.5-m) 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-foot (15-m) stations:
   (1) All paved areas — Edge of each paving lane prior to next paving lot

d. Shoulder and safety area blue tops at 50-foot (15-m) stations and at all break points with maximum of 50-foot (15-m) offsets.

e. Fence lines at 100-foot (30-m) 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-foot (7.5-m) stations, inlet and manholes.

h. Painting and Striping layout (pinned with 1.5 inch 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 feet (120 m) per pass (that is, paving lane).

j. 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.

50-07 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 of 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

50-08 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.

The Engineer and/or his authorized representative shall have full authority to inspect all materials on the project site, test all materials at as many locations and at any frequency he deems necessary to satisfy himself that the final in-place product meets the requirements of the plans and specifications.

50-09 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.

50-10 Removal of unacceptable and unauthorized work. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the Engineer as provided in the subsection 50-02 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 the subsection 70-14 titled CONTRACTOR’S RESPONSIBILITY FOR WORK of Section 70.

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.

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

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his or her hauling equipment and shall correct such damage at his or her own expense.
50-12 Maintenance during construction. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

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

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

50-13 Failure to maintain the work. Should the Contractor at any time fail to maintain the work as provided in the subsection 50-12 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.

50-14 Partial acceptance. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the 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.

50-15 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 a recommendation for the final acceptance and notify the Owner in writing of this acceptance as of the date of final inspection.

50-16 Claims for adjustment and disputes. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the 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.

**50-17 Cost reduction incentive.** The provisions of this subsection will apply only to contracts awarded to the lowest bidder pursuant to competitive bidding.

On projects with original contract amounts in excess of $100,000, the Contractor may submit to the Engineer, in writing, proposals for modifying the plans, specifications or other requirements of the contract for the sole purpose of reducing the cost of construction. The cost reduction proposal shall not impair, in any manner, the essential functions or characteristics of the project, including but not limited to service life, economy of operation, ease of maintenance, desired appearance, design and safety standards. This provision shall not apply unless the proposal submitted is specifically identified by the Contractor as being presented for consideration as a value engineering proposal.

Not eligible for cost reduction proposals are changes in the basic design of a pavement type, runway and taxiway lighting, visual aids, hydraulic capacity of drainage facilities, or changes in grade or alignment that reduce the geometric standards of the project.

As a minimum, the following information shall be submitted by the Contractor with each proposal:

a. A description of both existing contract requirements for performing the work and the proposed changes, with a discussion of the comparative advantages and disadvantages of each.

b. An itemization of the contract requirements that must be changed if the proposal is adopted.

c. A detailed estimate of the cost of performing the work under the existing contract and under the proposed changes.

d. A statement of the time by which a change order adopting the proposal must be issued.

e. A statement of the effect adoption of the proposal will have on the time for completion of the contract.

f. The contract items of work affected by the proposed changes, including any quantity variation attributable to them.

The Contractor may withdraw, in whole or in part, any cost reduction proposal not accepted by the Engineer, within the period specified in the proposal. The provisions of this subsection shall not be construed to require the Engineer to consider any cost reduction proposal that may be submitted.

The Contractor shall continue to perform the work in accordance with the requirements of the contract until a change order incorporating the cost reduction proposal has been issued. If a change order has not been issued by the date upon which the Contractor's cost reduction
proposal specifies that a decision should be made, or such other date as the Contractor may subsequently have requested in writing, such cost reduction proposal shall be deemed rejected. The Engineer shall be the sole judge of the acceptability of a cost reduction proposal and of the estimated net savings from the adoption of all or any part of such proposal. In determining the estimated net savings, the Engineer may disregard the contract bid prices if, in the Engineer's judgment such prices do not represent a fair measure of the value of the work to be performed or deleted.

The Owner may require the Contractor to share in the Owner's costs of investigating a cost reduction proposal submitted by the Contractor as a condition of considering such proposal. Where such a condition is imposed, the Contractor shall acknowledge acceptance of it in writing. Such acceptance shall constitute full authority for the Owner to deduct the cost of investigating a cost reduction proposal from amounts payable to the Contractor under the contract.

If the Contractor's cost reduction proposal is accepted in whole or in part, such acceptance will be by a contract change order that shall specifically state that it is executed pursuant to this subsection. Such change order shall incorporate the changes in the plans and specifications which are necessary to permit the cost reduction proposal or such part of it as has been accepted and shall include any conditions upon which the Engineer's approval is based. The change order shall also set forth the estimated net savings attributable to the cost reduction proposal. The net savings shall be determined as the difference in costs between the original contract costs for the involved work items and the costs occurring as a result of the proposed change. The change order shall also establish the net savings agreed upon and shall provide for adjustment in the contract price that will divide the net savings equally between the Contractor and the Owner.

The Contractor's 50% share of the net savings shall constitute full compensation to the Contractor for the cost reduction proposal and the performance of the work.

Acceptance of the cost-reduction proposal and performance of the cost-reduction work shall not extend the time of completion of the contract unless specifically provided for in the contract change order.

END OF SECTION 50
60-01 Source of supply and quality requirements. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

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

For projects funded under the Airport Improvement Program (AIP), Contractor shall supply steel and manufactured products that conform to the Buy American provisions established under 49 USC Section 50101 as follows: “Steel products must be 100% U.S. domestic product Manufactured Products. Preference shall be given to products that are 100% manufactured and assembled in the U.S. Manufactured products not meeting the 100% U.S. domestic preference may only be used on the project if the FAA has officially granted a permissible waiver to Buy American Preferences. Submittals for all manufactured products must include certification of compliance with Buy American requirements as established under 49 USC Section 50101. Submittal must include sufficient information to confirm compliance or submittal will be returned with no action.”

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

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the plans or specifications, the Contractor shall furnish such equipment that is:

a. Listed in advisory circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, and Addendum that is in effect on the date of advertisement; and,

b. Produced by the manufacturer as listed in the Addendum cited above for the certified equipment part number.

The following See the drawings and technical specifications for airport lighting equipment is required for this contract and is to be furnished by the Contractor in accordance with the requirements of this subsection.

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

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

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

The Contractor shall employ a testing organization to perform all Contractor required Quality Control tests. The Contractor shall submit to the Engineer resumes on all testing organizations and individual persons who will be performing the tests. The Engineer will determine if such persons are qualified. All the test data shall be reported to the Engineer after the results are known. A legible, handwritten copy of all test data shall be given to the Engineer daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the Engineer showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

The Contractor shall pay for all Quality Control tests, and costs shall be incidental to those items which require testing. Any additional testing that the Contractor deems necessary to ensure himself that the materials he is installing meet the required specifications and/or as a proof of the Owner authorized testing laboratory shall be solely the expense of the Contractor whether the tests pass or fail.

The Owner will pay for Quality Assurance testing directly. The Contractor shall furnish, at his own expense, all necessary specimens for testing of the materials, as required by the Engineer. The Contractor shall be responsible for notifying the testing laboratory to pick up the test samples.

The Owner reserves the right to back charge the Contractor for any tests that do not pass and must be redone. Charges for failing tests will be deducted from the Contractor's earnings at the end of project at the time of final payment or on a periodic basis during construction as approved by the Owner.

**60-03 Certification of compliance.** The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

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

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

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

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

Should the Contractor propose to furnish an “or equal” material or assembly, the Contractor shall furnish the manufacturer’s certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed “or equal” is suitable for use in the work.

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

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

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

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom the Engineer has contracted for materials.

b. The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

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

60-05 Engineer’s field office. The Contractor shall furnish for the duration of the project one building for the use of the field Engineers and inspectors, as a field office. This facility shall be an approved weatherproof building meeting the current State Highway Specifications (for example, Class I Field Office or Type C Structure). This building shall be located conveniently near to the construction and shall be separate from any building used by the Contractor. The Contractor shall furnish facsimile (FAX) machine, photocopy machine, water, sanitary facilities, heat, air conditioning, and electricity. The Contractor and the Contractor’s superintendent shall provide all reasonable facilities to enable the Engineer to inspect the workmanship and materials used into the work.

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

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

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

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

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

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

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

**END OF SECTION 60**
70-01 **Laws to be observed.** The Contractor shall keep fully informed of all Federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all his or her officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor’s employees.

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

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

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

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

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

70-05 **Federal aid participation.** For Airport Improvement Program (AIP) contracts, the United States Government has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner’s request to the FAA. In consideration of the United States Government’s (FAA’s) agreement with the Owner, the Owner
has included provisions in this contract pursuant to the requirements of Title 49 of the USC and the Rules and Regulations of the FAA that pertain to the work.

As required by the USC, the contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator, and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the USC, the rules and regulations implementing the USC, or this contract shall be construed as making the Federal Government a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

For this project, the FDOT has agreed to reimburse the Owner for some portion of the contract costs. Such reimbursement is made from time to time upon the Owner’s request to the FDOT. In consideration of the FDOT’s agreement with the Owner, the Owner has included provisions in this contract required by FDOT that pertain to the work.

As required by the FDOT, the contract work may be subject to the inspection and approval of duly authorized representatives of the FDOT and is further subject to those provisions of the rules and regulations that are cited in the contract, plans, or specifications.

No requirement of the FDOT, the rules and regulations implementing the FDOT, or this contract shall be construed as making the FDOT or the State of Florida a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-06 Sanitary, health, and safety provisions. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his or her employees as may be necessary to comply with the requirements of the state and local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, state, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous to his or her health or safety.

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

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to his or her own operations and those of his or her subcontractors and all suppliers in accordance with the subsection 40-05 titled MAINTENANCE OF TRAFFIC of Section 40 hereinbefore specified and shall limit such operations for the convenience and safety of the traveling public as specified in the subsection 80-04 titled LIMITATION OF OPERATIONS of Section 80 hereinafter.

70-08 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. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated. Unless otherwise specified, barricades, warning signs, and markings for hazards that are in the air operations area (AOAs) shall be a maximum of 18 inches (0.5 m) high. Unless otherwise specified, barricades shall be spaced not more than
4 feet (1.2 m) apart. Barricades, warning signs, and markings shall be paid for under subsection 40-05.

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 on Uniform Traffic Control Devices.

When the work requires closing an air operations area of the airport or portion of such area, the Contractor shall furnish, erect, and maintain temporary markings and associated lighting conforming to the requirements of advisory circular (AC) 150/5340-1, Standards for Airport Markings.

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stock piles, and the Contractor’s parked construction equipment that may be hazardous to the operation of emergency fire-rescue or maintenance vehicles on the airport in reasonable conformance to AC 150/5370-2, Operational Safety on Airports During Construction.

The Contractor shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to AC 150/5370-2.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their removal is directed by the Engineer.

Open-flame type lights shall not be permitted.

70-09 Use of explosives. Explosives shall not be used for this project. When the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet (300 m) from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify each property Owner and public utility company having structures or facilities in proximity to the site of the work of his or her intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

The use of electrical blasting caps shall not be permitted on or within 1,000 feet (300 m) of the airport property.

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

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

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

70-11 Responsibility for damage claims. The Contractor shall indemnify and save harmless the Engineer and the Owner and their officers, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of his or her contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, his or her surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

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

70-13 Opening sections of the work to traffic. Should it be necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such “phasing” of the work shall be specified herein and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his or her own estimate of the difficulties involved in arranging the work to permit such beneficial occupancy by the Owner as described below.

Upon completion of any portion of the work listed above, such portion shall be accepted by the Owner in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50.

No portion of the work may be opened by the Contractor for public use until ordered by the Engineer in writing. 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 Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at his or her expense.
The Contractor shall make his or her own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work. Contractor shall be required to conform to safety standards contained AC 150/5370-2 (available on the FAA website). (see Special Provisions).

Contractor shall refer to the approved Construction Safety Phasing Plan (CSPP) to identify barricade requirements and other safety requirements prior to opening up sections of work to traffic.

70-14 Contractor’s responsibility for work. Until the Engineer’s final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with the subsection 50-14 titled PARTIAL ACCEPTANCE of Section 50, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

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

70-15 Contractor’s responsibility for utility service and facilities of others. As provided in the subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section, the Contractor shall cooperate with the Owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and the Owners are as follows:
<table>
<thead>
<tr>
<th>Utility Service or Utility</th>
<th>Contact Information</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>For airside work contact the</td>
<td>Kerry Keith</td>
<td>(239) 673-0733 or</td>
</tr>
<tr>
<td>City of Naples Airport Authority</td>
<td>Director of Airport Development</td>
<td>(239) 253-4137 (cell)</td>
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<tr>
<td></td>
<td>160 Aviation Drive North</td>
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<td></td>
<td>Naples, FL 34101-3568</td>
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<tr>
<td>Sunshine One Call</td>
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<td>811</td>
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<tr>
<td>Internet, TV and Voice/Telephone</td>
<td>Century Link</td>
<td>1-877-290-5458</td>
</tr>
<tr>
<td>Internet, TV and Voice/Telephone</td>
<td>Comcast</td>
<td>1-239-793-3577</td>
</tr>
<tr>
<td>Electrical</td>
<td>FPL</td>
<td>1-800-468-8243</td>
</tr>
<tr>
<td>Water/Sewer</td>
<td>Naples Water &amp; Sewer (Public Works)</td>
<td>1-239-213-4720</td>
</tr>
<tr>
<td></td>
<td>Wayne McDowell</td>
<td></td>
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</table>

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

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of his or her plan of operations. Such notification shall be in writing addressed to THE PERSON TO CONTACT as provided in this subsection and subsection 70-04 titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this section. A copy of each notification shall be given to the Engineer.

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

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

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

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

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

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

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

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

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

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

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

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

70-16 Furnishing rights-of-way. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor’s operations.
70-17 Personal liability of public officials. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, his or her authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 No waiver of legal rights. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or his or her surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his or her obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

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

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

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

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

Should the Owner order suspension of the Contractor’s operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in the subsection 40-04 titled EXTRA WORK of Section 40 and the subsection 90-05 titled PAYMENT FOR EXTRA WORK of Section 90. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Section 80.

END OF SECTION 70
80-01 Subletting of contract. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

The Contractor shall provide copies of all subcontracts to the Engineer. The Contractor shall perform, with his organization, an amount of work equal to at least 25 percent of the total contract cost.

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

80-02 Notice to proceed. The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. The Contractor shall begin the work to be performed under the contract within 10 days of the date set by the Engineer in the written notice to proceed, but in any event, the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin. The Contractor shall not commence any actual construction prior to the date on which the notice to proceed is issued by the Owner.

80-03 Execution and progress. Unless otherwise specified, the Contractor shall submit their progress schedule for the Engineer’s approval within 10 days after the effective date of the notice to proceed. The Contractor’s progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

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

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

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

When the work requires the Contractor to conduct his or her operations within an AOA of the airport, the work shall be coordinated with airport operations (through the Engineer) at least 48 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in the subsection 70-08 titled BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS of Section 70.
When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor’s operations in the AOA until the satisfactory conditions are provided. The following AOA cannot be closed to operating aircraft to permit the Contractor’s operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows: shown in the plans and in the CSPP.

Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction and the CSPP (see Special Provisions).

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

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

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

No deviation or modifications may be made to the approved CSPP unless approved in writing by the Owner or Engineer. Approval from the FAA may also be required.

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

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

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

Should the Contractor fail to remove such persons or person or fail to furnish suitable and sufficient personnel for the proper execution of the work, the Engineer may suspend the work by written notice until compliance with such orders.
In addition, the following requirements shall apply concerning all workers utilized on the project:

a. The Contractor shall provide and maintain, continually on the project site of the Work during its progress, adequate and competent superintendence of all operations for and in connection with the Work. The Contractor shall provide a capable superintendent acceptable to the Owner. Such representative shall be able to read, write and speak English fluently and shall be authorized to receive instructions from the Engineer or his authorized representative. Said superintendent shall have authority to see that the Work is carried out in accordance with the Contract Documents and in a first class, thorough and workmanlike manner in every respect.

b. Incompetent, disorderly, intemperate or incorrigible employees shall be dismissed from the project by the Contractor or his representative when requested by the Engineer or the Owner, and such persons shall not again be permitted to return to the work without the written consent of the Owner.

c. The Contractor agrees to indemnify and hold the Owner harmless from any and all loss or damages arising out of jurisdictional labor disputes or other labor troubles of any kind that may occur during the construction and performance of the Contract.

d. The Contractor shall provide at the request of the Owner such reasonable information about his employees as may be necessary, including in part, name, address and social security number.

e. Any employee of the Contractor or any subcontractors who violate the badging requirements or leaves unbadged individuals in the Airport Operations Area (AOA) or the Secured Identification Display Area (SIDA) without properly badged individuals will be removed from the Airport and not allowed back onto the Airport without prior approval by the Airport management.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing airport facilities will result from its use.

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

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

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

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

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

**80-07 Determination and extension of contract time.** The number of calendar or working days allowed for completion of the work shall be stated in the proposal and contract and shall be known as the CONTRACT TIME.

Should the contract time require extension for reasons beyond the Contractor’s control, it shall be adjusted as follows:

- **a.** CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his or her weekly statement of the number of working days charged against the contract time during the week and the number of working days currently specified for completion of the contract (the original contract time plus the number of working days, if any, that have been included in approved CHANGE ORDERS or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

    The Engineer shall base his or her weekly statement of contract time charged on the following considerations:

    (1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least six (6) hours with the normal work force employed on such principal item. Should the normal work force be on a double-shift, 12 hours shall be used. Should the normal work force be on a triple-shift, 18 hours shall apply. Conditions beyond the Contractor’s control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or
temporary suspension of the entire work which have been ordered by the Owner for reasons not the fault of the Contractor, shall not be charged against the contract time.

(2) The Engineer will not make charges against the contract time prior to the effective date of the notice to proceed.

(3) The Engineer will begin charges against the contract time on the first working day after the effective date of the notice to proceed.

(4) The Engineer will not make charges against the contract time after the date of final acceptance as defined in the subsection 50-15 titled FINAL ACCEPTANCE of Section 50.

(5) The Contractor will be allowed one (1) week in which to file a written protest setting forth his or her objections to the Engineer’s weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

The contract time (stated in the proposal) is based on the originally estimated quantities as described in the subsection 20-05 titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Section 20. Should the satisfactory completion of the contract require performance of work in greater quantities than those estimated in the proposal, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in contract time shall not consider either the cost of work or the extension of contract time that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

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

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

c. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially complete.

If the Contractor finds it impossible for reasons beyond his or her control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this subsection, the Contractor may, at any time prior to the expiration of the contract time as extended, make a written request to the Owner for an extension of time setting forth the reasons which the Contractor believes will justify the granting of his or her request. Requests for extension of time on calendar day projects, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded what could normally be expected during the contract period. The Contractor’s plea that insufficient time was specified is not a valid reason for extension of time. If the supporting documentation justify the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Owner may extend the time for completion by a change order that adjusts the
contract time or completion date. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-07.1 Weather related extensions. The contract duration and phase durations set forth in the drawings account for inclement weather days normally encountered at the Project site, as well as observed holidays. The Contractor shall be charged for each calendar day during the term of construction including observed holidays and inclement weather days normally encountered at the project site. Normal inclement weather days shall be established by the Contractor obtaining the previous ten (10) years of inclement weather data from the National Oceanographic and Atmospheric Administration (NOAA) and averaging the previous ten (10) years of each type of inclement weather for each month and comparing it to each month of construction activities to determine if the number of inclement weather days occurring in any given month exceeds the average for that month over the past ten (10) years for that type of inclement weather, i.e. rain, snow, etc. If the Contractor is unable to work at least 50% of the normal work day on predetermined controlling work items due to abnormal inclement weather conditions, the Contractor may not be charged a calendar day provided the Contractor submits data and records to justify not charging a calendar day for that specific day. The Contractor must submit such data and request an extension within 30 days or the request will not be considered.

80-08 Failure to complete on time. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in the subsection 80-07 titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Section) the sum specified in the contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his or her surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

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

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or
b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or
c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or
d. Discontinues the execution of the work, or
e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or
f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

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

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

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

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

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

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

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

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

**80-11 Work area, storage area and sequence of operations.** The Contractor shall obtain approval from the Engineer prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate his or her work in such a manner as to ensure safety and a minimum of hindrance to flight operations. All Contractor equipment and material stockpiles shall be stored a minimum or 500 feet from the centerline of an active runway. No equipment will be allowed to park within the approach area of an active runway at any time. No equipment shall be within 250 feet of an active runway at any time.

END OF SECTION 80
90-01 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 (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the 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. For excavation, measure based on the volume of the excavation (in-place state of the material prior to excavation) or based on total truck volume of excavations multiplied by an Owner approved bulkage factor.

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 lb (907 kg) 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 (cubic meters) 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 (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) 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 (kg) or hundredweight (km).

Timber will be measured by the thousand feet board measure (MBM) 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.

Rental of equipment will not be measured and will be considered incidental to the Work. be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the subsection 90-05 titled PAYMENT FOR EXTRA WORK of this section.

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 (454 grams). 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 (2.3 km) 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.

90-02 Scope of payment. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of the subsection 70-18 titled NO WAIVER OF LEGAL RIGHTS of Section 70.

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

Payment for some portions of this contract will be done via unit prices. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services. Unit prices include all necessary labor, material, overhead, profit and applicable taxes. No direct or separate payment will be made for any work required by the Specifications or Drawings unless it is defined as a pay item. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices, methods of measurement, and payment. In the event the estimated quantities of Work required by the Contract Documents must be increased or decreased, unit prices will be utilized to add to or deduct from the Contract Sum by Change Order.
90-03 Compensation for altered quantities. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the subsection 40-02 titled ALTERATION OF WORK AND QUANTITIES of Section 40 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his or her unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-04 Payment for omitted items. As specified in the subsection 40-03 titled OMITTED ITEMS of Section 40, the Engineer shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the Engineer omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Engineer’s order to omit or non-perform such contract item. Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the Engineer’s order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

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

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

When the change order or supplemental agreement authorizing the extra work requires that it be done by force account, such force account shall be measured and paid for based on expended labor, equipment, and materials plus an allowance for overhead and profit determined as follows.

a. Miscellaneous. No additional allowance will be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided.

b. Comparison of Record. The Contractor and the Engineer shall compare records of the cost of force account work at the end of each day. Agreement shall be indicated by signature of the Contractor and the Engineer or their duly authorized representatives.

c. Statement. No payment will be made for work performed on a force account basis until the Contractor has furnished the Engineer with duplicate itemized statements of the cost of such force account work detailed as follows:

(1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman including supplemental benefits, payroll taxes, insurance premiums and other reasonable charges that are paid by the Contractor pursuant to existing written agreements with employees and/or labor organizations.
(2) Designation, dates, daily hours, total hours, rate and extension for each unit of machinery and equipment. For Contractor self-owned equipment, the maximum rate paid for equipment will be determined based upon the following factors:

(i) The base hourly rates shall be the daily rate as listed in the current Rental Rates for Construction Equipment prepared by Associated Equipment Distributors latest edition, divided by eight (8). Where no daily rate is listed, the daily rate will be determined by dividing the monthly rate by 10.

(ii) The first 20 hours will be paid at 90 percent of the above based hourly rate. For 21 to 40 hours, the rate will be 80 percent of the above base hourly rate. For over 40 hours, the rate will be 45 percent of the above base hourly rate.

(iii) The number of hours to be paid for shall be the number of hours that the equipment or plant is actually used on a specified force account job.

(iv) For rented equipment, such equipment will be paid for based upon rental cost as approved by the Engineer. Invoices showing rental charges must be submitted to the Engineer for such payment.

(v) For use of all equipment when, in the opinion of the Contractor and as approved by the Engineer, suitable equipment is not available on the site, the movement of required equipment to and from the site will be paid for at actual cost.

(vi) Equipment to be used by the Contractor shall be specifically described and be of suitable size and suitable capacity required for the work to be performed. In the event the Contractor elects to use equipment of a higher rental value than that suitable for the work, payment will be made at the rate applicable to the suitable equipment. The equipment actually used and the suitable equipment paid for will be recorded as part of the record for force account work. The Engineer shall determine the suitability of the equipment. If there is a differential in the rate of pay of the operator of oversize or higher rate equipment, the rate paid for the operator will likewise be that for the suitable equipment.

(vii) In the event that a rate is not established in the Associated Equipment Distributors Rental Rates, latest edition, for a particular piece of equipment or plant, the Owner shall establish a rate for that piece of equipment or plant that is consistent with its cost and use.

(3) Quantities of materials, prices and extensions.

(4) Transportation of materials to the site.

(5) Cost of property damage, liability and workmen’s compensation insurance premiums, unemployment insurance contributions and social security tax.

(6) Profit and Overhead. Profit and overhead cost shall be computed at fifteen (15) percent of the following:
(i) **Total Direct Labor Cost** (actual hours worked multiplied by the basic hourly wage rate) plus supplemental benefits payments, payroll taxes, insurance payments and other labor related fringe benefit payments as defined in (1) above, but not including the overtime additive payments. Profit and overhead shall not be paid on the premium portion of overtime.

(ii) **Total Cost of Materials** as defined in (3) and (4) above.

(iii) If any of the work is performed by a subcontractor, the Contractor shall be paid the actual and reasonable cost of such subcontracted work computed as outlined in (1) through (5) above, or on such other basis as may be approved by the Owner. Subcontractor profit and overhead shall be paid as outlined in this section, plus an additional allowance of five (5) percent of materials and direct labor to cover the contractor’s profit, superintendence, administration, insurance and other overhead. For purposes of computing profit and overhead, only one level or tier of subcontractors will be allowed.

(7) **Overhead shall include the following items, which will not receive direct reimbursement:**

   (i) **Premium on bond.**

   (ii) **Premium on insurance required by the State, Workmen’s Compensation Insurance, public liability and property damage insurance, unemployment insurance, federal old-age benefits, other payroll taxes and such reasonable charges that are paid by the Contractor pursuant to written agreement with his employee.**

   (iii) **All salary and expenses of executive officers, supervising officers or supervising employees.**

   (iv) **All clerical or stenographic employees.**

   (v) **All charges for minor equipment such as small tools, including shovels, picks, axes, saws, bars, sledges, lanterns, jacks, cables, pails, wrenches, etc. and other miscellaneous supplies and services.**

   (vi) **All drafting room accessories such as paper, tracing cloth, blueprinting, etc.**

   (vii) **Travel, meals, per diems, and other direct reimbursements to employees.**

90-06 Partial payments. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the Engineer, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection 90-07 titled PAYMENT FOR MATERIALS ON HAND of this section. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

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

From the total of the amount determined to be payable on a partial payment five (5) percent of such total amount will be deducted and retained by the Owner until the final payment is made, except as may be provided (at the Contractor’s option) in the subsection 90-08 titled PAYMENT OF WITHHELD FUNDS of this section. The balance (95 percent) of the amount payable, less all previous payments, shall be certified for payment. Should the Contractor exercise his or her option, as provided in the subsection 90-08 titled PAYMENT OF WITHHELD FUNDS of this section, no such percent retainage shall be deducted.

When at least 95% of the work has been completed, the Engineer shall, at the Owner’s discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done.

The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question. No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the subsection 90-09 titled ACCEPTANCE AND FINAL PAYMENT of this section.

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

90-07 Payment for materials on hand. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

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

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

c. The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.
d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his or her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

90-08 Payment of withheld funds. At the Contractor’s option, if an Owner withholds retainage in accordance with the methods described in subsection 90-06 PARTIAL PAYMENTS, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner’s deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-09 Acceptance and final payment. When the contract work has been accepted in accordance with the requirements of the subsection 50-15 titled FINAL ACCEPTANCE of Section 50, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer’s final estimate or advise the Engineer of the Contractor’s objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor’s receipt of the Engineer’s final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer’s estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with the subsection 50-16 titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Section 50.

After the Contractor has approved, or approved under protest, the Engineer’s final estimate, and after the Engineer’s receipt of the project closeout documentation required in subsection 90-11 Project Closeout, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments.
and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of the subsection 50-16 titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Section 50 or under the provisions of this subsection, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 Construction warranty.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

c. The Contractor shall remedy at the Contractor’s expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor’s expense any damage to Owner real or personal property, when that damage is the result of:
   (1) The Contractor’s failure to conform to contract requirements; or
   (2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor’s warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within 14 days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 14 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor’s expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner’s rights with respect to latent defects, gross mistakes, or fraud.
90-11 Project closeout. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor’s final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with subsection 40-08, FINAL CLEANUP.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.


l. Equipment commissioning documentation submitted, if required.

m. Provide Consent of Surety

n. Provide all test results required by the technical specifications and/or permit conditions.

END OF SECTION 90


100-01 General. When the specification requires a Contractor Quality Control Program, 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 or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The 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 preconstruction conference, their 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 accepted 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. It is the Contractor’s responsibility to review all portions of the Contract Documents including the Contract, General Provisions, Special Provisions, Technical Specifications, and Drawings to determine all requirements related to Quality Control. The Contractor’s Quality Control Program shall effectively address all such requirements throughout the Contract Documents.

Paving projects over $500,000 shall have a Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Contractor, subcontractors, testing laboratories, and Owner’s representative at start of construction. The workshop shall address QC and QA requirements of the project specifications. The Contractor shall coordinate with the Airport and the Engineer on time and location of the QC/QA workshop.

100-02 Description of program.

a. General description. The Contractor shall establish a Quality Control Program to perform quality control inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements.
of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

b. **Quality Control Program.** The Contractor shall describe the Quality Control Program in a written document that shall be reviewed and approved by the Engineer prior to the start of any production, construction, or off-site fabrication. The written Quality Control Program shall be submitted to the Engineer for review and approval at least five (5) calendar days before the start of work. The Contractor’s Quality Control Plan and Quality Control testing laboratory must be approved in writing by the Engineer prior to the Notice to Proceed (NTP).

The Quality Control Program shall be organized to address, as a minimum, the following items:

- a. Quality control organization
- b. Project progress schedule
- c. Submittals schedule
- d. Inspection requirements
- e. Quality control testing plan
- f. Documentation of quality control activities
- g. Requirements for corrective action when quality control and/or acceptance criteria are not met

The Contractor is encouraged to add any additional elements to the Quality Control Program that is deemed necessary to adequately control all production and/or construction processes required by this contract.

*The cost of development, administration and/or performance of the Quality Control Program shall not be paid for separately but shall be included in various other bid items.*

**100-03 Quality control organization.** The Contractor Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The quality control organization shall, as a minimum, consist of the following personnel:

- a. **Program Administrator.** The Program Administrator shall be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The Program Administrator shall have a minimum of five (5) years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as the contract.

  Additional qualifications for the Program Administrator shall include at least one of the following requirements:

  1. Professional Engineer with one (1) year of airport paving experience.
(2) Engineer-in-training with two (2) years of airport paving experience.

(3) An individual with three (3) years of highway and/or airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

(4) Construction materials technician certified at Level III by the National Institute for Certification in Engineering Technologies (NICET).

(5) Highway materials technician certified at Level III by NICET.

(6) Highway construction technician certified at Level III by NICET.

(7) A NICET certified engineering technician in Civil Engineering Technology with five (5) years of highway and/or airport paving experience.

The Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the contract plans and technical specifications. The Program Administrator shall report directly to a responsible officer of the construction firm. The Program Administrator may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

b. Quality control technicians. A sufficient number of quality control technicians necessary to adequately implement the Quality Control Program shall be provided. These personnel shall be either Engineers, engineering technicians, or experienced craftsmen with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of two (2) years of experience in their area of expertise.

The quality control technicians shall report directly to the Program Administrator and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by subsection 100-06.

(2) Performance of all quality control tests as required by the technical specifications and subsection 100-07.

(3) Performance of density tests for the Engineer when required by the technical specifications.

Certification at an equivalent level, by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

d. Laboratory certification. Testing laboratories used for the project shall meet the requirements of the FDOT Acceptance Program including a current accreditation from AASHTO or CMEC.

100-04 Project progress schedule. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical
Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates, and activity duration.

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

100-05 Submittals schedule. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:
   a. Specification item number
   b. Item description
   c. Description of submittal
   d. Specification paragraph requiring submittal
   e. Scheduled date of submittal

100-06 Inspection requirements. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by subsection 100-07.

Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These shall include the following minimum requirements:

   a. During plant operation for material production, quality control test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The Quality Control Program shall detail how these and other quality control functions will be accomplished and used.

   b. During field operations, quality control test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The Program shall document how these and other quality control functions will be accomplished and used.

100-07 Quality control testing plan. As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:
   a. Specification item number (for example, P-401)
   b. Item description (for example, Plant Mix Bituminous Pavements)
   c. Test type (for example, gradation, grade, asphalt content)
d. Test standard (for example, ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (for example, as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (for example, plant technician)

g. Control requirements (for example, target, permissible deviations)

The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The Engineer shall be provided the opportunity to witness quality control sampling and testing.

All quality control test results shall be documented by the Contractor as required by subsection 100-08.

**100-08 Documentation.** The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor’s Program Administrator.

Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:

- **a. Daily inspection reports.** Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician’s daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:
  1. Technical specification item number and description
  2. Compliance with approved submittals
  3. Proper storage of materials and equipment
  4. Proper operation of all equipment
  5. Adherence to plans and technical specifications
  6. Review of quality control tests
  7. Safety inspection.

The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible quality control technician and the Program Administrator. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record.

- **b. Daily test reports.** The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:
(1) Technical specification item number and description
(2) Test designation
(3) Location
(4) Date of test
(5) Control requirements
(6) Test results
(7) Causes for rejection
(8) Recommended remedial actions
(9) Retests

Test results from each day’s work period shall be submitted to the Engineer prior to the start of the next day’s work period. When required by the technical specifications, the Contractor shall maintain statistical quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Program Administrator.

100-09 Corrective action requirements. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.

The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

100-10 Surveillance by the Engineer. All items of material and equipment shall be subject to surveillance by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the Engineer at the site for the same purpose.

Surveillance by the Engineer does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor’s or subcontractor’s work.

100-11 Noncompliance.

a. The Engineer will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Engineer or his or her authorized representative to the Contractor or his or her authorized representative at the site of the work, shall be considered sufficient notice.

b. In cases where quality control activities do not comply with either the Contractor Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Engineer, the Engineer may:
(1) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

END OF SECTION 100
FAA GENERAL PROVISIONS
SECTION 110 METHOD OF ESTIMATING PERCENTAGE
OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

110-01 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.

110-02 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:

\[ X = \frac{x_1 + x_2 + x_3 + \ldots + x_n}{n} \]

Where: \( X = \) Sample average of all sublot values within a lot
\( x_1, x_2, \ldots = \) Individual sublot values
\( n = \) Number of sublots

e. Find the sample standard deviation (S_n) by use of the following formula:

\[ S_n = \sqrt{\frac{(d_1^2 + d_2^2 + d_3^2 + \ldots + d_n^2)/(n-1)}} \]

Where: \( S_n = \) Sample standard deviation of the number of sublot values in the set
\( d_1, d_2, \ldots = \) Deviations of the individual sublot values \( x_1, x_2, \ldots \) from the average value \( X \)

that is: \( d_1 = (x_1 - X), d_2 = (x_2 - X), \ldots d_n = (x_n - X) \)
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:

\[
Q_L = \frac{(X - L)}{S_n}
\]

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.

\[ Q_L = \frac{(X - L)}{S_n} \]

\[ Q_U = \frac{(U - X)}{S_n} \]

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with \( Q_L \) and \( Q_U \), using the column appropriate to the total number (n) of measurements, and determining the percent of material above \( P_L \) and percent of material below \( P_U \) for each tolerance limit. If the values of \( Q_L \) fall between values shown on the table, use the next higher value of \( P_L \) or \( P_U \). Determine the PWL by use of the following formula:

\[
PWL = (P_U + P_L) - 100
\]

Where: \( P_U = \) percent within upper specification limit

\( P_L = \) percent within lower 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.
   
   \[ X = \frac{(x_1 + x_2 + x_3 + \ldots + x_n)}{n} \]
   
   \[ X = \frac{(96.60 + 97.55 + 99.30 + 98.35)}{4} \]
   
   X = 97.95% density
3. Calculate the standard deviation for the lot.
\[ S_n = \left[ \left(96.60 - 97.95\right)^2 + \left(97.55 - 97.95\right)^2 + \left(99.30 - 97.95\right)^2 + \left(98.35 - 97.95\right)^2 \right] / \left(4 - 1\right) \]^{1/2}
\[ S_n = \left[ \left(1.82 + 0.16 + 1.82 + 0.16\right) / 3 \right]^{1/2} \]
\[ S_n = 1.15 \]

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.
\[ S_n = \left[ \left(3.57 - 5.00\right)^2 + \left(3.57 - 3.74\right)^2 + \left(3.57 - 2.30\right)^2 + \left(3.57 -3.25\right)^2 \right] / \left(4 - 1\right) \]^{1/2}
\[ S_n = \left[ \left(2.04 + 0.03 + 1.62 + 0.10\right) / 3 \right]^{1/2} \]
\[ S_n = 1.12 \]

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 \((97.95 + 1.463 \times 1.15) = 99.63%\)
- OR
- less than \((97.95 - 1.463 \times 1.15) = 96.27\%\).
NAPLES MUNICIPAL AIRPORT
ARFF BUILDING REPLACEMENT

SECTION 007200
FAA GENERAL PROVISIONS

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)
Percent Within
Limits
(PL and PU)
99
98
97
96
95
94
93
92
91
90
89
88
87
86
85
84
83
82
81
80
79
78
77
76
75
74
73
72
71
70
69
68
67
66
65
64
63
62
61
60
59
58
57
56
55
54
53
52
51
50

n=3

n=4

1.1541
1.1524
1.1496
1.1456
1.1405
1.1342
1.1269
1.1184
1.1089
1.0982
1.0864
1.0736
1.0597
1.0448
1.0288
1.0119
0.9939
0.9749
0.9550
0.9342
0.9124
0.8897
0.8662
0.8417
0.8165
0.7904
0.7636
0.7360
0.7077
0.6787
0.6490
0.6187
0.5878
0.5563
0.5242
0.4916
0.4586
0.4251
0.3911
0.3568
0.3222
0.2872
0.2519
0.2164
0.1806
0.1447
0.1087
0.0725
0.0363
0.0000

1.4700
1.4400
1.4100
1.3800
1.3500
1.3200
1.2900
1.2600
1.2300
1.2000
1.1700
1.1400
1.1100
1.0800
1.0500
1.0200
0.9900
0.9600
0.9300
0.9000
0.8700
0.8400
0.8100
0.7800
0.7500
0.7200
0.6900
0.6600
0.6300
0.6000
0.5700
0.5400
0.5100
0.4800
0.4500
0.4200
0.3900
0.3600
0.3300
0.3000
0.2700
0.2400
0.2100
0.1800
0.1500
0.1200
0.0900
0.0600
0.0300
0.0000

Positive Values of Q (QL and QU)
n=5
n=6
n=7
n=8
1.6714
1.6016
1.5427
1.4897
1.4407
1.3946
1.3508
1.3088
1.2683
1.2290
1.1909
1.1537
1.1173
1.0817
1.0467
1.0124
0.9785
0.9452
0.9123
0.8799
0.8478
0.8160
0.7846
0.7535
0.7226
0.6921
0.6617
0.6316
0.6016
0.5719
0.5423
0.5129
0.4836
0.4545
0.4255
0.3967
0.3679
0.3392
0.3107
0.2822
0.2537
0.2254
0.1971
0.1688
0.1406
0.1125
0.0843
0.0562
0.0281
0.0000

1.8008
1.6982
1.6181
1.5497
1.4887
1.4329
1.3810
1.3323
1.2860
1.2419
1.1995
1.1587
1.1192
1.0808
1.0435
1.0071
0.9715
0.9367
0.9025
0.8690
0.8360
0.8036
0.7716
0.7401
0.7089
0.6781
0.6477
0.6176
0.5878
0.5582
0.5290
0.4999
0.4710
0.4424
0.4139
0.3856
0.3575
0.3295
0.3016
0.2738
0.2461
0.2186
0.1911
0.1636
0.1363
0.1090
0.0817
0.0544
0.0272
0.0000

007200-67

1.8888
1.7612
1.6661
1.5871
1.5181
1.4561
1.3991
1.3461
1.2964
1.2492
1.2043
1.1613
1.1199
1.0800
1.0413
1.0037
0.9671
0.9315
0.8966
0.8625
0.8291
0.7962
0.7640
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FAA AC 150/5370-10G


NAPLES MUNICIPAL AIRPORT
ARFF BUILDING REPLACEMENT

Percent Within
Limits
(PL and PU)
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SECTION 007200
FAA GENERAL PROVISIONS

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END OF SECTION 110
END OF FAA GENERAL PROVISIONS

007200-68

FAA AC 150/5370-10G


SECTION 00 73 00
SPECIAL PROVISIONS
SECTION 10 GENERAL INFORMATION

10-01 CONTRACT PROVISIONS. The General Provisions and these Special Provisions are applicable to all divisions and sections of the Contract Documents and Specifications. It shall be the Contractor's responsibility to so inform all parties who should be bound or influenced thereby.

All Contract Documents shall be considered complimentary, and what is required by one shall be binding as if required by all. The Contractor shall not take advantage of any apparent error or omission on the plans or specifications.

In the case of an apparent inconsistency between or within various portions of the Contract Documents, the Contractor shall bring such conflicts or contradictions in writing to the Engineer's attention. The Engineer will render a decision, in writing, indicating the course of action with which the Contractor shall proceed, without additional contract cost to the Owner. In the event one product or method is more expensive than the other, the Contractor shall bid on the product or method that provides the better quality or greater quantity of work in accordance with Engineer's interpretation.

If work is required by the drawings and specifications in a manner which makes it impossible to proceed, or should discrepancies appear among contract documents, the Contractor shall request an interpretation before proceeding with the work. If the Contractor fails to make such a request, no excuse will thereafter be entertained for failure to carry out the work in a satisfactory manner.

The Contract Documents are cooperative and supplementary. Portions of the Work which can be best be illustrated by the plans may not be included in the specifications and portions best described by the specifications may not be depicted on the plans. All items necessary or incidental to completely construct or erect the Work shall be furnished, whether called for in the specifications or shown on the plans. Anything mentioned in the specifications and not shown on the plans, or anything shown on the plans and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both.

10-02 DEFINITIONS. The following terms when used in the Contract Documents shall be defined as follows:

   A. Addenda. Written or graphic instruments issued prior to the opening of Bids that clarify, correct or change the bidding documents or the Contract Documents.

   B. Airport. Naples Municipal Airport

   C. Bid. The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work and services to be performed.

   D. City. The City of Naples, Florida itself, any subsidiaries or affiliates, elected and appointed officials, employees, volunteers, representatives and agents.

   E. Day. Unless otherwise defined shall mean "calendar" day.
F. **Department**: Florida Department of Transportation (FDOT)

G. **Engineer**: Atkins North America, Inc. (d/b/a Atkins)

H. **O.A.R.** Owner’s Authorized Representative. Where the terms “Engineer” and “Architect” are used throughout the Contract Documents it shall be synonymous with “Owner’s Authorized Representative” or “O.A.R.”

I. **Owner**: Naples Airport Authority (NAA)

J. **R.P.R.** Resident Project Representative

**10-03 USE OF STANDARD SPECIFICATIONS.** The project specifications include documents based on Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (latest edition), Federal Aviation Administration (FAA) Standard Specifications for Specifying Construction of Airports as found in FAA Advisory Circular 150/5370-10G, and specifications developed specifically for this project. Modifications to standard specifications have been made as applicable for this Project in the following two forms:

- **Strikeouts**: Language shown in this manner is to be ignored and is not applicable to the work.
- **Italics**: Language shown in this manner is additional language, which is relevant to, and is part of the contract documents for this specific project.

**10-04 SUBSURFACE DATA.** An investigation of subsurface conditions in the area covered by the work to be performed was conducted by Tierra, Inc. A copy of this report is provided as an attachment to the Project Manual. The Engineer does not make any representation regarding existing subsoil conditions. It is the Contractor's responsibility to perform additional soil borings to verify the limits of suitable vs. unsuitable material on-site. In the event of an apparent discrepancy between the recommendations of the report and the Plans or Specifications, the Contractor shall be obligated to follow the Plans or Specifications. If there is any apparent ambiguity or confusion on the part of the Contractor, he shall bring forth any questions to the attention of the Engineer for clarification prior to proceeding with any related work.

**10-05 PROTECTION OF PERSONS.** The Contractor shall at all times protect the lives and health of his employees under the Contract; take all necessary precautions for the safety of all persons on or in the vicinity of the project site and comply with all applicable provisions of Federal, State and Municipal safety laws and building codes.

The Contractor shall comply with all pertinent provisions of the Manual of Accident Prevention in Construction issued by the Associated General Contractors of America, Inc., latest edition, to prevent accidents or injury to persons on or about or adjacent to the premises where the work is being performed. He shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of persons and shall post danger signs warning against the hazards created in part by features of construction such as protruding nails, rod hoists, well holes, falling materials, etc., and he shall designate a responsible member of his organization on the Work site whose duty shall be the prevention of accidents.
The Contractor shall comply with all provisions of the "Williams-Steiger Occupational Safety and Health Act of 1970" including any amendments thereto and rules and regulations issued pursuant thereto, applicable to the Work and performance of the Contract. Where a State in which Work is performed has passed legislation bearing on Occupational Safety and Health, such legislation and amendments thereto, together with rules and regulations issued pursuant thereto shall be complied with by the Contractor.

10-06 AUTHORITY OF THE ENGINEER. The Engineer, through its duly authorized representatives, shall furnish engineering services during construction of the Work to the extent provided in the Contract Documents. He/she shall respond to technical questions which arise in the execution of the Work and decide the meaning and intent of any portion of the Contract Documents where the same may be found obscure or be in dispute. He/she shall observe and review the Work in the process of construction. Compliance with the Contract Documents shall be the Contractor's responsibility notwithstanding such observation or review.

The Engineer shall have the authority to recommend suspension of the Work to the Owner when it appears such suspension may be necessary to accomplish the proper implementation of the intent of the Contract Documents. The authority to observe, review or recommend suspension of the Work, or exercise such other authority as may be granted by the Contract Documents, shall not be construed or interpreted to mean supervision of construction, which is the Contractor's responsibility, nor make the Engineer responsible for providing a safe place for the performance of Work by the Contractor or by the Contractor's employees, or those of suppliers or subcontractors, or for access, visits, use, work, travel, or occupancy by any other person. The Engineer shall also have the authority to reject any Work, materials, or equipment which do not conform to the Contract Documents.

The Engineer shall determine the amount, quality, acceptability, and fitness of the several kinds of Work, materials, equipment and supplies which are to be paid for under the Contract and shall decide questions which may arise in relation to said Work and its compliance with the Contract Documents.

The Engineer's estimates and decisions shall be final and conclusive, except as otherwise expressly provided in case any question shall arise between the parties to the Contract relative to the Contract Documents, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for Work under the Contract affected in any manner or to any extent by such question.

10-07 NIGHTTIME WORK. In phases of work requiring daytime work, the Contractor shall not perform nighttime work unless given advance written approval by the Engineer and/or Owner. If the Engineer and/or Owner approves any contractor request for nighttime work, the Contractor shall coordinate closely with the Engineer and the Owner during any and all approved nighttime work. This includes any nighttime hauling of materials to the project site. If the Contractor wishes to perform nighttime work or haul materials at night, the Contractor shall reimburse the Owner for any nighttime inspection costs incurred by the Owner to adequately and properly inspect said nighttime work or hauling of materials.

In phases of work requiring night time work, the Contractor shall perform said night time work within the time frame allotted by the Owner and as provided for in the Contract Documents. The Contractor shall coordinate with the Owner and Engineer each day before night time operations commence to ensure all special instructions, time limitations, directives, etc. are adhered to each night of night time operations. The Contractor shall not enter areas requiring night time
construction operations until cleared to do so, each night, by the Owner. Any violation of this provision shall result in a $1,000.00 fine for each occurrence.

END OF SECTION 10
SPECIAL PROVISIONS
SECTION 20 PROJECT COORDINATION

20-01 COORDINATION. Coordinate construction activities included under various Sections of these Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

A. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

B. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

C. Make adequate provisions to accommodate items scheduled for later installation.

D. Coordinate construction activities with public and private utilities. Notify "Underground Facilities Protective Organizations" (UFPO) a minimum of 72 hours prior to excavation. Notify the Owner of any utility locations encountered which conflict with the work. Coordinate with the Owner and Utility Company in the protection, removal, relocation or replacement of conflicting utility locations.

Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

20-02 ADMINISTRATIVE PROCEDURES. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

- Preparation of schedules.
- Installation and removal of temporary facilities.
- Delivery and processing of submittals.
- Progress meetings.
- Project Close out activities.

20-03 CONSERVATION. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

20-04 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level.

E. Recheck measurements and dimensions, before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

20-05 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

20-06 DUST CONTROL. The Contractor shall maintain strict dust control during the project duration. If dust control is not maintained to the satisfaction of the Owner, the Contractor shall receive one warning. If further violations of the dust control occur, the Contractor shall be fined $1,000.00 for each individual infraction.

20-07 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. The Contractor shall be responsible for the preservation of all public and private property. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his/her manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the nonexecution thereof by the Contractor, he shall restore, at his/her own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.
20-08 STAFFING LIST. Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

END OF SECTION 20
30-01 SUMMARY. This section specifies administrative and procedural requirements for project meetings including but not limited to the pre-construction conference and progress meetings.

30-02 PRE-CONSTRUCTION CONFERENCE. The Owner shall schedule a pre-construction conference and organizational meeting at the Project site or other convenient location prior to commencement of construction activities. The Owner and Engineer will conduct the meeting to review responsibilities and personnel assignments. Attendees shall include representatives of the Owner; the Engineer; the Contractor and its superintendent, major subcontractors, manufacturers, suppliers involved; government agencies; utility company representatives; and other concerned parties familiar with and authorized to conclude matters relating to the Work.

30-03 PROGRESS MEETINGS. The Contractor shall conduct weekly progress meetings at the Project site, or mutually agreed meeting place, on a day and time agreed by the Contractor, Owner, and Engineer. Identify progress meetings in the progress schedule.

In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

Topics for discussion at each meeting should include, but not necessarily be limited to:
- Review and correct or approve minutes of the previous progress meeting.
- Review progress since the last meeting.
- Determine where each activity is in relation to the Contractor’s progress schedule, whether on time or ahead or behind schedule.
- Determine how construction behind schedule will be expedited and secure commitments from parties involved to do so.
- Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- Review the present and future needs of each entity present.
- Coordinate any anticipated impacts to Owner or Tenant operations.
- Update status of outstanding RFIs and shop drawings

No later than 3 working days after each progress meeting date, Contractor shall distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report. With the minutes of the meeting, Contractor shall include a revised progress schedule reflecting any revisions to the schedule have been made or recognized.

30-04 COORDINATION MEETINGS. The Contractor or Owner may call for additional meetings as necessary to coordinate specific Work items. Meetings shall be scheduled at a time and place convenient for all parties involved. Representatives of each party familiar with the Project and authorized to conclude matters related to progress shall be present. The Contractor shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

END OF SECTION 30
SPECIAL PROVISIONS
SECTION 40 SUBMITTAL REQUIREMENTS

40-01 SUMMARY. This section specifies administrative and procedural requirements for shop drawings and product data required for performance of the Work, including: Contractor's construction schedule, submittal schedule, daily construction reports, monthly aerial photographs, shop drawings, product data, and samples. Refer to other parts of the Contract Documents for additional requirements related to technical and administrative submittals.

40-02 DEFINITIONS

A. Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

B. Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams or other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

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

40-03 CONTRACTOR RESPONSIBILITY. The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the Work of the Owner or any separate Contractor, all shop drawings, product data and samples required by the Contract Documents. By submitting such shop drawings, product data and samples, the Contractor represents that he/she has determined and verified all materials, field measurements and field construction criteria related thereto, or will do so, and that he/she has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. This includes the Contractor reviewing and approving any items submitted by subcontractors prior to submitting them for review.

Engineer's review of submitted items is for reasonable conformity with the requirements of the Contract Documents only. Engineer’s approval of submitted items shall not relieve the Contractor from his/her responsibility to meet any Contract requirement. If any submitted item includes a deviation from any contract requirement, it is the Contractor's responsibility to clearly identify, in writing, such deviation at the time of submission. The Contractor shall not be relieved from responsibility for any errors or omissions in the shop drawings, product data or samples by the Engineer's approval thereof.

No portion of the Work requiring submission of a shop drawing, product data or sample shall be commenced until the respective submittal has been approved by the Engineer. All such portions of the Work shall be in accordance with approved submittals. If the Contractor does proceed without required approvals, it will be at his/her own risk and the Owner or Engineer may require the Work to be removed and redone at no additional cost.

40-04 CONTRACTOR'S CONSTRUCTION SCHEDULE. The Contractor shall prepare a fully developed, horizontal bar chart type Contractor's “Construction Schedule”. The schedule shall contemplate all major work items and their relationships to one another. Indicate important stages of construction for each major portion of the Work, including testing and installation.
Clearly identify portions of the project that correlate to specific phases or work areas with operational restrictions shown in the Contract Documents.

The Contractor shall present the initial construction schedule at the pre-construction conference and be prepared to discuss the logic utilized in its development. The schedule shall be updated after revisions discussed in regular progress meetings, when any significant changes to anticipated work flow occur, or a minimum of once per month. Issue revised schedules within 3 working days from the time that a significant change in project schedule has been identified.

Contractor shall print and distribute copies of each schedule to the Engineer, Owner, subcontractors, and other parties with vested interest in the scheduled dates. Post copies in the Project meeting room and temporary field office. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution as appropriate when they have completed their assigned portion of the Work and are no longer involved in construction activities.

40-05 SUBMITTAL SCHEDULE. The Contractor shall prepare a list of items for which shop drawings, product data, or samples are to be submitted ("submittal schedule"). The Contractor shall clearly identify items that are critical to the construction progress schedule. Coordinate the submittal schedule with the list of subcontractors, schedule of values and the list of products as well as the Contractor's progress schedule.

Submit a draft submittal schedule not later than ten (10) calendar days after the pre-construction meeting. Following response to initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office. Approval of the submittal schedule by the Engineer will not relieve the Contractor of the responsibility of submitting complete submittals as required by the Contract Documents.

Revise the submittal schedule after each meeting or activity where revisions have been recognized or made. Issue the updated submittal schedule concurrently with report of each meeting. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

40-06 DAILY CONSTRUCTION REPORTS. Prepare daily construction reports recording the information concerning events at the site. Daily reports must be provided to the Engineer upon request.

40-07 MONTHLY AERIAL PHOTOGRAPHS. The Contractor shall obtain full color high-resolution digital aerial photographs of the project area a minimum of once per calendar month. Photographs shall be taken professionally by a firm who specializes in providing high quality aerial images and is approved by the Engineer. A minimum of three (3) aerial color photographs shall be obtained each month of the project to include at least two (2) oblique views and one (1) vertical view. Contractor shall submit two (2) copies of 8"x10" prints and one (1) CD of digital images in .tif or .jpg format with each pay application. Provide an additional set of photos for both Substantial Completion and Final Completion of the project if they fall at times off-cycle from the monthly pay applications. Failure to submit photographs could be considered grounds for denial of the pay application.
**40-08 SHOP DRAWINGS.** Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered shop drawings. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information with each shop drawing submittal: dimensions, identification of products and materials included, compliance with specified standards, notation of coordination requirements, and notation of dimensions established by field measurement. Do not use shop drawings without an appropriate final stamp indicating action taken in connection with construction.

**40-09 PRODUCT DATA.** Collect product data into a single submittal for each element of construction or system. Product data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing in diagrams and templates, standard wiring diagrams and performance curves. Where product data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

Mark each copy to show applicable choices and options. Where printed product data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information, manufacturer's printed recommendations, compliance with recognized trade association standards, compliance with recognized testing agency standards, application of testing agency labels and seals, notation of dimensions verified by field measurement, and notation of coordination requirements.

**40-10 SAMPLES.** Provide samples as required by the Contract Documents.

**40-11 SUBMITTAL PROCEDURES.** Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals. Allow the Engineer a minimum of two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals, or if required specifically by the Specifications. The Engineer will advise the Contractor when a submittal being processed must be delayed for coordination. No extension of Contract Time will be authorized because of Contractor's failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Provide a space on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.

The Contractor shall not reproduce the Engineer's project drawings for Shop Drawing use without prior written approval of the Engineer.
Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Each drawing or part of the brochure shall be listed separately on the letter and identified as indicated thereon. Failure to do this will cause rejection of the submittal. Submittals received from sources other than the Contractor will be returned without action.

The Contractor shall submit six (6) copies, or at Engineer's option, one reproducible copy and one print of all Shop Drawings required for the Work of the various trades unless greater quantities are specifically requested for certain equipment. Of these, three copies, or the reproducible copy, will be annotated as appropriate and returned to the Contractor with appropriate action indicated. By agreement with the Engineer, the Contractor may submit more than the required number of copies. Receipt of less than the required number of copies will be cause for withholding the Shop Drawings from being checked until receipt of the necessary additional copies.

As an alternative to the above, if acceptable to the Owner, the Engineer may allow electronic submission of shop drawings for review. If this method is used, the Engineer will return comments electronically in the same fashion. All information required herein shall still be included in the submission. Specifics of this procedure shall be discussed and agreed to by all parties at the Pre-Construction Conference.

40-12 ENGINEER'S ACTION. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly.

The Engineer will stamp each submittal indicating the results of the review and/or action to be taken. The stamp shall indicate the following (or similar):

A. Final Unrestricted Release: Where submittals are marked "Reviewed No Comments" or "Approved" that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final acceptance and/or partial payments will depend upon that compliance.

B. Final But Restricted Release: When submittals are marked "Reviewed, Comments as Noted" or "Approved as Noted" that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final acceptance and/or partial payments will depend upon that compliance.

C. Returned for Resubmittal: When submittal is marked "Rejected" or "Revise and Resubmit" or "Returned for Corrections", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark. Do not permit submittals marked as such to be used at the Project site, or elsewhere where Work is in progress.

D. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Not Reviewed" or "Acknowledged".
Compliance with specified characteristics is the Contractor's responsibility. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Engineer's approval of shop drawings, product data or samples. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Engineer's approval thereof.

END OF SECTION 40
SPECIAL PROVISIONS
SECTION 50 PROJECT CLOSEOUT

50-01 SUMMARY. This Section specifies administrative and procedural requirements for project closeout, including but not limited to: Substantial Completion, Final Acceptance, and Final Cleaning. Closeout requirements for specific construction activities are included in the appropriate Technical Specifications.

Closeout is hereby defined to include general requirements near the end of Contract time, in preparation for Final Acceptance, Final Payment, normal termination of Contract, occupancy by Tenant and/or Owner, and similar actions evidencing completion of the Work. Time of closeout is directly related to Substantial Completion, and therefore may be a single-time period for the entire Work or a series of time periods for individual parts of the Work which have been certified as Substantially Complete at different dates.

50-02 SUBSTANTIAL COMPLETION. Substantial Completion can be defined as when the Work is sufficiently complete so it may be safely, conveniently and beneficially utilized by the Owner for all of the purposes for which it was intended. Before requesting inspection for certification of Substantial Completion, the Contractor must complete the following.

A. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

B. Include supporting documentation for completion as indicated in the Contract Documents.

C. Advise Owner of pending insurance change-over requirements.

D. Submit specific workmanship bonds, maintenance agreements, warranties, final certifications and similar documents.

E. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.

F. Submit record drawings, final topographic survey, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.

G. Deliver tools, spare parts, extra stock, and similar items.

H. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.
I. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

J. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

Upon receipt of Contractor's request, the Engineer will proceed with inspection or advise the Contractor of prerequisites not fulfilled. Following initial inspection, the Engineer will prepare the Certificate of Substantial Completion or advise Contractor of Work which must be performed prior to issuance of the certificate and repeat inspection when requested and assured that Work has been substantially completed. Results of completed inspection will form initial "punch list" for Final Acceptance. Results of the completed inspection will form the basis of requirements for final acceptance.

Following the Substantial Completion inspection, the Contractor shall correct or remedy all punch list items to the satisfaction of the Engineer and Owner within a two (2)-week period after the date of Substantial Completion. If subsequent inspections are necessary after the two-week period in order to eliminate deficiencies, the cost of all subsequent inspections with respect to the Owner's and Engineer's time shall be paid by the Contractor. When ready, the Contractor shall request in writing, a final inspection of the Work. Upon completion of reinspection, the Engineer will advise the Owner to proceed with Final Acceptance or advise the Contractor of Work not completed or obligations not fulfilled as required for Final Acceptance.

50-03 FINAL ACCEPTANCE. When the following items are completed, the Contractor may request final inspection for certification of final acceptance and final payment.

A. Submit certified copy of the Engineer's final punch list of itemized Work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by the Engineer.

B. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

C. Submit an updated final statement, accounting for final changes to the Contract Sum. Include resolution of any outstanding quantity discrepancies.

D. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.

E. Submit consent of surety to final payment.

F. Submit a final liquidated damages settlement statement if applicable.

G. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

H. Submit evidence from surety that payment and performance bond shall remain in effect one (1) year following final payment.
I. Other requirements as included in the General Provisions and elsewhere in the Contract Documents.

Immediately after being notified by the Engineer that all other requirements of the Contract have been completed, the Contractor shall give notice of said completion by an advertisement for a period of four (4) successive weeks in the newspaper with the largest circulation published within the city or county where the work is performed. Proof of publication of said notice shall be made by the Contractor to the Owner, by affidavit of the publisher and a printed copy of the published notice.

Contractor shall satisfy these requirements as well as all requirements in the General Provisions and Contract Documents prior to receiving final payment.

END OF SECTION 50
SPECIAL PROVISIONS
SECTION 60 PROJECT RECORD DOCUMENTS

60-01 SUMMARY. Record documents are defined to include those documents or copies relating directly to performance of the Work, which the Contractor is required to prepare or maintain for the Owner's records, recording the Work as actually performed. In particular, record documents show changes in the Work in relation to the way in which shown and specified by original Contract Documents; and show additional information of value to the Owner's records. Record documents include newly prepared drawings (if any are specified), marked-up copies of Contract drawings, shop drawings, specifications, addenda, field orders, change orders, marked-up product data submittals, record samples, field records for variable and concealed conditions such as excavations and foundations, and miscellaneous record information on Work which is otherwise recorded only schematically or not at all.

Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Owner's reference during normal working hours. The record documents shall be kept legible and current and shall be available for inspection at all times by the Engineer.

60-02 RECORD DRAWINGS. During progress of the Work, the Contractor shall maintain a set of Contract drawings and shop drawings, with mark-up of actual installations which vary from the Work as originally shown. Mark whatever drawing is most capable of showing actual physical condition, fully and accurately. Where shop drawings are marked up, mark cross-reference on Contract drawings at the corresponding location. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

Mark with erasable colored pencil, using separate colors where feasible to distinguish between changes for different categories of Work at the same general location. Mark-up important additional information which was either shown schematically or omitted from the original drawings. Give particular attention to information on Work concealed, which would be difficult to identify or measure and record at a later date. Note alternate numbers, field orders or change order numbers and similar identification. Require each person preparing mark-ups to initial and date mark-ups and indicate the name of the firm. Label each sheet "PROJECT RECORD" in 1-1/2-inch high letters. In showing changes in the Work, use the same legends as used on the original drawings. Indicate exact locations by dimensions and exact elevations by job datum. Give dimensions from a permanent point.

After Substantial Completion, submit record drawings to the Engineer for review. The Engineer shall be the sole judge of the acceptability of the final record drawings. If the Engineer returns the drawings with comments, the Contractor shall address expeditiously. Receipt and acceptance of the record drawings is a prerequisite for Final Payment.

60-03 RECORD SPECIFICATIONS. Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data. Upon completion of the Work, submit record Specifications to the Engineer for review. The Engineer shall be the sole judge of the acceptability of the final record specifications. If the Engineer returns the
specification with comments, the Contractor shall address expeditiously. Receipt and acceptance of the record specifications is a prerequisite for Final Payment.

60-04 RECORD PRODUCT DATA. Maintain one copy of each Product Data submittal. Mark these documents to show variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications. Upon completion of mark-up, submit complete set of record Product Data to the Owner for the Owner's records.

60-05 MISCELLANEOUS RECORD SUBMITTALS. Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Owner for the Owner's records.

60-06 RECORD SURVEY. As soon as practical after Substantial Completion, the Contractor will be responsible for submitting an as-built topographic survey in accordance with Technical Specification T-104. The survey must be reviewed and accepted by the Engineer prior to release of final payment.

60-07 RECORD PHOTOGRAPHS. Before final completion, the Contractor will be responsible for submitting final aerial photographs in accordance with Special Provision Section 50.

END OF SECTION 60

END OF SPECIAL PROVISIONS
SECTION 012000
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 MEASUREMENT OF QUANTITIES

A. All work completed under the Contract will be measured by the Contractor and subject to verification by the Owner, or their authorized representative(s), using units of measurement specified in the Contract Documents.

B. The term "lump sum" when used as an item of payment shall constitute full compensation for furnishing all plant, labor, materials, equipment, overhead, profit, and incidentals; and performing any associated Contractor quality control, environmental protection, safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

C. The term “unit price” shall constitute full compensation for furnishing all plant, labor, materials, equipment, overhead, profit, and incidentals; and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

D. 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 (1 sq. meter) 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 OWNER.

E. Unless otherwise specified, all Contract items which are measured by the linear foot (meter) 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.

F. Asphalt will be measured by total weight, in Tons, delivered to the jobsite as indicated on the plant batch tickets, placed and accepted. Any waste or rejected asphalt shall be subtracted from the total tonnage indicated on the plant tickets. Any asphalt placed at a spread rate greater than 7% over the target spread rate shall be considered excess or waste and shall not be measured for payment.

G. The term "ton" will mean the short ton consisting of 2,000 pounds (907 kilograms). All materials which are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designated by the OWNER. 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 OWNER directs, and each truck shall bear a plainly legible identification mark.
H. 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 to the OWNER, 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 OWNER in writing, material specified to be measured by the cubic yard (meter) may be weighed, and such weights will be converted to cubic yards (meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the OWNER and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

I. Rental of equipment will not be measured and will be considered incidental to the Work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work.

J. When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, 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.

K. 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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PAYMENT FOR CONTRACT WORK

A. The terms "Contract Pay Item", "Contract Payment Item", "Pay Item", and "Bid Item" shall be considered interchangeable and to have the same intent and meaning when used throughout the Contract Documents.

B. Payment for Contract Work shall be in accordance with the Pay Items included in the Bid Schedule. Unless detailed measurement and payment instructions are specified in Paragraph 3.2 below or the referenced technical specification, Pay Items will be measured in accordance with Paragraph 1.1 and paid as follows:

1) Lump Sum Pay Items: For Pay Items listed as “LS” or “Lump Sum” payment
shall be made monthly based on the percentage of overall effort for the respective item is complete, in-place, and accepted as agreed to by the Contractor and O.A.R.

2) Unit Price Pay Items: For Pay Items listed as a specific unit of measure (such as LF, SY, SF, AC, etc.), payment shall be made monthly based on the measured quantity of the respective item that is complete, in-place, and accepted as agreed to by the Contractor and O.A.R.

C. Incidental Work: All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum or unit price item most closely associated with the work involved.

3.2 PAYMENT OF SPECIFIC BID ITEMS

Payment will be made under:

012000-1: General Conditions (per Lump Sum): Payment for this item shall be complete and total compensation for items necessary to comply with the requirements of all General Provisions, Special Provisions, Contract Requirements, and Division 0 Specifications not otherwise specified for direct payment. This shall include but not be limited to insurances, bonds, licenses, permits, overhead, profit, and general administrative costs of the Contract. The costs to develop and maintain the Project baseline schedule shall be included in this item. All additional efforts required to complete the Project but not enumerated under a specific bid items shall be included as a subsidiary obligation to this item. Payment for this lump sum item shall be prorated uniformly across the contract schedule with an even amount paid each month based on the contract duration.

012000-2: New ARFF Building (per Lump Sum): Payment for this item shall be complete and total compensation for the construction of the ARFF Building per the requirements of the Bid Documents for all items not otherwise stipulated as a pay item on the Bid Schedule. This shall include the work specified by the Technical Specifications related to the building included in Divisions 03 through 28. After award of the Contract, and prior to mobilization for field work, the Contractor shall submit to the Engineer a schedule of values for the building work that can be used to administer partial payments. The schedule of values shall provide a detailed list of building components specific enough to allow for verification prior to each payment. The Engineer and Owner will review proposed schedule of value and provide comments. The schedule of values must be agreed to by all parties prior to submittal of the first pay application.

END OF SECTION 012000
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## TECHNICAL SPECIFICATIONS
### TABLE OF CONTENTS

This section of the Project Manual contains the technical specifications to be utilized on this project. Within this volume are sections from the Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (July 2017 Edition), Federal Aviation Administration (FAA) Standard Specifications for Specifying Construction of Airports as found in FAA Advisory Circular 150/5370-10G, and specifications developed specifically for this project. Only relevant sections from the Division II – Construction Operations portion of the FDOT standard specifications have been included herein. Where other sections of the FDOT specifications are referenced, but not included herein, the standard FDOT specification section shall be utilized. Where sections of the FDOT specification are NOT referenced within these FDOT specifications they shall not apply.

Modifications have been made to the standard specifications as applicable for this project and appear in the following two forms:

- **Strikeouts:** Language shown in this manner is to be ignored and is not applicable to the work.
- **Italics:** Language shown in this manner is additional language, which is relevant to, and is part of the contract documents for this specific project.

### FAA SPECIFICATIONS (NON-STANDARD SPECIFICATIONS ARE MARKED WITH **)

- ITEM M-110 – MOBILIZATION*
- ITEM P-104 – PROJECT SURVEY AND STAKEOUT*
- ITEM P-120 – DEMOLITION*
- ITEM P-125 – PAVEMENT REMOVAL AND MILLING*
- ITEM P-151 – CLEARING AND GRUBBING
- ITEM P-152 – EXCAVATION, SUBGRADE, AND EMBANKMENT
- ITEM P-156 – TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL
- ITEM P-620 – RUNWAY AND TAXIWAY MARKING
- ITEM F-162 – CHAIN-LINK FENCE
- ITEM L-100 – LIGHTING AND TAXIWAY MARKING
- ITEM L-104 – GENERAL ELECTRICAL SAFETY REQUIREMENTS AND TEMPORARY AIRFIELD LIGHTING
- ITEM L-108 – UNDERGROUND POWER CABLE FOR AIRPORTS
- ITEM L-110 – AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS
- ITEM L-115 – ELECTRICAL MANHOLES AND JUNCTION STRUCTURES
- ITEM L-125 – INSTALLATION OF AIRPORT LIGHTING SYSTEMS*

### FDOT SPECIFICATIONS

- SECTION 121 – FLOWABLE FILL
- SECTION 160 – STABILIZING
- SECTION 200 – ROCK BASE
- SECTION 285 – OPTIONAL BASE COURSE
- SECTION 300 – PRIME AND TACK COATS
SECTION 320 – HOT MIX ASPHALT – PLANT METHODS
SECTION 330 – HOT MIX ASPHALT – GENERAL CONSTRUCTION REQUIREMENTS
SECTION 334 – SUPERPAVE ASPHALT CONCRETE
SECTION 346 – PORTLAND CEMENT CONCRETE
SECTION 350 – CEMENT CONCRETE PAVEMENT
SECTION 425 – INLETS, MANHOLES, AND JUNCTION BOXES
SECTION 430 – PIPE CULVERTS
SECTION 520 – CONCRETE GUTTER, CURB ELEMENTS, AND TRAFFIC SEPARATORS
SECTION 522 – CONCRETE SIDEWALK AND DRIVEWAYS
SECTION 530 – REVETMENT SYSTEMS
SECTION 570 – PERFORMANCE TURF
SECTION 700 – HIGHWAY SIGNING
SECTION 710 – PAINTED PAVEMENT MARKINGS

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03 45 00 ARCHITECTURAL PRECAST SHAPES

DIVISION 04 – MASONRY

04 40 14 MARBLE WINDOW SILLS
04 81 00 UNIT MASONRY ASSEMBLIES

DIVISION 05 – METALS

05 12 00 STRUCTURAL STEEL
05 44 00 COLD-FORMED METAL TRUSSES
05 50 00 METAL FABRICATIONS
05 51 00 METAL STAIRS
05 52 13 PIPE AND TUBE RAILINGS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 53 MISCELLANEOUS ROUGH CARPENTRY
06 20 00 FINISH CARPENTRY
06 41 16 MILLWORK

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 11 13 DAMPPROOFING
07 17 00 BENTONITE WATERPROOFING
07 21 00 BUILDING INSULATION
07 22 00 ROOF AND DECK INSULATION
07 24 11 EXTERIOR FINISH SYSTEM
07 25 00 WEATHER BARRIERS
07 26 10 UNDERSLAB VAPOR RETARDER
07 41 13 METAL ROOF PANELS
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07 92 00 JOINT SEALANTS
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08 11 13   HOLLOW METAL DOORS AND FRAMES
08 14 16   FLUSH WOOD DOORS
08 31 13   ACCESS DOORS AND FRAMES
08 33 23   OVERHEAD COILING DOORS
08 33 23.13   HIGH SPEED ROLLING DOORS
08 36 13   SECTIONAL OVERHEAD DOORS
08 39 60   REMOVABLE ALUMINUM FLOOD BARRIERS
08 41 13   ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08 51 13   ALUMINUM WINDOWS
08 71 00   DOOR HARDWARE
08 80 00   GLAZING

DIVISION 09 - FINISHES

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09 29 00   GYPSUM BOARD
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09 67 00   EPOXY FLOORING
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10 14 00   IDENTIFYING DEVICES
10 21 13   TOILET COMPARTMENTS
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10 26 00   WALL PROTECTION
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ITEM M-110
MOBILIZATION

DESCRIPTION

110-1.1 The work specified in this section consists of the preparatory work and operations in mobilizing for beginning, performing, maintaining, and concluding work on the project, including but not limited to those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site and for safety equipment and first aid supplies, sanitary and other facilities as required by these Specifications, the General Conditions, Supplementary Conditions, the plans and State and Local laws and regulations. The costs of and any other pre-construction expense necessary for the start of the work, the cost of construction materials, and vacating, restoring the site, and demobilization shall also be included in mobilization.

110-1.2 This section will include Safety, Security and Traffic Control requirements as defined in the Drawings, Specifications, and CSPP for all landside and airside MOT/phasing. Safety and Security Traffic Control shall include the provision of all guards and/or flagmen, temporary markings, barricades, closure markers, signs, flags, etc. required by the Drawings, Specifications, and CSPP for all landside and airside MOT/phasing.

110-1.3 This section will include the Safety Plan Compliance Document (SPCD) requirements as defined in the Volume 2 Technical Specifications, Construction Safety and Phasing Plan (CSPP) in Appendix A, and FAA AC 150/5370-2F. The SPCD shall include a statement certifying the Contractor has reviewed and will comply with the information described in the CSPP. The SPCD shall also provide supplemental information to the CSPP as defined in AC 150/5370-2F. The SPCD shall be submitted and approved by Owner prior to Mobilization on site.

METHOD OF MEASUREMENT

110-2.1 Mobilization will be paid for on a lump sum basis; hence, no separate measurement will be made for the various items included. The amount bid for the item of "mobilization" shall not exceed 7% of the total contract amount for all other items listed in the proposal. The Owner, at its discretion, may accept or reject any bid that includes an amount for mobilization that exceeds 7% of the total contract amount.

110-2.2 Safety, Security and Traffic Control Requirements will be paid for on a lump sum basis; hence, no separate measurement will be made.

110-2.3 Completion of the SPCD shall be considered an incidental obligation to the project. Therefore, no separate measurement will be made.

BASIS OF PAYMENT

110-3.1 All work covered under Mobilization shall be paid for at the contract lump sum price for mobilization. Partial payments will be made in accordance with the following:

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<th>% of Orig. Contract Amount Earned</th>
<th>Allowable % of Lump Sum Price of Item*</th>
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Calculation of partial payments for the lump sum bid item for mobilization will be limited to 7% of the original contract amount.

No additional payment will be made for demobilization and remobilization due to shutdowns, suspensions of the work or for other mobilization activities.

The standard retainage will be applied to these allowances. Partial payments made on these items shall in no way act to preclude or limit any of the provisions for partial payments otherwise provided for by the contract.

No additional payment will be made for demobilization and remobilization due to shutdowns, suspensions of the work or for other mobilization activities.

110-3.2 All work covered under Safety, Security and Traffic Control Requirements shall be paid for at the contract lump sum price for Safety, Security and Traffic Control Requirements. Partial payments will be made for Safety, Security and Traffic Control pay item in accordance with the Mobilization partial payments table presented above. Completion of the SPCD shall be considered incidental to this effort and will not receive direct payment.

Payment will be made under:

- Item M-110-1 Mobilization – per Lump Sum
- Item M-110-2 Safety, Security, and Traffic Control – per Lump Sum

END OF ITEM M-110
ITEM P-104
PROJECT SURVEY AND STAKEOUT

DESCRIPTION

104-1.1 Under this item, the Contractor shall do all necessary surveying required to construct all elements of the work as shown in the Contract Drawings and specified in the proposal and specifications. This shall include, but not be limited to, stakeout, layout and elevations for pavements, structures, forms and appurtenances as shown and required, consistent with the current practices and shall be performed by qualified personnel acceptable to the Engineer. All survey work shall be provided under the direction of a land surveyor licensed in the state of Florida.

MATERIALS

104-2.1 All instruments, equipment, stakes and any other material necessary to perform the work satisfactorily shall be provided by the Contractor. All stakes used shall be of a type approved by the Engineer. It shall be the Contractor’s responsibility to maintain these stakes in their proper position and location at all times.

CONSTRUCTION METHODS

104-3.5 PRE-CONSTRUCTION SURVEYS. The Contractor shall be required to survey and confirm existing field conditions prior to beginning construction in each work area. This initial stakeout survey shall proceed immediately following the initial administrative notice to proceed of the Contract or as soon as authorized by the Owner and shall be expeditiously progressed to completion in a manner and at a rate satisfactory to the Engineer. The Contractor shall keep the Engineer fully informed as to the progress of the stakeout survey.

Confirmation of existing conditions shall include, but is not limited to, drainage structure locations, elevations and inverts, pipe inverts, existing ground elevations, elevations at the edge of pavements where the proposed work will tie into and pavement elevations 50-feet beyond the tie-in point, existing utility locations and elevations, and any other existing features and conditions that may impact the proposed construction. The contractor shall submit the pre-construction survey to the Engineer and notify the Engineer of any discrepancies that are found in the existing conditions compared to the information contained in the plans prior to beginning construction in each work area.

104-3.2 SURVEY PROCEDURES. The exact position of all work shall be established from control points, baseline transit points or other points of similar nature that are shown on the Contract Drawings and/or modified by the Engineer. Before any layout work is accomplished, the Contractor shall first verify that the control point data shown on the plans is accurate. Any error or apparent discrepancy or absence in or of data shown or required for accurately accomplishing the stakeout survey shall be immediately referred to the Engineer for interpretation or resolution before the control point(s) in question are used for survey and layout.

The Contractor shall place two offset stakes or references at each joint corner for concrete pavement and at each intersection of the asphalt paving grid shown on the Pavement Elevation Plans and at such intermediate locations as the Engineer may direct. From computations and
measurements made by the Contractor, these stakes shall be clearly and legibly marked with the correct northing and easting, and cut or fill so as to permit the establishment of the exact centerline location and elevation during construction. If markings become faded or blurred for any reason, the markings shall be restored by the Contractor at the request of the Engineer. The Contractor shall locate and place all cut, fill, slope, fine grade or other stakes and points, as the Engineer may direct, for the proper progress of the work. All control points shall be properly guarded and flagged for easy identification.

The Contractor shall trim trees, brush and other interfering objects, consistent with the Contract Drawings, from survey lines in advance of all survey work to permit accurate and unimpeded work by his stakeout survey crews.

Drainage structures shall be staked out by the Contractor at the locations and elevations shown on the Contract Drawings or specified by the Engineer. The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

The Contractor shall be responsible for the accuracy of his work and shall maintain all reference points, stakes, etc., throughout the life of the work. Damaged or destroyed points, benchmarks or stakes, or any reference points made inaccessible by the progress of the construction, shall be replaced or transferred by the Contractor. Any of the above points which may be destroyed or damaged shall be transferred by the Contractor before they are damaged or destroyed. All control points shall be referenced by ties to acceptable objects and recorded. Any alterations or revisions in the ties shall be so noted and the information furnished to the Engineer immediately.

All stakeout survey work shall be referenced to the centerlines shown on the Contract Drawings. All computations necessary to establish the exact position of the work from control points shall be made and preserved by the Contractor. All computations, survey notes and other records necessary to accomplish the work, shall be neatly made. Such computations, survey notes and other records shall be made available to the Engineer upon request and shall become the property of the Owner and delivered to the Engineer per phase with the record documents due not later than the date of acceptance of the Contract.

The Contractor shall furnish, at his expense, all horizontal and vertical control, all staking and layout of construction work called for on the plans and the Engineer and Owner shall not be responsible for such work. However, the Owner and Engineer reserve the right to check all lines, grades, and measurements with their appointed surveyor. Should the Owner’s surveyor detect errors in said lines, grades, and measurements, the Contractor shall pay for all subsequent surveying costs performed to verify correction of errors found in said lines, grades and measurements. Definition of an error shall be a discrepancy of 1/4-inch or more. In the case of a discrepancy between the technical specifications and this defined tolerance, this tolerance shall govern.

During the progress of the construction work, the Contractor will be required to furnish all of the surveying and stakeout incidental to the proper location by line and grade for each phase of the work. For paving and any other operation requiring extreme accuracy, the Contractor will restake with pins or other acceptable hubs located directly adjacent to the work at a spacing directed by the Engineer.
Any existing stakes, iron pins, survey monuments or other markers defining property lines which may be disturbed during construction shall be properly tied into fixed reference points before being disturbed and if directed by the Engineer, accurately reset in their proper position upon completion of the work at no cost to the Owner.

Maintain a surveyor's log of control and other survey Work. Make this log available for reference. Record deviations from required lines and levels, and advise the Engineer when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

Just prior to completion of the work, the Contractor shall reestablish, if necessary, and retie all control points as permanently as possible and to the satisfaction of the Engineer.

Should the Owner's surveyor detect errors in said lines, grades, and measurements, the Contractor shall pay for all subsequent surveying costs performed to verify correction of errors found in said lines, grades and measurements. Definition of an error shall be a discrepancy of 1/4-inch or more. In the case of a discrepancy between the technical specifications and this defined tolerance, this tolerance shall govern.

104-3.3 MINIMUM STANDARDS. Construction Staking and Layout includes but is not limited to (in the case of different standards elsewhere in the Contract Documents, the more stringent shall be required):

- Clearing and Grubbing perimeter staking.
- Rough Grade slope stakes at 25 linear feet.
- Drainage Swales slope stakes and flow line blue tops at 25 linear feet.
- Subgrade blue tops at 25 linear foot and 25-foot offset distance (max.) for the following section locations:
  a. Taxiways – minimum 5 per 25 linear feet
  b. Apron areas – 25 linear feet for asphalt pavement on each edge of paving lane
  c. Roadways – minimum 3 per 25 linear feet
- Base Course blue tops at 25 linear feet for asphalt pavement and on each concrete panel corner for concrete and 25 foot offset distance (max.) for the following section locations:
  a. Taxiways – minimum 5 per 25 linear feet
  b. Apron areas – Apron areas – 25 linear feet for asphalt pavement on each edge of paving lane
- Pavement areas:
  a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 25 linear feet for asphalt pavement and on each concrete panel corner for concrete
  b. Between Lifts at 25 linear feet for the following section locations:
    (1). Taxiways – each paving lane width
    (2). Apron areas – each paving lane width
  c. After finish paving operations at 25 linear feet for asphalt pavement on each edge of paving lane and on each concrete panel corner and center (5 shots per panel)
    (1). All paved areas – Edge of each paving lane prior to next paving lot
    d. Shoulder and safety area blue tops at 25 linear feet and at all break points with maximum of 25-foot offsets
- Fence lines at 25 linear feet.
- Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, VASI’s, PAPI’s, REIL’s, Wind
Cones, Distance Markers (signs), pull boxes and manholes.

- Drain lines, cut stakes and alignment on 25 linear feet, inlet and manholes.
- Painting and Striping layout (pinned with 1.5 inch PK nails) marked for paint Contractor. (All nails shall be removed after painting)
- Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet per pass (i.e. paving lane).

104-3.4 AS-BUILT SURVEYS. The Contractor shall be required to submit cross sectional data in a digital terrain model (DTM) format to the Engineer at monthly intervals prior to the Contractor submittal of the monthly application for payment so that the Engineer can verify the quantities of various earthwork and materials volumes for payment. All cross-sectional data provided at any time will be in AutoCAD Civil 3D 2016 or higher format only. No other formats will be accepted. If the data is submitted in another format other than AutoCAD, no earthwork or other materials volumes will be calculated and approved for payment. The earthwork shall include, but not be limited to, unclassified excavation, embankment, new or existing subbase courses, new or existing base courses, subgrade, topsoil, etc. The Contractor shall submit the surveying and stakeout data monthly prior to submittal of a monthly pay request to be reviewed by the Engineer for accuracy prior to approving the subsequent pay request.

104-3.5 AS-BUILT FIELD DATA. The Contractor shall keep at the construction site a complete set of full-size prints issued for construction. During construction, these prints shall be marked to show all approved deviations from the construction drawings in the color red. The drawings shall show the following information but not be limited thereto:

a. The location and description of any utility lines and other installations of any kind known to exist within the construction area.

b. Correct elevation or location of pavements, structures and utilities if any changes were made from the contract drawings.

c. Correct elevations if changes were made in site grading from the contract drawings.

d. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor.

e. Drainage structure rim and invert elevations.

f. Where contract drawings or specifications allow options, the option used shall be noted on the as-built drawings.

g. Any other change or modification from the original design.

Marking of the as-built plans shall occur continuously during construction to keep them up to date with all known changes. The resulting field-marked prints shall be referred to and marked as "As-Built Field Data". They shall be made available for inspection by the Engineer and Owner whenever requested during construction and shall be jointly inspected for accuracy and completeness by the Engineer and a Contractor representative prior to submission of each pay application. Failure to keep the As-Built Field Data current shall be sufficient justification to withhold an additional retained percentage from the progress payment.
The Contractor shall be required to submit the As-Built Field Data to the Engineer for review at the completion of construction and as a condition of final acceptance by the Owner. If the review by the Engineer of the as-built drawings reveals errors and/or omissions, they shall be returned to the Contractor for corrections.

**METHOD OF MEASUREMENT**

104-4.1 Project survey and stakeout will not be measured for payment.

**BASIS OF PAYMENT**

104-5.1 No separate payment will be made for project survey and stakeout. Cost will be incidental to project.

**END OF ITEM P-104**
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ITEM P-120
DEMOLITION

DESCRIPTION

120-1.1 This item shall consist of the demolishing and removal of structures, foundations, building slabs, footings, storm drainage pipe and structures, utilities, and all other miscellaneous items as indicated on the Plans and in the manner indicated by the instructions supplied on the drawings and in these Specifications or as directed by the Engineer. All structures to be removed shall be removed to their full depth. This item includes all associated tasks required to dispose of the facilities intended for demolition, protect existing facilities which are to remain, and regrading in areas disturbed by the demolition activities.

CONSTRUCTION METHODS

120-2.1 General. Remove and dispose of the materials from the following:
   (1) those structures, or portions of structures, shown in the Plans to be removed;
   (2) those structures, or portions of structures, found within the limits of the area to be cleared and grubbed, and directed by the Engineer to be removed;
   (3) those structures, or portion of structures, which are necessary to be removed in order to construct new structures; and
   (4) other appurtenances or obstructions which may be designated in the Contract Documents.

120-2.2 Permits and Licenses. Obtain all necessary permits and licenses for performing the work and furnish a copy of same to the Engineer prior to commencing the work. Comply with the requirements of the permits. Perform demolition and removal in compliance with applicable laws and ordinances and in such a manner as to avoid hazard to persons and property and to prevent spread of dust and flying particles.

120-2.3 Utility Services. Provide written notices to utility companies or local authorities furnishing gas, water, electrical, telephone or sewer service to remove any equipment owned by utility or authority in structures to be demolished and to remove, disconnect, cap or plug their services to facilitate demolition. Submit copies of said notices to the Owner's Authorized Representative (O.A.R.). The Contractor shall not demolish or remove any existing work that would result in an interruption of any utility service until that service is relocated either by the Contractor or by others as noted on the Plans or directed by the Engineer.

120-2.4 Safety. Provide and maintain temporary safety barriers and other safety and security devices as necessary to protect the public and project personnel from injury due to demolition work. Protect from damage all existing work, equipment and improvements that are to remain and restore all damage caused by the demolition work to the satisfaction of the O.A.R. Excavation and trenching required for demo within the aircraft operations area (AOA) shall be prominently marked in accordance with FAA Advisory Circular 150/5370-2F, Operational Safety on Airports during Construction, and the project Construction Safety and Phasing Plan (CSPP).

120-2.5 Salvage. Remove equipment, devices and materials to be salvaged with the minimum amount of damage and store on the site as directed by the Owner. Documentation of the existing condition of all salvaged items shall be provided to the O.A.R. prior to any salvage efforts by the Contractor. Store salvaged equipment and materials which can be damaged by the weather in a weather tight building or area on site. Remove from the site any salvaged items that are
determined to be of no value to the Owner after removal and Owner's inspection. Airport reserves the first right of refusal on any items that are removed from their existing locations during demolition. Any items not kept by the Owner will become the property of the Contractor and will need to be removed from the site at the Contractor's expense.

120-2.6 Backfill. All excavations caused by pavement, drainage, structural, and foundation removal shall be backfilled with embankment or other suitable material to smooth finished grade or, in areas designated for new construction, finished subgrade elevation. Placement, compaction and grading of this material shall be considered a subsidiary obligation to demolition of the respective item. Backfill shall be performed in accordance with the requirements of P-152.

120-2.7 Plugging Pipe. When existing pipe culverts or utilities are to be permanently placed out of service, fill them with flowable fill that is non-excavatable, contains a minimum 350 pounds per cubic yard of cementitious material and meets the requirements of FDOT Section 121 and/or plug them with masonry plugs as shown in the Plans. Install masonry plugs that are a minimum of 8 inches in thickness, in accordance with FDOT Design Standards, Index 280. When proposed or existing pipe culverts or utilities are to be temporarily placed out of service, plug them with prefabricated plugs as shown in the Plans. Install prefabricated plugs in accordance with the manufacturer's recommendations. Do not fill or construct masonry plugs in any pipe culvert intended for current or future service. The location and limits of utility pipe to be removed or abandoned will be determined by the contractor's means and methods of providing temporary utility relocations in order to keep the existing terminal building operational at all times.

120-2.8 Cleanup. Remove on a daily basis all debris created within facilities which are to remain in service during the modification work, and broom clean the floor at the end of each day's operation.

After demolition, clean site to a condition satisfactory to the Engineer, free from demolished materials, rubbish or debris. Grade site to meet adjacent contours and provide flow for surface drainage. Sod or seed site once graded in accordance with project requirements.

Return all interrupted utility services to their pre-demolition states and disconnect temporary services, unless otherwise specified. Repair or restore any damage done to existing facilities, which are to remain to the satisfaction of the Owner.

METHOD OF MEASUREMENT

120-3.1 The length of pipe to be removed shall be measured in linear feet (meters) of pipe removed 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 fittings shall be included as incidental in the footage as typical pipe sections in the pipe being measured.

120-3.2 Misc. structures to be removed shall be measured by each unit removed.

BASIS OF PAYMENT

120-4.1 Payment will be made at the contract unit price per linear foot (meter) for each kind of pipe of the type and size designated for removal and at the contract unit price per unit for each
structure removal. These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and removal of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

120-4.2 Payment will be made at the contract unit price for each structure to be removed. These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and removal of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- Item P-120-1 Remove 24-Inch RCP – per Linear Foot
- Item P-120-2 Remove Utility Piping – per Linear Foot
- Item P-120-3 Remove Stormwater Structure – per Each
- Item P-120-4 Remove Light Pole – per Each
- Item P-120-5 Relocate Existing Fuel Tank – per Lump Sum

END OF ITEM P-120
ITEM P-125
PAVEMENT REMOVAL AND MILLING

DESCRIPTION

125-1.1 This section consists of the breaking up and removal of pavements of all types including base courses, as well as milling asphalt in areas indicated on the plans or as directed by the Engineer.

125-1.2 The Contractor shall accomplish the demolition and disposal in accordance with all local, state, and federal regulations and laws in regard to hazardous or toxic materials and shall obtain any permits required to accomplish the work.

125-1.3 Perform the work covered by this section including but not limited to milling and re-milling the pavement at locations, depths, widths, and typical sections indicated in the contract documents, cleaning the milled surface, loading, hauling, stockpiling the milled material for use in recycled asphalt mixtures, and disposal of any excess milled material.

125-1.4 Milled material becomes the property of the Contractor to be disposed of off Airport property or for use in recycled pavements if allowable.

CONSTRUCTION METHODS

125-2.1. Asphaltic and concrete pavement to be removed shall be cut to the full depth of the pavement material around the perimeter of the area to be removed. The pavement shall be removed in such a manner that the joint for each layer of pavement replacement is offset from the joint in the preceding layer as directed by the plans. The removal of all base material associated with the pavement shall be included in the price of the pavement to be removed.

125-2.2. Existing pavement called for saw cutting in the plans shall be saw cut along neat lines, and to the depth indicated on the plans and typical sections. A power saw approved by the Engineer shall be used for cutting pavement. After the existing pavement has been saw cut through, the Contractor may use pry bars, pneumatic tools or other methods approved by the Engineer, to pry loose the existing pavement from that pavement which is to remain. A pavement breaker, under the supervision of the Engineer, may be used to break up the pavement to be removed after the pavement has been completely saw cut through and completely free from the pavement to remain. Care shall be taken not to disturb or damage saw cuts of existing pavement and curbs to remain. Any existing pavements and curbs not indicated to be removed that are damaged by the Contractor's operations, shall be repaired to the satisfaction of the Engineer.

125-2.3. For milling, use a self-propelled unit capable of removing the existing asphalt pavement to the depths, widths, and typical sections shown in the contract. Use milling machines designed and built exclusively for pavement milling operations and with sufficient power, traction, and stability to accurately maintain depth of cut and slope. Provide a milling machine capable of maintaining a depth of cut and cross slope that will achieve the results specified in the Contract Documents.

125-2.4. If it becomes evident after starting milling that the milling machine cannot consistently produce the specified results, the Engineer will reject the milling machine for further use.
125-2.5. Use milling machines equipped with an electronic grade control system that will automatically control the longitudinal profile and cross slope of the milled pavement surface through the use of a mobile grade reference(s), an erected string line(s), joint matching shoe(s), slope control systems, or other methods or combination of approved methods. Use an erected fixed string line when required by the contract; otherwise, use a mobile grade reference system capable of averaging the existing grade or pavement profile over a minimum 30 foot distance or by non-contacting laser or sonar type ski systems with at least four referencing stations mounted on the milling machine at a minimum length of 24 feet.

125-2.6. Coordinate the position of the grade control system such that the grade sensor is at the approximate midpoint of the mobile reference system. Use a machine capable of leaving a uniform surface suitable for handling traffic without excessive damage to the underlying pavement structure. Use a milling machine and other loading equipment capable of loading milled material to be used in other parts of the work without excessive segregation.

125-2.7. If present, remove any existing raised reflective pavement markers prior to milling.

125-2.8. Provide additional equipment necessary to satisfactorily remove the pavement in the area of manholes, water valves, curb and gutter, and other obstructions.

125-2.9. Equip the milling equipment with a means of effectively limiting the amount of dust escaping from the removal operation in accordance with local, State, and Federal air pollution control laws and regulations.

125-2.10. Mill the existing pavement in a manner that will restore the pavement surface to a uniform longitudinal profile and cross section in accordance with typical sections shown in the plans. Where indicated in the contract, remove pavement to a specified depth and produce a specified cross slope. Mill intersections and other irregular areas as indicated in the contract.

125-2.11. The Contractor may elect to make multiple cuts to achieve the required depth of cut or cross slope required by the plans.

125-2.12. Establish the longitudinal profile of the milled surface by a mobile string line on the side of the cut nearest the centerline of the road. Establish the cross slope of the milled surface by an automatic cross slope control mechanism or by a second skid sensing device located on the opposite edge of the cut. The Engineer may waive the requirement for automatic grade and cross slope controls where conditions warrant.

125-2.13. Operate the milling equipment in such a manner as to prevent damage to the underlying pavement structure, utilities, drainage facilities, curb and gutter, paved surfaces outside the milled area, and any other appurtenances. Produce milled pavement surfaces that are reasonably smooth and free of excessive scarification marks, gouges, ridges, continuous grooves, or other damage. Repair any leveling or patching required as a result of negligence by the Contractor with hot asphalt plant mix at no cost to the Owner and in a manner acceptable to the Engineer. Coordinate the adjustment of manholes, meter boxes, and valve boxes with the milling operation.

125-2.14. Thoroughly clean the milled pavement surface of all loose aggregate particles, dust, and other objectionable material. Disposing or wasting of oversize pieces of pavement or loose aggregate material will not be permitted within the right of way.
125-2.15. Conduct pavement removal operations in a manner that effectively minimizes the amount of dust being emitted. The Engineer may require pre-wetting of the pavement. Plan and conduct the operation so it is safe for persons and property adjacent to the work including the traveling public.

125-2.16. Pavement removal shall consist of breaking up and removal of bituminous pavements and base courses as indicated on the plans. The horizontal limits of these removals shall be surveyed and saw cut prior to removal, unless otherwise agreed to by the Engineer.

125-2.17. The Contractor shall protect and maintain existing utilities/facilities to remain. Any existing utilities/facilities not indicated to be removed that are damaged by the Contractor's operations, shall be repaired to the satisfaction of the Engineer.

**METHOD OF MEASUREMENT**

125-3.1 Milled asphalt pavement to be paid for will be the actual number of square yards of pavement surface that has been milled in accordance with the requirements of this Section. In measuring this quantity, the length will be the actual length milled, measured along the pavement surface. The width will be the width required by the plans or directed, measured along the pavement surface. Where the depth of milling varies from the required depth, no adjustment in the contract unit price will be made.

125-3.2 Full depth asphalt removal to be paid for will be the actual number of square yards of pavement surface that has been removed including base materials in accordance with the requirements of this Section. In measuring this quantity, the length will be the actual length removed, measured along the pavement surface. The width will be the width required by the plans or directed, measured along the pavement surface.

125-3.3 Miscellaneous concrete pavement removal to be paid for will be the actual number of square yards of pavement surface that has been removed including base materials in accordance with the requirements of this Section. In measuring this quantity, the length will be the actual length removed, measured along the pavement surface. The width will be the width required by the plans or directed, measured along the pavement surface.

**BASIS OF PAYMENT**

125-4.1 Payment shall be made at the contract unit price for asphalt pavement milling, 2-inch nominal depth, as outlined in the plans. This price shall be full compensation for removing and disposal of asphalt pavement and all labor, equipment and incidentals necessary to complete the item.

125-4.2 Payment shall be made at the contract unit price for full depth asphalt pavement removal as outlined in the plans. This price shall be full compensation for removing and disposal of asphalt pavement and all labor, equipment and incidentals necessary to complete the item.

125-4.3 Payment shall be made at the contract unit price for miscellaneous concrete pavement removal as outlined in the plans. This price shall be full compensation for removing and disposal of asphalt pavement and all labor, equipment and incidentals necessary to complete the item.
Payment will be made under:

Item P-125-1  Asphalt Milling, 2-Inch Nominal Depth – per Square Yard

END OF ITEM P-125
ITEM P-151
CLEARING AND GRUBBING

DESCRIPTION

151-1.1 This item shall consist of *stripping* clearing or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the plans or as required by the Engineer.

a. **Clearing** shall consist of the cutting and removal of all trees, stumps, brush, logs, hedges, the removal of fences and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required.

b. **Clearing and grubbing** shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the Engineer is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, and the disposal from the project of all spoil materials resulting from clearing and grubbing. *Clearing and grubbing shall also include the removal of all miscellaneous trees, concrete sidewalk, and concrete curb and gutter as shown in the plans.*

c. **Stripping** shall consist of the removal of existing turf where trees and brush are not present.

CONSTRUCTION METHODS

151-2.1 **General.** The areas denoted on the plans to be *stripping* clearing or cleared and grubbed shall be staked on the ground by the Contractor for review by the Engineer. The clearing and grubbing shall be done at a satisfactory distance in advance of the grading operations.

*Perform stripping or clearing and grubbing as most appropriate within the following areas:*

   (a) All areas where excavation is to be done, including borrow pits, lateral ditches, right-of-way ditches, etc.

   (b) All areas where roadway or parking embankments will be constructed.

   (c) All areas where airfield pavements will be constructed.

   (d) All areas where building construction will occur.

   (e) All areas where structures will be constructed, including pipe culverts

   (f) Other areas as designated in the plans or required by the Engineer.

All spoil materials removed by clearing or by clearing and grubbing shall be disposed of outside the Airport's limits at the Contractor's responsibility, except when otherwise directed by the Engineer. As far as practicable, waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed in accordance with requirements for formation of embankments. Any broken concrete or masonry that cannot be used in construction and all other materials not considered suitable for use elsewhere, shall be disposed of by the Contractor. In no case shall any discarded materials be left in windrows or piles adjacent to or within the airport limits. The manner and location of disposal of materials shall be subject to the approval of the Engineer and shall not
create an unsightly or objectionable view. When the Contractor is required to locate a disposal area outside the airport property limits, the Contractor shall obtain and file with the Engineer permission in writing from the property owner for the use of private property for this purpose.

Blasting shall not be allowed.

The removal of existing structure and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a telephone or telegraph pole, pipeline, conduit, sewer, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall advise the Engineer who will notify the proper local authority or owner to secure prompt action.

151-2.2 Clearing. The Contractor shall clear the staked or indicated area of all objectionable materials. Trees unavoidably falling outside the specified clearing limits must be cut up, removed, and disposed of in a satisfactory manner. To minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared. The Contractor shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut flush with the original ground surface. The grubbing of stumps and roots will not be required.

Fences shall be removed and disposed of as directed by the Engineer. Fence wire shall be neatly rolled and the wire and posts stored on the airport if they are to be used again, or stored at a location designated by the Engineer if the fence is to remain the property of a local owner or authority.

151-2.3 Clearing and Grubbing. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials shall be removed, except where embankments exceeding 3-1/2 feet (105 cm) in depth will be constructed outside of paved areas. For embankments constructed outside of paved or building areas, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off flush with the original ground and allowed to remain. Tap roots and other projections over 1-1/2 inches (38 mm) in diameter shall be grubbed out to a depth of at least 18 inches (0.5 m) below the finished subgrade or slope elevation.

Clearing and grubbing shall also include the removal of all miscellaneous trees, concrete sidewalk, and concrete curb and gutter as shown in the plans. Any buildings and miscellaneous structures that are shown on the plans to be removed shall be demolished or removed, and all materials shall be disposed of by removal from the site. The cost of removal is incidental to this item. The remaining or existing foundations, wells, cesspools, and like structures shall be destroyed by breaking down the materials of which the foundations, wells, cesspools, etc., are built to a depth at least 2 feet (60 cm) below the existing surrounding ground. Any broken concrete, blocks, or other objectionable material that cannot be used in backfill shall be removed and disposed of at the Contractor’s expense. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes under embankment areas remaining after the grubbing operation shall have the sides of the holes flattened to facilitate filling with acceptable material and compacting as required in Item P-152. The same procedure shall be applied to all holes remaining after grubbing in areas where the depth of holes exceeds the depth of the proposed excavation.

151-2.4 Stripping. Stripping shall be conducted in the locations shown on the plans where maintained turf exists. Stripping shall consist of blading the area indicated on the plans to a depth
as required to remove all organic material present. In order to minimize embankment required do not remove more material than as required to remove organics. Strippings shall be stockpiled separately from suitable excavation and used as topsoil beneath new sod. Strippings used as topsoil shall be spread to a depth of 4-inches. All excess strippings shall be legally disposed of off-site.

151-2.5 Trees to Remain. As an exception to the above provisions, where required by the plans or so directed by the Engineer, trim, protect, and leave standing desirable trees within the project area. Trim branches of trees extending over the area occupied by the roadway or parking lot as directed, to give a clear height of 16 feet above pavement.

151-2.6 Protection of Property Remaining in Place. Protect and do not displace property obstructions which are to remain in place, such as buildings, sewers, drains, water or gas pipes, conduits, poles, walls, posts, bridges, etc.

151-2.7 Demolition of Pavements and Structures. Pavements and structures called for removal on the plans or as found in the project area shall be demolished in accordance with specifications P-120 and P-125. Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the contract. The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

151-2.8 Hazardous Materials. If hazardous materials are encountered during clearing, Contractor shall cease operations immediately in the area and notify the Engineer. Handle, transport and dispose of hazardous materials in accordance with all Local, State and Federal requirements. Accept responsibility for the collection, sampling, classification, packaging, labeling, accumulation time, storage, manifesting, transportation, treatment and disposal of hazardous waste, both solid and liquid. Separate all solid and liquid waste and collect all liquids used at hygiene stations and handle as hazardous materials/waste. Obtain written approval from the Engineer for all hazardous materials/waste stabilization methods before implementation. Obtain an EPA/FDEP Hazardous Waste Identification Number (EPA/FDEP ID Number) before transporting and/or disposal of any hazardous materials/waste. Transport all hazardous materials/waste in accordance with applicable 40 CFR 263 Standards. Provide a copy of all completed Hazardous Materials/Waste manifest/bills of lading to the Engineer within 21 days of each shipment. Furnish two copies of Certification of Compliance from the firm actually removing and disposing of the hazardous materials/waste stipulating, the hazardous materials/waste has been handled, transported and disposed of in accordance with this Specification. The Certification of Compliance shall be attested to by a person having legal authority to bind the company.

METHOD OF MEASUREMENT

151-3.1 The quantities of clearing or clearing and grubbing as shown by the limits on the plans or as ordered by the Engineer shall be the number of square yards (square meters) or fractions thereof, of land specifically cleared or cleared and grubbed.
151-3.2 When isolated trees are designated for clearing, the quantities of trees, as determined in accordance with ranges of butt diameter size, measured at a point 18 in (45 cm) above the ground level at the tree, shall be paid for according to the schedule of sizes as follows:

The number of trees:
- From 0 to 2-1/2 feet (75 cm), butt diameter
- From 2-1/2 to 5 feet (75 to 150 cm), butt diameter
- For 5 feet (150 cm) or more, butt diameter

151-3.2 The quantities of stripping as shown by the limits on the plans or as ordered by the Engineer shall be the number of acres of land specifically stripped.

151-3.3 The quantities of fence removal as shown by the limits on the plans or as ordered by the Engineer shall be the number of linear feet, of fence removal including poles, meshing, concrete anchors, etc.

151-3.2 The quantities of rip rap removal as shown by the limits on the plans or as ordered by the Engineer shall be the number of square yards of rip rap removed.

BASIS OF PAYMENT

151-4.1 Payment shall be made at the contract unit price per acre for stripping clearing. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.2 Payment shall be made at the contract unit price per acre for clearing and grubbing. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.3 Payment shall be made at the contract unit price per acre (square meter) for clearing isolated trees. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.4 Payment shall be made at the contract unit price per linear foot for fence removal including poles, meshing, concrete anchors, etc. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

151-4.2 Payment shall be made at the contract unit price per square yard for rip rap removal. 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-151-4.1 Clearing—per Acre (square meter)
- Item P-151-4.2 Clearing and Grubbing—per Acre (square meter)
- Item P-151-4.3 Clearing for isolated trees:
  - From 0 to 2-1/2 feet (75 cm), butt diameter, per tree
  - From 2-1/2 to 5 feet (75 to 150 cm), butt diameter, per tree
  - For 5 feet (150 cm) or more, butt diameter, per tree
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END OF ITEM P-151
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, roadways, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

The Engineer has made available for reference the results of a geotechnical investigation for Contractor information. The Engineer makes no guarantees about the information presented in the report. The Contractor should not assume data in the report is a guarantee of depth, extent, or character of material present. The Contractor is responsible for verifying information as required for construction. In the event that recommendations in the report contradict with the plans and/or specifications then the plans and/or specifications shall govern.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

b. Rock excavation. Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard (0.4 m³) will be classified as “rock excavation.”

c. Muck excavation. Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.

d. Drainage excavation. Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.

e. Borrow excavation. Borrow excavation 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. Borrow 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. All removed pavement, debris, rock and any material containing vegetable or organic matter, such as muck, peat, organic silt, roots, stumps, or sod shall be considered unsuitable for use in embankment construction and shall be legally disposed of off of airport property. Material, suitable for topsoil may be used on the embankment slope when approved by the Engineer.
152-1.4 Subgrade Compaction. Subgrade preparation and compaction shall consist of compacting the subgrade under paved areas to meet the compaction outlined within this specification and depicted on the typical plan sections. This item will include the excavation/removal and re-compaction of the in-place subgrade material that does not meet the in-place density requirements indicated in the typical sections. All work and excavation required in order to achieve the density requirements shall be included.

152-1.5 Embankment Material.

a. Use of Excavated Material. The Contractor shall assume responsibility for determining the suitability of excavated material for use on the Project in accordance with the applicable Contract Documents. Consider the sequence of work and maintenance of traffic phasing in the determination of the availability of this material.

b. General Requirements for Embankment Materials. All materials used for embankment on this project shall meet FDOT Type S material requirements as specified in FDOT Index Section 505. For depths greater than 4ft from bottom of base, FDOT Type S or P can be used. Construct embankments shall not contain muck, stumps, roots, brush, vegetable matter, rubbish, reinforcement bar or other material that does not compact into a suitable and enduring roadbed. Remove all waste material designated as undesirable. Use material in embankment construction in accordance with plan details or as the Engineer directs. Complete the embankment using maximum particle sizes (in any dimension) as follows:

For other than airfields:
- In top 12 inches: 3-1/2 inches (in any dimension).
- 12 to 24 inches: 6 inches (in any dimension).
- In the depth below 24 inches: not to exceed 12 inches (in any dimension) or the compacted thickness of the layer being placed, whichever is less.

For airfields:
- In top 24 inches: 3-1/2 inches (in any dimension).
- 24 to 36 inches: 6 inches (in any dimension).
- In the depth below 36 inches: not to exceed 12 inches (in any dimension) or the compacted thickness of the layer being placed, whichever is less. Spread all material so that the larger particles are separated from each other to minimize voids between them during compaction.

c. Strength Requirements of Suitable Material. For material not requiring LBR stabilization, the material shall have a minimum 4-day soaked CBR of 15 in accordance with ASTM D1883 when compacted to 100% and optimum moisture content of ASTM D1557. Materials shall be tested at a rate of 1 test for every 2,500 cubic yards. These tests shall be conducted by the Contractor’s Quality Control Laboratory. For materials requiring LBR stabilization, stabilize material in accordance with Section 160.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be completely stripped or cleared and grubbed in accordance with Item P-151. The
suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be legally disposed of off airport property 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 If 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. The Engineer will immediately investigate the Contractor’s finding and the Owner will direct the Contractor to either resume his/her operations or to suspend operations as directed. 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. Should the Owner order suspension of the Contractor’s operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract modification (change order or supplemental agreement).

If the Contractor’s operations encounter or expose any abnormal condition indicating the presence of contaminated materials, Contractor shall cease operations immediately in the vicinity and notify the Engineer. The presence of tanks or barrels; discolored earth, metal, wood, ground water, etc.; visible fumes; abnormal odors; excessively hot earth; smoke; or other conditions that appear abnormal may indicate the presence of contaminated materials and must be treated with extreme caution. Make every effort to minimize the spread of contamination into uncontaminated areas. Immediately provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Ensure provisions adhere to all applicable laws, rules or regulations covering potentially hazardous conditions and will be in a manner commensurate with the gravity of the conditions.

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 inches (100 mm), 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 staked out the work and provided obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface to the Engineer for review and approval. 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 legally disposed of off airport property.

When the volume of the excavation exceeds that required to construct the embankments to the
grades indicated, the excess shall be used to grade the areas of ultimate development or 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 offsite 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 inches (300 mm) 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 (per cubic meter) for unclassified excavation. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans.

A material that is high in moisture content and which yields under proof rolling does not necessarily classify as unsuitable material. Proof rolling shall be as indicated in paragraph 152-2.2f Proof Rolling.

Undercutting of suitable but wet material does not constitute unsuitable material. The Contractor is required to manipulate and dry the material unless the material is classified as unsuitable. If the material is classified as unsuitable material, then the Contractor shall remove the material to the depth directed by the Engineer.

The backfill of undercut areas shall not begin until the volume of the excavation is determined by cross sections or other means acceptable to the Engineer. The backfill shall be accomplished in the same manner as other embankment called out in this section with regard to the thickness and compaction requirements.

The backfill material may consist of unclassified excavation acceptable to the Engineer. All backfill shall be in accordance with paragraph 152-1.5 b.

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 *may* 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 feet (60 cm) 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 as indicated in the plans.* shall be compacted to a depth of 36 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D1557. The natural in-place densities shall be not lower than the densities indicated in the typical section. If the in-place densities are lower, the soil shall be removed and re-compacted to a density not lower than the densities indicated in the typical sections. The material to be compacted shall be within ±2% of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils).

*In order to achieve uniform moisture content throughout the layer, wetting or drying of the material and manipulation shall be required when necessary. Should the material be too wet to permit proper compaction or rolling, all work on all of the affected portions of the embankment shall be delayed until the material has dried to the required moisture content. Sprinkling of dry material to obtain the proper moisture content shall be done with approved equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required water shall be available at all times.*

The in-place field density shall be determined in accordance with 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 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches (150 mm) of the subgrade. The finished grading operations, conforming to the typical cross-section, shall be completed and maintained at least 1,000 feet (300 m) ahead of the paving operations or as directed by the Engineer. *The in-place densities for depths greater than 12 inches shall be checked by digging test pits at 12 inch depth increments or less at a rate not lower of that required for acceptance. The minimum size of the test pits is 4 feet by 4 feet with a flat bottom.*

*Tests shall be completed by the Contractor Quality Control Test Firm. Copies of all tests shall be provided to the Engineer for review. The Owner reserves the right to obtain independent Quality Assurance testing for verification if so desired.*

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 *under airfield pavements (including taxiways, aircraft parking apron, and other airfield areas) and the building footprint* shall be proof rolled with a 20 ton (18.1 metric ton) Tandem axle Dual Wheel
Dump Truck loaded to the legal limit with tires inflated to 80/100/150 psi (0.551 MPa/0.689 MPa/1.034 MPa) in the presence of the Engineer’s Representative. Apply a minimum of 4 coverages, or as specified by the Engineer, to all paved airfield pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Careful observations should be made during proof rolling to help identify any areas of soft yielding soils that may require over excavation and replacement.

g. Disposal of Paving Materials. Unless otherwise noted, Contractor shall take ownership of paving materials, such as paving brick, asphalt block, concrete slab, sidewalk, curb and gutter, etc., excavated in the removal of existing pavements or earthwork, and dispose of them outside airport property. If the materials are to remain the property of the Owner, place them in neat piles as directed. Existing limerock base that is removed may be incorporated in the stabilized portion of the subgrade. If the construction sequence will allow, incorporate all existing limerock base into the project as allowed by the Contract Documents.

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 measurements and tests 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 to permit accurate measurements, 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. Where an embankment is to be constructed to a height of 4 feet (1.2 m) or less, all sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (150 mm) and shall then be compacted as indicated in paragraph 152-2.6. The minimum compaction shall be 90 % of the maximum dry density as determined by ASTM D1557 unless noted in the plans. When the height of fill is greater than 4 feet (1.2 m), sod not required to be removed shall be thoroughly disked and recompacted to the density of the surrounding ground before construction of embankment.
Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (300 mm) and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.6 Formation of embankments. Embankments shall be formed in successive horizontal layers of not more than 8 inches (200 mm) in loose depth for the full width of the cross-section, unless otherwise approved by the Engineer.

*If the Contractor desires to place embankment in lifts greater than 8 inches, the Contractor may submit a plan and construct a test section to demonstrate that the specified compaction can be achieved with thicker lifts using the equipment that is proposed to be used for the construction of the embankment. The maximum allowable compacted lift thickness in all cases shall be 12 inches.*

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 ±2% 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. *Should the material be too wet to permit proper compaction or rolling, all work on all of the affected portions of the embankment shall be delayed until the material has dried to the required moisture content. Sprinkling of dry material to obtain the proper moisture content shall be done with approved equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required water shall be available at all times.* Samples of all embankment materials for conformance with the specification. 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 based on the required materials.

Rolling operations shall be continued until the embankment is compacted to not less than the density indicated in the plans. 95% 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 6 inches and to a density of not less than 100 percent of the maximum density as determined by ASTM D1557. *Where trenches for widening strips are not of sufficient width to permit the use of standard compaction equipment, perform compaction using vibratory rollers, trench rollers, or other type compaction equipment approved by the Engineer.*

On all areas outside of the pavement areas (*i.e. areas to be turfed*), no compaction will be required.
on the top 4 inches (100 mm).

The in-place field density shall be determined in accordance with ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Contractor’s laboratory shall perform all density tests in the Engineer’s presence and provide the test results upon completion to the Engineer for acceptance.

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. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay, or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer. 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 inches (100 mm) in their greatest dimensions will not be allowed in the top 6 inches (150 mm) of the subgrade. Rock fill 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 feet (60 cm) 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 feet (1.2 m) below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in 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 re-compact.
No stabilized subgrade, subbase, base, or surface course shall be placed on the subgrade until the unstabilized 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. *Shape the surface of the earthwork to conform to the lines, grades, and cross-sections shown in the Plans.* 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-foot (3.7-m) straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch (12 mm), or shall not be more than 0.05 feet (15 mm) 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 (3 mm) 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.

*Contractor is responsible for accounting for thickness of turfing and topsoil when forming embankments. If embankment is placed to an elevation where turf restricts pavement from draining as required by the plans, the Contractor shall be responsible for correcting the embankment elevations.*

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 at approved locations. Stockpiles shall not be placed within 400 feet of runway pavement or 65.5 feet of taxiway pavement and shall not be placed on areas that subsequently will require any excavation or embankment fill. 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 (cubic meter) 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 (cubic meter) for “topsoiling,” as provided in Item T-905.

152-2.11 Building Foundations. *The proposed terminal building embankment should be completed in accordance with additional requirements in the Structural drawings.*

152-2.12 Quality Control and Acceptance Testing. *Tests for suitability and acceptance of*
embankments and recompaction shall be completed by the Contractor Quality Control Test Firm. Copies of all tests shall be provided to the Engineer for review. The Owner reserves the right to obtain independent Quality Assurance testing for verification if so desired.

Before initial production, a comparison test shall be completed with the Quality Control and Quality Assurance Test Firms to correlate gauges. When comparing the computed dry density of one nuclear gauge to a second gauge, ensure that the difference between the two computed dry densities does not exceed 2 lb/ft$^3$ between gauges from the same manufacturer, and 3 lb/ft$^3$ between gauges from different manufacturers. Repair or replace any Quality Control gauge that does not compare favorably with the Quality Assurance gauge. Both nuclear gauges shall be calibrated in accordance with ASTM D6938. Calibration checks shall be conducted once per week.

Contractor shall determine the modified Proctor maximum density and optimum moisture content by sampling and testing the material in accordance with ASTM D 1557. Perform soil classification tests on the sample collected in accordance with ASTM D421. Classify soils in accordance with ASTM D 2487 or AASHTO M 145 in order to determine compliance with embankment utilization requirements. Conduct one soil classification test for every lot used for acceptance. If the material does not meet the soil classification required, the material shall be removed and replaced with compliance material. In addition, the Contractor may sample the material during the construction of the stockpile for quality control.

Embankment shall be accepted for density on a lot basis. A lot will consist of one day’s production when production does not exceed 2,400 square yards (2,000 square meters) per 8-inch lift (or approved lift thickness as determined in the test section). A lot will consist of one-half day’s production when a day’s production consists of between 2,400 and 4,800 square yards (2,000 and 4,000 square meters) per 8-inch lift (or approved lift thickness).

Each lot shall be divided into two equal sublots. Two tests shall be made for each sublot. Sampling locations will be determined by the Quality Control Lab on a random basis in accordance with statistical procedures contained in ASTM D 3665. Soil samples shall be collected at the sampling locations and a composite sample prepared for moisture-density testing in accordance to ASTM D 1557 for the lot. Each lot will be accepted for density when the average field density of the two sublots is at least the density as specified in the typical sections. No individual test shall be less than 2 percentage points below the density target for the lot (i.e. not less than 98% for 100% compaction). The in-place field density shall be determined in accordance with ASTM D 6938 with verification by ASTM D 1556. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached. If the subgrade in excavation areas meet the density requirements as specified in the typical sections, no further subgrade preparation will be required.

Subgrade in excavation areas shall be tested and accepted for density on a lot basis. A lot will consist of up to 2,400 square yards. Each lot shall be divided into two equal sublots. Two tests shall be made for each sublot. Sampling locations will be determined by the Quality Control Lab on a random basis in accordance with statistical procedures contained in ASTM D 3665. Soil samples shall be collected at the sampling locations and a composite sample prepared for moisture-density testing in accordance to ASTM D 1557 for the lot. Each lot will be accepted for density when the average field density of the two sublots is at least the density as specified in the typical sections.
152-2.13 **Maintenance and Protection of Work.** While construction is in progress, maintain adequate drainage at all times. Maintain a shoulder at least 3 feet wide adjacent to all pavement or base construction in order to provide support for the edges. Maintain all earthwork construction throughout the life of the Contract, and take all reasonable precautions to prevent loss of material due to the action of wind or water. Repair any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work. Maintain all channels excavated as a part of the Contract work against natural shoaling or other encroachments to the lines, grades, and cross-sections shown in the Plans, until final acceptance of the project.

**METHOD OF MEASUREMENT**

152-3.1 The quantity of excavation to be paid for shall be the number of cubic yards (cubic meters) measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

152-3.2 Borrow material shall be paid for on the basis of the number of cubic yards (cubic meters) measured in its original position at the borrow pit.

152-3.3 Stockpiled material shall be paid for on the basis of the number of cubic yards (cubic meters) measured in the stockpiled position.

152-3.4 For payment specified by the cubic yard (cubic meter), 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 Engineer by means of field cross-sections taken randomly at intervals not exceeding 500 linear feet (150 m). Final survey data furnished by the Contractor shall contain all appropriate break points, high points, and low points.

**BASIS OF PAYMENT**

152-4.1 “Unclassified excavation” “Unsuitable Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter) for the removal and disposal of any materials found on site to not be suitable for embankment construction. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.2 “Rock Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.3 “Muck Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.4 “Drainage Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment,
tools, and incidentals necessary to complete the item.

152-4.5 “Borrow Excavation” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item including all placement and compaction of embankments. (Onsite) shall be defined as existing stockpile areas on Airport property. (Offsite) shall be additional material that must be imported from off Airport property.

152-4.6 “Stockpiled Material” payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

152-4.7 For embankment in place, payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- **Item P-152-4.1** Unclassified Excavation – per Cubic Yard (cubic meter)
- **Item P-152-4.2** Rock Excavation – per cubic yard (cubic meter)
- **Item P-152-4.3** Muck Excavation – per Cubic Yard (cubic meter)
- **Item P-152-4.4** Drainage Excavation – per cubic yard (cubic meter)
- **Item P-152-4.5** Borrow Excavation – per cubic yard (cubic meter)
- **Item P-152-4.6** Stockpiled material – per cubic yard (cubic meter)
- **Item P-152-1** Unsuitable Excavation – per cubic yard
- **Item P-152-2** Borrow Excavation (Onsite) – per cubic yard
- **Item P-152-3** Borrow Excavation (Offsite) – per cubic yard

**TESTING REQUIREMENTS**

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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
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.

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 item T-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 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 and FDOT Standard Index 102, Current Edition. Silt fence shall be approved by the Engineer before installing on the project site.

156-2.6 OTHER. All other materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project. Temporary erosion control measures in accordance with FDOT Standard Index 102, Current Edition, will also be acceptable.
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 Contractor shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

The Contractor is required to prepare for and obtain a National Pollutant Discharge Elimination Permit System (NPDES) from the Florida Department of Environmental Protection (FDEP) including the required Stormwater Pollution Prevention Plan (SWPPP). Contractor may use temporary erosion control measures shown in the contract drawings as a guidance for minimum requirements. However, the Contractor will be responsible for any additional measures necessary to satisfy permitting requirements. Contractor to ensure the erosion control plan includes procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills.

Prepare the erosion control plan in accordance with the planned sequence of operations and present in a format acceptable to the Engineer. The erosion control plan shall describe, but not be limited to, the following items or activities:

a. For each phase of construction operations or activities, supply:
   (1) Locations of all erosion control devices
   (2) Types of all erosion control devices
   (3) Estimated time erosion control devices will be in operation
   (4) Monitoring schedules for maintenance of erosion control devices
   (5) Methods of maintaining erosion control devices
   (6) Containment or removal methods for pollutants or hazardous wastes

b. The name and telephone number of the person responsible for monitoring and maintaining the erosion control devices.

156-3.2 SCHEDULE. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work, as are applicable 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.

Do not begin any soil disturbing activities until Engineer approval of the Contractor’s erosion control plan, including required signed certification statements. Any soil disturbing activities performed without the required signed documents or certification statements may be considered a violation of the FDEP permit.

156-3.3 CONSTRUCTION DETAILS. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the 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 or required by an Agency Having Jurisdiction. 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. Provide routine maintenance of permanent and temporary erosion and sediment control features, until the project is complete and accepted. If reconstruction of such erosion and sediment control features is necessary due to the Contractor’s negligence or carelessness or, in the case of temporary erosion and sediment control features, failure by the Contractor to install permanent erosion control features as scheduled, the Contractor shall replace such erosion control features.

Inspect all erosion and sediment control features at least once every seven calendar days and within 24 hours of the end of a storm of 0.50 inches or greater. Maintain all erosion control features as required in the SWPPP, Contractor’s Erosion Control Plan and as specified in the FDEP permit. 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 inches (41 cm) and a maximum of 34 inches (86 cm) above the ground surface. Posts shall be set no more than 10 feet (3 m) on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary,
the fabric shall be spliced at a support post with a minimum 12-inch (300-mm) overlap and securely sealed. A trench shall be excavated approximately 4 inches (100 mm) deep by 4 inches (100 mm) wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working conditions until permanent erosion control is established. Silt fence shall be removed upon approval of the Engineer.

**156-3.5 LIMITATION OF EXPOSURE OF ERODIBLE EARTH.** The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations, and to direct the Contractor to 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.

**156-3.6 INCORPORATION OF EROSION AND SEDIMENT CONTROL FEATURES:** Incorporate permanent erosion control features into the project at the earliest practical time. Use temporary erosion and sediment control features found in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (E&SC Manual) to correct conditions that develop during construction which were not foreseen at the time of design, to control erosion and sediment prior to the time it is practical to construct permanent control features, or to provide immediate temporary control of erosion and sediment that develops during normal construction operations, which are not associated with permanent erosion control features on the project. (An electronic version of the E&SC Manual can be found at the following URL: [http://www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/FLErosionSedimentManual.pdf](http://www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/FLErosionSedimentManual.pdf))

Install all sediment control devices in a timely manner to ensure the control of sediment and the protection of lakes, streams, gulf or ocean waters, or any wetlands associated therewith and to any adjacent property outside the right-of-way as required. At sites where exposure to such sensitive areas is prevalent, complete the installation of any sediment control device prior to the commencement of any earthwork.

Schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposure of uncompleted construction to the elements is as short as practicable. Schedule and perform clearing and grubbing so that grading operations can follow immediately thereafter. Schedule and perform grading operations so that permanent erosion control features can follow immediately thereafter if conditions on the project permit.

Use temporary erosion, sediment and water pollution control features found in the E&SC Manual. These features consist of, but are not limited to, temporary turf, rolled erosion control products, sediment containment systems, runoff control structures, sediment barriers, inlet protection systems, silt fences, turbidity barriers, and chemical treatment. For design details for some of these items, refer to the Design Standards and E&SC Manual.

**156-3.7 PROTECTION DURING SUSPENSION OF CONTRACT TIME.** If it is necessary to suspend the construction operations for any appreciable length of time, shape the top of the earthwork in such a manner to permit runoff of rainwater, and construct earth berms along the top edges of embankments to intercept runoff water. Provide temporary slope drains to carry runoff from cuts and embankments that are in the vicinity of rivers, streams, canals, lakes, and
impoundments. Locate slope drains at intervals of approximately 500 feet, and stabilize them by paving or by covering with waterproof materials. Should such preventive measures fail, immediately take such other action as necessary to effectively prevent erosion and siltation. The Engineer may direct the Contractor to perform, during such suspensions of operations, any other erosion and sediment control work deemed necessary.

156-3.8 REMOVAL OF EROSION CONTROL DEVICES. In general, remove or incorporate into the soil any temporary erosion control features existing at the time of construction of the permanent erosion control features in an area of the project in such a manner that no detrimental effect will result. The Engineer may direct that temporary features be left in place.

METHOD OF MEASUREMENT

156-4.1 Temporary air and water pollution, soil erosion, and siltation control will be paid for on a lump sum basis; hence, no separate measurement will be made. Temporary erosion and pollution control work required which is not attributed to the Contractor’s negligence, carelessness, or failure to install permanent controls will be performed as scheduled or ordered by the Engineer. Completed and accepted work will be measured as follows:

a. Temporary seeding and mulching will be measured by the square yard (square meter).

b. Temporary slope drains will be measured by the linear foot (meter).

c. Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard (cubic meter) of excavation performed, including necessary cleaning of sediment basins, and the cubic yard (cubic meter) of embankment placed at the direction of the Engineer, in excess of plan lines and elevations.

d. All fertilizing will be measured by the ton (kilogram).

e. Installation and removal of silt fence will be measured by the linear foot (metre) (lump sum).

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 with costs included in the contract prices bid for the items to which they apply.

BASIS OF PAYMENT

156-5.1 Accepted quantities of temporary air and 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-156-5.1a—Temporary seeding and mulching—per square yard (square meter)

Item P-156-5.2b—Temporary slope drains—per linear foot (meter)
Item P-156-5.3c Temporarily benches, dikes, dams and sediment basins - per cubic yard (cubic meter)

Item P-156-5.4d Fertilizing per ton (kilogram)

Item P-156-1 Temporary Pollution, Erosion, and Siltation Control – per Lump Sum

Payment shall be made on a prorated basis with each pay application based on the percentage of Project work completed.

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
ITEM P-620
RUNWAY AND TAXIWAY MARKING

DESCRIPTION

620-1.1 This item shall consist of the 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 620-2.2a. Paint shall be furnished in **Yellow – 33538 or 33655; White – 37925; Red – 31136; or Black – 37038** in accordance with Federal Standard No. 595. **Waterborne black paint shall be used to outline a border at least 6-inches wide around all markings of other colors.**

   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.

620-2.3 Reflective media. Glass beads shall meet the requirements of **Fed. Spec. TT-B-1325D, Type III.** 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.

<table>
<thead>
<tr>
<th>Paint Color</th>
<th>Glass Beads, Type III</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>See Table 1</td>
</tr>
<tr>
<td>Yellow</td>
<td>See Table 1</td>
</tr>
<tr>
<td>Red</td>
<td>Not used</td>
</tr>
<tr>
<td>Black</td>
<td>Not used</td>
</tr>
</tbody>
</table>

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 (7 °C) and rising and the pavement surface temperature is at least 5 °F (2.7 °C) above the dew point or meets the manufacturer’s recommendations. Markings shall not be applied when the pavement temperature is greater than 130 °F (55 °C). 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 sandblasting 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. Sandblasting or high-pressure water shall be used to remove curing materials.

At least 24 hours prior to remarking existing markings, existing markings must be removed such that 75% of the existing markings are removed. After removal, the surface shall be cleaned of all residue or debris either with sweeping or blowing with compressed air or both.

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. All yellow and white markings shall receive glass beads.

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 (12 mm) in 50 ft (15 m) and marking dimensions and spacings shall be within the following tolerances:

<table>
<thead>
<tr>
<th>Dimension and Spacing</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 in (910 mm) or less</td>
<td>±1/2 in (12 mm)</td>
</tr>
<tr>
<td>greater than 36 in to 6 ft (910 mm to 1.85 m)</td>
<td>± 1 in (25 mm)</td>
</tr>
<tr>
<td>greater than 6 ft to 60 ft (1.85 m to 18.3 m)</td>
<td>± 2 in (50 mm)</td>
</tr>
<tr>
<td>greater than 60 ft (18.3 m)</td>
<td>± 3 in (76 mm)</td>
</tr>
</tbody>
</table>
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. If airport operations require markings to be painted prior to the waiting period, the paint may be applied in a temporary light coat application as directed by the Engineer. Temporary paint shall be applied at a 50% application rate. Glass beads are not required for temporary markings. The final markings and glass beads should occur after the waiting period is complete.

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 (19 liters) of paint and application of 35 lbs (15.9 kg) of Type I/50lbs (22.7 kg) 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 (19 liters) of waterborne paint shall cover no more than 575 square feet (53.4 m²).

### Table 1. Application Rates for Paint and Glass Beads

<table>
<thead>
<tr>
<th>Paint Type</th>
<th>Paint Sq ft per gallon, ft²/gal. (Sq m per liter, m²/l)</th>
<th>Glass Beads, Type I, Gradation A</th>
<th>Glass Beads, Type III</th>
<th>Glass Beads, Type IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterborne Type I or II</td>
<td>115 ft²/gal. max (2.8 m²/l)</td>
<td>N/A</td>
<td>10 lb./gal. min (1.2 kg/l)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made.

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 ft (5 m) and a free span between supporting wheels of no less than 18 ft (5.5 m). The heater must emit thermal radiation to the marking material in such a manner that the difference in temperature of 2 in (50 mm) wide linear segments in the direction of heater travel must be within 5 percent 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 ºF (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-VOC sealer with a maximum applied viscosity of 250 centiPoise (ASTM D 2393) 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. *Any excess paint outside the limits of markings, including splatters, splashes, spillage, or drippings of paint shall be removed. Any existing markings to remain that area damaged from Contractor's operations shall be repainted at the Contractor’s Expense.*

620-3.9 Marking removal. Any marking to be removed shall be removed by either water blasting, sand blasting, or grinding. No chemical paint removers or metal bead blasting will be allowed. Contractor shall perform test section of removal method in order to ensure pavement damage doesn't occur during removal process. Test section and method of marking removal shall be approved by the Engineer prior to proceeding with full pavement removal operations.

620-3.10 Temporary Markings. All work associated with temporary markings shall be included under the pay item for Safety, Security, and Traffic Control. No additional compensation shall be made for temporary markings.

### METHOD OF MEASUREMENT

620-4.1 The quantity of runway apron 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. *Associated surface preparation is incidental to the pavement markings.*

620-4.2 Removal of pavement markings shall be considered incidental to project work and will not be measured separately.

### BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract price per square foot for runway apron and taxiway painting and associated surface preparation. 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** Runway and Apron and Taxiway Painting with Reflective Beads - per Square Foot
- **Item P-620-2** Apron and Taxiway Painting without Reflective Beads (Black) - per Square Foot

**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 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
ITEM F-162
CHAIN-LINK FENCE

DESCRIPTION

162-1.1 This item shall consist of furnishing and erecting a chain-link fence and gates in accordance with these specifications and 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-inch (50 mm) mesh and shall meet the requirements of ASTM A392, Class 2.

162-2.2 Barbed wire. Barbed wire shall be 2-3-strand 12-1/2 gauge zinc-coated wire with 4-point barbs and shall conform to the requirements of ASTM A121, Class 3, Chain Link Fence Grade.

162-2.3 Posts, rails, and braces. Line posts, rails, and braces shall conform to the requirements of ASTM F1043 or ASTM F1083 as follows:

- Galvanized tubular steel pipe shall conform to the requirements of Group IA, (Schedule 40) coatings conforming to Type A, or Group IC (High Strength Pipe), External coating Type B, and internal coating Type B or D.

- Roll Formed Steel Shapes (C-Sections) shall conform to the requirements of Group IIA, and be galvanized in accordance with the requirements of ASTM F1043, Type A.

- 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.

- Aluminum Pipe shall conform to the requirements of Group IB.

- Aluminum Shapes shall conform to the requirements of Group IIB.

- Vinyl or polyester coated steel shall conform to the requirements of ASTM F1043, Paragraph 7.3, Optional Supplemental Color Coating.

- Composite posts shall conform to the strength requirements of ASTM F1043 or ASTM F1083. The strength loss of composite posts shall not exceed 10% when subjected to 3,600 hours of exposure to light and water in accordance with ASTM G152, ASTM G153, ASTM G154, and ASTM G155.

- Posts, rails, and braces furnished for use in conjunction with aluminum alloy fabric shall be aluminum alloy or composite.

- Posts, rails, and braces, with the exception of galvanized steel conforming to F 1043 or ASTM F 1083, Group 1A, Type A, or aluminum alloy, shall demonstrate the ability to withstand testing in salt spray in accordance with ASTM B 117 as follows:
NAPLES MUNICIPAL AIRPORT
TECHNICAL SPECIFICATIONS
ARFF BUILDING REPLACEMENT
ITEM F-162 CHAIN-LINK FENCE

- 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 Fed. Spec. 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 Fed. Spec. RR-F-191/4.

162-6 Miscellaneous fittings and hardware. Miscellaneous steel fittings and hardware for use with zinc-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A153. Barbed wire support arms shall withstand a load of 250 pounds (113 kg) applied vertically to the outermost end of the arm.

162-2.7 Concrete. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 3,000 psi. 2500 psi (17 240 kPa).

162-2.8 Marking. Each roll of fabric shall carry a tag showing the kind of base metal (steel, aluminum, or aluminum alloy number), kind of coating, the gauge of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal (steel, aluminum, or aluminum alloy number), and kind of coating.

CONSTRUCTION METHODS

162-3.1 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 feet (1.5 m) 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 7 days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned footing depth, a hole 2 inches (50
mm) larger than the greatest dimension of the posts shall be drilled to a depth of 12 inches (300 mm). After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required footing depth. No extra compensation shall be made for rock excavation.

**162-3.3 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 in the manner 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 inch (25 mm) or more than 4 inches (100 mm) from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched thereon to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 inches (150 mm) or less.

**162-3.6 Electrical grounds.** Electrical grounds shall be constructed at 250-foot (150 m) intervals. The ground shall be accomplished with a copper clad rod 8 feet (240 cm) long and a minimum of 5/8 inch (15 mm) in diameter driven vertically until the top is 6 inches (150 mm) below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. Installation of ground rods shall not constitute a pay item and shall be considered incidental to fence construction. The Contractor shall comply with FAA-STD-019, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment, Paragraph 4.2.3.8, Lightning Protection for Fences and Gates, when fencing is adjacent to FAA facilities.

**162-3.7 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 sodded per T-904.

**METHOD OF MEASUREMENT**

**162-4.1** Chain-link fence will be measured for payment by the linear foot (meter). Measurement will be along the top of the fence from center to center of end posts, excluding the length occupied by gate openings. **Concrete apron shall be incidental to installation of the fence and will not be measured separately.**

**162-4.2** Gates, including vehicle and associated pedestrian gate, and associated equipment & infrastructure including but not limited to card reader, blue box, camera, associated light pole including foundation, concrete island, bollards, wiring, etc. and will be measured as complete units.
BASIS OF PAYMENT

162-5.1 Payment for chain-link fence will be made at the contract unit price per linear foot (meter).

162-5.2 Payment for each AOA vehicle and associated pedestrian gate, and associated equipment & infrastructure including but not limited to card reader, blue box, camera, concrete island, associated light pole and foundation, bollards, wiring, etc. will be made at the contract unit price for each gate.

The price shall be full compensation for furnishing all materials for gates and associated equipment & infrastructure, and for all preparation, erection, and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item F-162-5.1 Chain-Link Fence – per Linear Foot
Item F-162-5.2a Vehicle Gate – per each
Item F-162-5.2b Pedestrian Gates – per each

Item F-162-1 Temporary AOA Chain-Link Fence – per Linear Foot
Item F-162-2 7-foot High Chain-Link Fence with Barbed Wire – per Linear Foot
Item F-162-3 24-foot Cantilevered Vehicle Gate – per each
Item F-162-4 Relocate Existing ATCT Access Gate – per Lump Sum
Item F-162-5 Bollard – per each

MATERIAL REQUIREMENTS

ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A491 Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
<table>
<thead>
<tr>
<th>ASTM Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A572</td>
<td>Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel</td>
</tr>
<tr>
<td>ASTM A653</td>
<td>Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process</td>
</tr>
<tr>
<td>ASTM A824</td>
<td>Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence</td>
</tr>
<tr>
<td>ASTM A1011</td>
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FAA-STD-019  Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment

END OF ITEM F-162
ITEM L-100
LIGHTING AND ELECTRICAL WORK

DESCRIPTION

100-1.1 GENERAL. The airfield electrical work to be done under this contract shall include the furnishing of all supervision, labor, materials, tools, equipment, and incidentals necessary to provide new airfield lighting systems and other electrical work as shown on the drawings.

Work shall be in accordance with Federal Aviation Administration Advisory Circular No. 150-5370-10, Standards for Specifying Construction of Airports, as modified herein, other FAA Advisory Circulars and Specifications referred to herein, and other requirements as specified herein. All FAA Advisory Circulars shall be as specified, or the latest adopted edition if revised.

The electrical work shall comply with latest adopted editions, codes and standards applicable to this Contract as follows:

- ANSI C2, National Electrical Safety Code
- ASTM, American Society of Testing and Materials
- FAA, Advisory Circulars
- FAA, Orders
- NEC, National Electrical Code (NFPA No. 70)
- NECA, Standard for Installation
- NEMA, Standard for Materials and Products
- NFPA No. 101, Life Safety Code
- UL, Underwriters Laboratories

All work shall be performed in strict accordance with these contract specifications, drawings, and any instructions that may be furnished by the Engineer during execution of the work to aid in interpretation of said drawings and specifications. Installation details and material and equipment specifications shall be in conformance with all applicable FAA Advisory Circulars. The contractor shall furnish written proof of FAA approval on all equipment covered by FAA specifications as part of the submittal package. The specifications shall be kept on file at the Contractor’s airport construction office.

100-1.2 RELATED DOCUMENTS. The general provisions of the contract apply to the work specified in the project documents including but not limited to drawings, specifications, FAA Orders and Advisory Circulars, documents referenced herein or written clarifications issued in the course of construction (such as Submittal Comments, Addenda, RFIs, Construction Changed Directives, and Design Clarifications, etc.)

100-1.3 FAA FACILITIES AND CABLE RUNS. The Contractor is hereby advised that the construction limits of the project may include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the prosecution of the project work, shall comply with the following:

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

b. The Contractor shall notify the appropriate FAA Airway Facilities Point-of Contact seven (7) calendar days prior to commencement of construction activities in order to permit
sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If prosecution of the project work requires a facility outage, the Contractor shall contact the appropriate FAA Point-of-Contact a minimum of 48 hours prior to the time of the required outage.

d. If prosecution of the project work results in damages to existing FAA equipment or cables, the Contractor shall repair the damaged item in conformance with FAA Airway Facilities' standards to the satisfaction of the appropriate FAA Point-of-Contact.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 48 hours prior to the time the cable work commences. The FAA reserves the right to have an FAA Airway Facilities representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA Airway Facilities’ specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA Airway Facilities restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA Airway Facilities, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

100-1.4 SUMMARY OF WORK. The work to be performed includes furnishing all labor, supplies, materials, equipment, transportation, and services required to augment, move, install, and complete electrical work as specified herein and as shown on the contract drawings.

The work includes, but is not limited to, the following:

(1) Compliance with the terms and conditions directly identified or implied within all project documents (front end documents, technical specifications, drawings, clarifications, etc.)

(2) Maintain in operation, all existing field electrical facilities and circuits while this improvement work is in progress, including protection of airport personnel, aircraft, and vehicles.

(3) Provide underground cable (L-824) and cable terminations (L-823) in accordance with plans and specifications, at the locations shown on the plans. Test all circuit loops before and after installation of new cables to verify that no damage was caused by the Contractor.

(4) Coordination of all utility locate requests, dig permits, public utility marking and coordination “one call” utilities marking prior to excavation work.

(5) Provide preconstruction investigation, verification, and testing to establish knowledge of the existing system. Contractor shall provide all required test equipment, excavation, potholing, personnel required to complete this phase of the work.

(6) Retain the services of a Licensed Land Surveyor in the State of Florida as required to locate new installations, identify safety areas, and document existing conditions.
(7) Installation of new duct bank (direct earth buried and concrete encased) and associated handholes.

(8) Provide and install taxiway edge lighting.

(9) Demolition, removal, and disposal from the site, existing equipment that is no longer required under this project.

(10) Ground all equipment, enclosures, regulators, and conduits installed under this contract as shown in the plans, or as called for by the authority having jurisdiction.

(11) Adjust finished grade as necessary to accommodate existing and new airfield equipment after notification to the Engineer.

(12) Other items required to complete the installation of the referenced systems that is required to meet FAA requirements. The omission of expressed reference to any parts necessary for or reasonably incidental to the complete installation shall not be construed as releasing the Contractor from furnishing and installing such parts. The required parts and installation shall be provided at no extra cost to the Owner.

(13) All items of general work that is required in completing the above referenced scope, such as excavation, cutting, patching, etc. shall be included in this Contract as a component of the work they support.

100-1.5 WORK REQUIREMENTS. The general work requirements are as follows:

a. All installations of electrical infrastructure (conduit, structures, grounding, etc.), lighting equipment & fixtures, cabling, terminations, controls, power distribution equipment, testing and verification shall be performed by licensed electricians with a demonstrated knowledge of the stated standards of this project.

b. All work shall be scheduled to minimize the impact and duration of shutdowns. The Contractor shall keep the Owner informed of scheduled work which will affect existing equipment and operations. Minimum three (3) working days advance notice shall be given to the Owner and approval received for any disconnections or shutdowns. All shutdowns shall then be coordinated with the Owner.

c. Existing lighting systems shall be operational at the end of each working day at least 30 minutes prior to nightfall except as permitted by the Engineer. Poor weather visibility or an emergency situation may require postponement of a scheduled shutdown or reactivation of the system during an ongoing shutdown on any given day.

d. The plans are diagrammatic. Locations of equipment to be installed are shown in the plans, but the actual installation will depend on field conditions and the nature of the equipment furnished. When conditions which will adversely affect the installation become apparent, the Owner and Engineer shall be notified in writing.

e. Locations and quantities of materials shown on the plans and in these specifications are approximate and shall be used for estimating purposes only. Actual locations and quantities of materials shall be reviewed by the contractor through field investigation. No
additional payment will be made for discrepancies between estimated quantities and locations of materials as shown in these documents and the actual field conditions.

f. The Contractor shall at all times keep the construction areas free from accumulations of waste material and rubbish, and prior to completion of work shall remove any rubbish from and about the project, as well as all tools, reels, equipment, and materials not a part of the project. Upon completion of the construction, the Contractor shall leave the work and premises in a clean, neat, and safe condition satisfactory to the Owner. The Contractor shall be responsible for the proper performance in all respects, in whole and in part, of the electrical equipment and for the mechanical installation of electrical equipment until acceptance of the entire work by the Owner.

g. At the end of every working shift, all tools, equipment and material shall be removed from the active airfield and returned to the approved project staging areas to prevent any accidental contact with aircraft and to comply with FAA regulations governing runway and taxiway safety areas and object free areas.

h. The Contractor shall be responsible for the proper performance in all respects, in whole and in part, of the electrical equipment and for the mechanical installation of electrical equipment until acceptance of the entire work by the Engineer.

100-1.6 SUBMITTALS. In addition to the requirements stated in other portions of the project documents, for electrical products, the Contractor shall include wiring diagrams, cut sheets, project specific shop drawings, etc. of all equipment used on the job, including, but not limited to the items listed in these specifications and in the format described herein.

**ALL PRODUCT SUBMITTALS SHALL BE PROJECT SPECIFIC**

"GENERIC" PROJECT DATA OR MARKETING MATERIALS ARE NOT ACCEPTABLE.

100-1.6.1 Submittal Format. The submittal shall be an electronic pdf format consisting of manufacturer's brochures and cut sheets describing the equipment and materials the Contractor plans to incorporate in the work. These sheets shall be sequentially ordered by specification number with the reference specification number shown on each sheet. Each cut sheet shall show the complete specification or drawing number which the item must comply with. The submitted cut sheet shall clearly show the equipment manufacturer's name, catalog number, size, type, and/or rating as required by these specifications or drawings by underlining or circling the information. Marked catalog sheets must be included. A submittal index is not acceptable and will not replace marked catalog sheets.

The conformance to FAA criteria or other standards where called for shall be clearly indicated for each item. Each sheet shall be dedicated to one piece of equipment, and all sheets shall be sequentially numbered. One manufacturer's cut sheets shall be submitted for each item. Each submittal shall show on the cover the complete job name and number, date, contractor's name, and the words: "Electrical Submittal."

Samples of conduit, duct, fittings, cables, tapes, etc., may be requested by the Engineer or required in these specifications at no additional cost to the project. In the event any items of material or equipment contained in the list fail to comply with specification requirements, such items will be rejected. All rejected items shall be amended to meet the criteria and then resubmitted for approval by the Engineer.
Substitutions of materials referenced herein is allowed when "or equal" is referenced. Any substitution shall be included in the submittal package.

100-1.7 DRAWINGS. The plans, which constitute an integral part of this Contract, shall serve as the working drawings. They indicate the extent and general layout of the lighting and signing system, arrangement of circuits, cables through ducts, connections to existing circuit cables, and other work. Field verification of scale dimensions is required to determine actual locations, distances, and levels. The Contractor shall research in the field the exact routing and identification of all circuits, which extend through, serve, or are affected by the area where work is to commence. No extra compensation will be allowed because of minor differences between work shown on the drawings and field conditions. The Contractor shall check the plans and specifications and, if any portion of the work is found to be omitted, unclear, or in error, the Contractor shall immediately notify the Engineer. The directions of the Engineer shall be followed, and the work completed accordingly.

a. The design drawings may be utilized in the preparation of the shop or working drawings showing the permanent construction, as described in L-100.

b. The plans and specifications are complementary and what is called for in either one shall be as binding as if called for in both.

c. Where a disagreement exists between the plans and specifications, or between plan sheets, the item or arrangements of better quality, greater quantity, or higher cost shall be included in the bid.

d. Any discrepancies between the drawings, Advisory Circulars, and field conditions must be resolved with the Engineer before proceeding. All agreements shall be verified in writing.

e. Conditions identified in the project drawings covering existing electrical, drainage, communications and other site utilities installed underground are based on record documentation from previous projects. These conditions were not independently verified during design and as a result the Owner and Engineer cannot guarantee the accuracy of this information. The contractor shall be responsible for investigating and identifying existing conditions and systems within the work area and shall modify his means and methods to accommodate these conditions.

f. "Record" drawings covering equipment installed under previous contracts and which relate to this contract will be available for the Contractor. The airport cannot, however, guarantee the accuracy of these drawings. Those conditions that will affect the work under this Contract should be verified prior to any design/fabrication/installation commitment. All printing and handling costs associated with reproduction of record documents shall be the responsibility of the Contractor.

g. Detail dimensions shown on the plans are approximate and shall be field verified before construction. All discrepancies shall be submitted to the Owner in writing before construction begins.

100-1.8 RECORD DRAWINGS. The Contractor shall mark up a set of red line prints to show the as-built conditions which differ from the contract plans. The mark-up set shall be kept at the Contractor’s site office and not used for construction. Any changes or deviations shall be recorded in red within one week. The Contractor shall furnish the work drawing set and one newly printed
as-built drawing set to the Engineer upon completion. This work shall be completed and accepted by the Engineer before approval of final payment.

100-1.9 MAINTENANCE AND OPERATING INSTRUCTIONS. The Contractor shall provide the Owner with complete instructions in the proper care and operation of the equipment installed under this contract. This is considered as part of the final inspection, and final acceptance will not be given until the Owner’s representative is knowledgeable about the system.

The Contractor shall also collect and assemble into each of two (2) hardcover books the installation details, instructions, parts list, source of local supply, schematics of actual equipment and operations, and directions supplied by the manufacturer with all equipment. If cut sheets are included showing various models and features of the equipment supplied, the specific model and features shall be clearly indicated to show only the options of the equipment that are actually provided and installed. Final acceptance of the work will not be made until such data has been presented complete to the Engineer for transmission to the Owner.

The Contractor shall install all equipment according to the manufacturers’ instructions and as shown in the drawings and specifications. The Contractor shall notify the engineer in writing if any discrepancies exist between the aforementioned documents. Work shall be suspended until resolved and approval to proceed has been granted by the Engineer.

100-1.10 TRAINING. The Contractor shall provide the airport maintenance staff training on the operation and maintenance for all material provided under the Contractor’s scope of work.

100-1.11 SAFETY RULES. The Electrical Safety Rules shall be observed and complied with in every detail, and any violation thereof shall be cause for immediate termination of the individuals in violation. The contractor at a minimum shall comply with all applicable OSHA regulations applicable to the work begin performed. In the event of a safety rule violation, the Owner may elect to supersede the Contractor's authority to continue with the work until all safety violations and procedures are reviewed and corrected. Any cost incurred by the Owner due to safety violations shall be recovered by the Owner from the Contractor. If violations are of sufficient prevent the Contractor from completing the work, the Owner may take recourse to the contractors Surety for completion of the Project.

Project specific electrical safety rules and procedure followed by the contractors shall meet or exceed the following airfield circuit safety rules:

a. The Contractor shall be responsible for conforming with the safety requirements of Appendix 1 to AC 150-5370-2 latest edition.

b. The Contractor shall be responsible for conforming with all safety requirements set forth by OSHA

c. All Electrical circuits shall be de-energized before work is accomplished thereon.

d. Electrical circuits shall be considered deenergized only when one of the following conditions exists:

(1) Switches connecting subject circuit to the electrical supply are observed in the OPEN position, with an air break, and safety-tagged (padlocked) in the OPEN position;

(2) Electrically operated switches are visibly OPEN, blocked or racked in the OPEN...
position, and safety-tagged OPEN;

(3) Whenever the supply circuit break is not visible and clearly identified, the circuit shall be grounded. The ground connection shall be safety-tagged before work thereon, when the ground connection is not within sight of the work area.

(4) The contractor shall verify that no voltage or current is present on circuits with a calibrated multi-meter rated for the voltage system that it is testing.

e. Use of Red Safety Tags:

(1) Safety tags shall be filled out and connected to any switch or equipment opened for protection of personnel working upon circuits connected thereto.

(2) Safety tags shall be removed only by the employee who placed the tag, or by another employee designated in writing by the employee who placed the tag, to remove the tag. Removal of a safety tag placed by an employee not available at the time of need to remove, may be authorized by the Electrical Superintendent or his designated representative, only after carefully checking that the circuit is ready to be energized.

(3) Equipment with a safety tag attached shall not be operated, and connections with a safety tag attached shall not be changed.

(4) Insulated cables, operated at over 300 volts to ground shall be handled, when energized, only with rubber gloves tested to 15,000 volts.

(5) Insulated cables, which have been in operation, shall be cut only with a grounded cable shears, or shall be grounded by driving a grounded sharp tool through the shielding and the conductors before cutting.

(6) All personnel working around energized electrical equipment operating at over 600 volts shall wear standard insulated, nonconducting hard hats, and shall wear no garments with metallic zipper fasteners.

(7) Ladders used in any electrical work shall be of wood or fiberglass construction.

(8) The Contractor shall designate a supervisor for all contract personnel and operations, said supervisor shall be on the job wherever contract operations are in progress.

100-1.12 CONTRACTOR QUALIFICATIONS. Work shall be performed by a contractor licensed in the State of Florida, with a minimum of five years of electrical contracting experience in airfield electrical systems.

EQUIPMENT AND MATERIALS

100-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified by independent laboratory testing to be in compliance with the specification.

b. 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. Whenever Underwriters Laboratories has a published standard applicable to the equipment furnished for this contract, the furnished equipment shall be listed by UL. Material and systems assembled “in compliance with”,
“in accordance with” or other description that implies compliance with a standard or certification shall not be acceptable.

c. Materials and equipment shall be as specified herein. When materials are used that are not specifically designated herein, they shall be in accordance with the best industry standards and practices for equipment of this type. All components and parts shall be suitable for operation under the environmental conditions specified herein. Metal parts shall be either inherently corrosion-resistant or shall be suitably protected to resist corrosion or oxidation during extended service life.

100-2.2 HARDWARE CORROSION PROTECTION. In order to prevent deterioration due to corrosion, all bolts, nuts, studs, washers, pins, terminals, springs, hangers and similar fastenings and fittings shall be of an approved corrosion-resisting material and/or be treated in an approved manner to render it adequately resistant to corrosion. All hardware such as cap screws, set screws, tap bolts, nuts, washers, etc., shall be of stainless steel type 304, SAE Grade 2, if they are used outdoors unless specified otherwise on the plans. Brass, bronze, or hot-dip galvanized ferrous hardware (per ASTM, Specification A1530) will be considered for indoor use. All bolts, screws, nuts, etc., shall be coated with a layer of "Neverseize" or "Anti-seize" compound.

All ferrous metalwork shall be galvanized. If any galvanizing is damaged, the metal work shall be refinshed by cleaning, treating with one coat of wash primer conforming to Federal (military) Specification MIL-P-152388, and shall be given one shop coat of zinc-rich base paint (zinc dust paint) conforming to Federal Specification TT-P-641F Type II, immediately when the wash primer is dry.

100-2.3 PARTS RATING. All parts shall be of adequate rating for the application and shall not be operated above the parts manufacturer's recommended ratings and shall comply with FAA standards for rating and performance.

100-2.4 ENVIRONMENTAL CONDITIONS. The equipment installed outdoors shall be designated for continuous outdoor operation under the following environmental conditions unless specified elsewhere:

   a. Temperature: Any ambient temperature from minus 20°F to plus 120°F.
   b. Altitude: 5224 MSL.
   c. Humidity: Up to 100 percent.
   d. Sand and Dust: Exposure to windblown sand and dust particles.
   e. Wind: Operation at wind velocities up to 120 miles per hour.
   f. Water: Components provided for underground installation, direct buried or installed in underground housing, shall be suitable for continuous operation, continuously or intermittently submerged in water.

100-2.5 SALVAGE. Except as otherwise specified or indicated on the drawings, all electrical materials and equipment to be salvaged and shall be offered to the Airport. The airport shall have the right of first refusal on all demolished equipment and material. Should the Airport choose to not accept the demolished equipment, it shall become the property of the Contractor. All wastes
such as removed asphalt, concrete, excess excavation, conductors, concrete structures, damaged base cans, lighting fixtures, signs, cable, etc., shall become property of the Contractor and shall be recycled or disposed of offsite by the Contractor unless otherwise indicated by the Owner.

100-2.6 TESTING. All materials and finishes are subject to testing. Material inspection and testing, and strength tests on the concrete will be performed by the Contractor. The testing of electrical equipment shall conform to the description of the individual specification sections.

100-2.7 INSPECTION. Provide for electrical inspections by the authority having jurisdiction. No work shall be concealed or enclosed until after inspections. If work is concealed or enclosed without inspection and approval, the Contractor shall be responsible for all expense and work required to open and restore the concealed area in addition to all required modifications.

Contractor shall provide certified copies of mill reports identifying the material specification requirements for all reinforcing bar and castings. Copies of order bills and test reports shall be furnished as requested.

Work or materials not conforming to the project documents as determined by the Owner, Resident Inspector, Engineer, FAA or Authority Having Jurisdiction shall be immediately corrected or removed and reinstalled. The cost of remediation of sub-standard products or construction shall be the responsibility of the contractors and shall not be paid for by the Owner.

100-2.8 WARRANTY. The Contractor shall provide a written 1-year warranty guaranteeing all work installed under this contract. It shall cover all parts and labor against defective parts, corrosion or workmanship necessary to repair or bring into proper operation any equipment including, but not limited to, isolation transformers, signs, lamps, edge lights, lighting fixtures, conduit system, and junction boxes. The warranty shall start upon the acceptance of all work as accepted by the Engineer. Final payment will be withheld until receipt of the warranty by the Engineer.

CONSTRUCTION METHODS

100-3.1 GENERAL. Installation shall be performed by experienced and skilled persons to obtain only the best workmanship. All equipment shall be set square and true with construction. The work shall be under constant supervision by the Contractor, or by an authorized and competent foreman and licensed electrician with five years’ experience, until completion.

100-3.2 INSTALLATION METHOD. The methods used for the installation of electrical system and equipment shall conform to the National Electric Contractors Association (NECA) published "Standard of Installation" except where specifically specified or shown otherwise, and to the requirements of the National Electrical Code (NEC) and its revisions as adopted by the local agency having jurisdiction.

All electrical materials, construction methods, and installation shall be in accordance with applicable Federal Aviation Administration's Advisory Circulars including amendments, the National Electrical Code, and the American National Standards Institute Standard C2.

The workmanship shall be first class and in accordance with the highest standards of the electrical industry and consistent with the best commercial practices. The installations and adjustments
shall be by licensed electricians.

The responsibility for the correct and satisfactory installation and operation of all materials and equipment required herein shall rest with the Contractor. Before any equipment is ordered, a complete schedule of materials and detailed shop drawings covering all items of equipment and brochures of the materials proposed for installation shall be submitted for approval by the Engineer as described in Item L-100.

**100-3.3 SITE CONDITIONS.** At least seven (7) working days prior to commencing construction operations in an area which may involve underground utility facilities, the Contractor shall notify the Engineer of each underground utility facility shown on the plans. When coordinated with the Engineer, the FAA will assist the Contractor in locating existing FAA cables.

The existence of any known buried wires, conduits, junction boxes, ducts, or other facilities is shown in a general way only. It will be the duty of the Contractor, with the help of airport personnel, to visit the site and make exact determination of the existence and location of any facilities prior to commencing any work. It is understood that the Contractor will be responsible for making the exact determination of the location and condition of such facilities and any costs shall be paid for locating services by the Contractor. The Contractor shall obtain from the Engineer copies of contract drawings from previous construction projects, examine these drawings, and verify at the site the location of all below grade utilities in the vicinity of work performed under this Contract.

All items damaged by the Contractor's workers or equipment shall be replaced immediately at the Contractor's expense.

**100-3.4 INTERRUPTIONS.** Interruptions of lighting circuits may be necessary during construction. The Contractor shall provide a reliable shunt cable to provide temporary continuity of circuit service to runway and taxiway lights and signs during construction where required. The Contractor shall not interrupt any circuit or perform any work that might endanger any circuit until approval of the Engineer has been received. Temporary cables shall be protected and identified as a hazard.

The Contractor shall be responsible for installing, maintaining, protecting, and removing all required temporary jumper cables used to maintain power to electrical circuits.

For the permanent installation, all temporary connections and rerouting of circuits shall be replaced with new materials installed in accordance with the specifications and as shown on the plans.

The Contractor shall remove all circuit cables from their respective electrical power sources in the vault before working on the cables in the field. All such cables shall be so marked at the point of disconnection to prevent accidental reconnection. This work is incidental to the electrical work and no separate payment will be made. See item L-100, SAFETY RULES.

**100-3.5 CODES.** The Contractor shall comply with all ordinances, laws, regulations, and codes applicable to the work involved and as referenced in these specifications. This does not relieve the Contractor from furnishing and installing work shown or specified which may be beyond the requirements of such ordinances, laws, regulations, and codes.

**100-3.6 SAFETY AREA.** The Contractor shall abide by the requirements of the Contract Specifications when working within the runway or taxiway safety areas or as directed by the
METHOD OF MEASUREMENT

100-4.1 Other than the specifically identified in pay items below, the requirements of this section shall be incidental to the work being performed.

BASES OF PAYMENT

100-5.1 Unless specifically identified below, all work required by Item L-100 shall be included in the prices for installation of the respective electrical items. Each pay item listed in other sections of these specifications list major components of work and material to be installed. In no way shall the omission of any reference to work or material implied by the drawings or specifications release the contractor from performing or providing a complete and functional installation for the contract price as agreed upon at the time of the contract award.

The demolition of existing electrical infrastructure pay item shall be an all-inclusive item for the removal of existing electrical cabling, infrastructure and equipment. Payment will be made at the contract unit price for identification, decommissioning, removal of all obsolete and abandoned cable, excavation/exposure of structures, disassembly, cutting, crushing, removal, handling, and disposal as required per local laws and ordinances. Restoration of the site including back backfill, compaction and site restoration shall be incidental to this pay item. Should dewatering be required during the electrical demolition, it shall be incidental to this pay item. This price shall be full compensation for furnishing all materials and for all preparation, handling and disposal of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Prior to the initiation of construction, the contractor shall be responsible for the verification of existing conditions. The Site Locating, Duct Tracing and Pot Holing (soft dig) pay item shall be inclusive of all cost and efforts to locate, identify, trace, expose and protect the existing systems and cabling that are located within each phase/area of work. The contractor shall coordinate all locating efforts with the FAA, local utilities, and the Owner. The pay item shall be inclusive of marking and staking of all existing conditions that impact or are potentially in conflict with the proposed installation. In all areas where existing system are in close proximity (12’) to new installations, the contractor shall soft dig (Pothole) to identify the exact location of existing infrastructure or cabling on the intervals identified above. The contractor shall identify locations and depth of these conditions prior to the initiation of any new installation. This price shall be full compensation for furnishing all materials, equipment, subcontracts, and for all preparation, maintenance and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

| L-100-1 | Electrical Demolition | Lump Sum |
| L-100-2 | Site Locating, Duct Tracing and Pot Holing | Lump Sum |
MATERIAL REQUIREMENTS

AC 150/5370-2C  Operational Safety on Airports During Construction
AC 150/5370-10  Standards for Specifying Construction of Airports
MIL-P-152388  Wash Primer Specification
TT-P-641F  Type II, Base Paint, Zinc-Rich

END OF ITEM L-100
ITEM L-104
GENERAL ELECTRICAL SAFETY REQUIREMENTS AND TEMPORARY AIRFIELD LIGHTING

DESCRIPTION

104-1.1 The purpose of this specification section is to establish the proper safety guidelines necessary to protect aircraft, 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 All applicable requirements of the below listed Advisory Circulars, latest edition, standards and related reading shall be complied with:

- AC 150/5200-18 Airport Safety Self-Inspection
- AC 150/5210-5 Painting, Marking and Lighting of Vehicles used on an Airport
- 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 150/5370-2 Operational Safety on Airports During Construction
- 29 CFR, Part 1926/1910 Occupational Safety and Health Standards for the Construction Industry
- ANSI C2 National Electrical Safety Code
- NFPA 70 National Electrical Code
- NFPA 70E Standard for Electrical Safety Requirements for Employee Work Places

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.

GENERAL REQUIREMENTS

104-1.3 GENERAL SAFETY PROVISIONS. The Contractor shall take all necessary safety and health measures in performing work under this contract. The Contractor shall meet with the Construction Manager 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.

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 Construction Manager 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 Airport Fire Department (ARFF) 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) and in areas such as paint storage, fuel storage, and posted no smoking 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 Construction Manager. The Construction Manager 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 fire-fighting equipment and fire prevention methods and, before operations begin, clear all welding and cutting operations with the Construction Manager.

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 Construction Manager and not proceed until clearance is obtained in writing. The Construction Manager 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 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 Construction Manager.

104-1.6 REMOVAL OF EQUIPMENT. When permanently removing equipment, the electrical
wiring, conduit/duct 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/duct not removed shall have a pull string installed.

104-1.7 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 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 Construction Manager, 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 Construction Manager, 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 Construction Manager, 72 hours prior to the start of excavation work or surface penetration, to enable the Construction Manager 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 Construction Manager 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 Construction Manager. 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 disconnect or cause to be disconnected any electrical circuit before permission is requested from and granted by the Construction Manager.

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 runway/taxiway lighting equipment or any other equipment is disconnected, permission must first be granted by the Construction Manager. 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, and the Construction Manager

b. After identity of the circuit is established, and the circuit disconnected, the time and date shall be recorded by the Construction Manager.

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 the Construction Manager. The Construction Manager 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.

At a minimum, Lock-Out and Tag-Out (LOTO) procedures shall comply with the Owner's requirements and NFPA 70E. All new electrical equipment to be installed in Airfield Lighting Vaults must have arc-flash information as PPE and boundary limit information as required by NEC. A minimum of 1-electrician per shift must have attended the OSHA safety course and be classified as the "Competent Safety Person". The Contractor's electricians requiring entry into electrical junction structures, light bases, etc. which may contain energized 5KV circuits must have a tested voltage detection device designated for their use. PPE equipment includes insulated gloves, eye protection, insulated extension poles, fire resistant shirts/pants, etc. PPE must be worn by electricians working near energized cabling/equipment as defined by NFPA 70E.
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 and that shall guide aircraft in a safe path away from all possible accident-prone areas. Temporary configurations must allow for the air traffic control tower to control the circuits at all times.
g. Temporary connections shall be made by splicing an adequate length of L-824 cable into existing circuit connectors. Temporary cable may be re-used in other locations; however, shall not be re-used for any permanent installation.

The Contractor shall provide a set of marked-up, ‘As-Built’ temporary lighting plans to the Construction Manager prior to final temporary lighting and signage connections. An amended temporary single line diagram must be posted in the source field lighting vault. The Electric Shop must be advised in writing of any temporary lighting plans. The notification should include an emergency personnel response list including project manager, foreman and supervisor with their respective contact information to be used in the event of an emergency.

Closed taxiways shall be so marked in a manner acceptable to FAA and the Construction Manager and said marking shall be kept in acceptable condition. This item shall include, at the Construction Manager’s discretion the temporary removal or covering of airfield signage.

All NOTAMs to be scheduled shall give an itemized work description of both general and electrical work to be done. The electrical work must define all airfield circuits that will be impacted. This shall include lighting, signage and navigational aids. An expanded contract drawing may be enlarged to detail the upcoming work shift areas. The sketch should accompany the NOTAM request.

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 Construction Manager. 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, at the end of each work shift and shall so certify to the Construction Manager before leaving the work site. Should bad weather cause poor visibility the Construction Manager 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 Owner’s Representative. This test shall be performed prior to any activity affecting the respective circuit. When the circuit is returned to its final condition, the circuit’s insulation resistance shall be checked again in the presence of the Construction Manager. 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.

104-4.3 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 Construction Manager.

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 Owner’s Representative.

METHOD OF MEASUREMENT

104-5.1 Temporary airfield lighting during construction shall be measured as a lump sum, inclusive of all edge L-153 reflectors, lighting fixtures, signage modifications (including temporary sign panels and/or covering signs), conduit, cabling, connections, coordination, phasing and all labor and incidentals required.
BASIS OF PAYMENT

104-5.2 Payment will be made at the contract unit price for temporary airfield lighting during construction. Work of this item shall include work associated with providing temporary edge reflectors and temporary circuits and connections to maintain airfield lighting during work phases. This work includes, but is not limited to, L-153 edge reflectors, signage modifications and temporary sign panels, covering signs, disconnecting series lighting cables, series isolation transformers, devices, de-energizing regulators and S-1 cutouts, lockout/tag out procedures, temporary conduit, temporary cable, circuit jumpers, splices, connections, phasing, and coordination of work with Owner & FAA, and all labor, equipment, tools and incidentals necessary to complete this item in accordance with these specifications and as indicated on the drawings. Payment shall be at the contract lump sum price for temporary airfield lighting circuits during construction, which price and payment thereof shall constitute full compensation for all labor, materials, equipment, expenses and incidentals.

Payment will be made under:

Item L-104-1 Temporary Airfield Lighting During Construction per lump sum

END OF ITEM L-104
ITEM L-108
UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the 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 cable for FAA owned/operated facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks is in 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 advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer’s certification of compliance with the applicable specification, when requested by the Engineer.

c. Manufacturer’s certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor’s cost.

d. All materials and equipment used to construct this item shall be submitted to the 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 products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Engineer reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.
f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner’s discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain a minimum insulation resistance per AC 150/5340-26B, Maintenance Airport Visual Aid Facilities, Table 5-1 and paragraph 5.1.3.1, 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 latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge AWG), L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, nonshielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer’s recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Federal Specification J-C-30 and shall be type THWN-2, 75°C. Conductors for parallel (voltage) circuits shall be sized and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600 volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 2 AWG bare solid copper wire for counterpoise and/or No. 2 AWG bare solid for ground wire per ASTM B3 and ASTM B8, and shall be tinned copper per ASTM B33. See AC 150/5340-30 for additional details about counterpoise and ground wire types and installation. For voltage powered circuits, the equipment ground conductor shall be minimum No. 6 AWG, 600V rated, Type XHHW insulated, green color, stranded copper equipment ground conductor.
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 be less than 10 feet (2.54 m) and 3/4 inch (19 mm) in diameter.

108-2.4 Cable connections. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The cast splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, “Scotchcast” Kit No. 82-B, or as manufactured by Hysol® Corporation, “Hyseal Epoxy Splice” Kit No. E1135, or an approved equivalent, 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-shrink splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer’s recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. See AC 150/5340-30 for additional information about methods of attaching a ground to a galvanized light base. All exothermic connections shall be made per the manufacturer’s recommendations and listings.

108-2.5 Splicer qualifications. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the Engineer proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating
personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 Concrete. Concrete for cable markers shall be per 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 –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 Existing circuits. Whenever the scope of work requires connection to an existing circuit, the circuit’s insulation resistance shall be tested, in the presence of the Engineer. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the 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.

108-2.12 Detectable warning tape. Plastic, detectable, American Wood Preservers Association (AWPA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metalized foil core and shall be 4 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

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 (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the Engineer.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 Installation in duct banks or conduits. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor’s expense. The Contractor shall notify the Engineer of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with
minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer’s recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the 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 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.


108-3.4 Cable markers for direct-buried cable. Not Used.

108-3.5 Splicing. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

   a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer’s instructions and to the satisfaction of the Engineer.

   b. Field-attached plug-in splices. These shall be assembled per the manufacturer’s instructions. These splices shall be made by plugging directly into mating connectors. 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 inches (38 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 inches (38 mm) on each side of the joint.

   d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:
Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. 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 one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

**108-3.6 Bare counterpoise wire installation for lightning protection and grounding.** If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The Engineer shall select one of two methods of lightning protection for the airfield lighting circuit based on the frequency of local lightning:

**a. Equipotential.** – may be used by the Engineer for areas that have high rates of lightning strikes. This is where the counterpoise is bonded to the light base (edge lights included) and counterpoise size is determined by the Engineer.

**b. Isolation** – used in areas where lightning strikes are not common. The counterpoise is not bonded to edge light fixtures, in-pavement fixtures are bonded to the counterpoise. Counterpoise size is selected by the Engineer.

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.
For edge light fixtures installed in turf (stabilized soils) and for raceways or cables adjacent to the full strength pavement edge, the counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade.

Each light base or mounting stake shall be provided with a grounding electrode.

When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

When a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

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:

c. A ground rod installed at and securely attached to each light fixture base, mounting stake, and to all metal surfaces at junction/access structures via #6 AWG wire.

d. For parallel voltage systems only, install a #6 AWG green insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base internal grounding lug and to all metal surfaces at junction/access structures. Dedicated ground rods shall be installed and exothermically welded to the counterpoise wires at each end of a duct bank crossing under pavement.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

108-3.7 Counterpoise installation above multiple conduits and duct banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete cone of protection measured 22-1/2 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.
108-3.8 Counterpoise installation at existing duct banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 Exothermic bonding. Bonding of counterpoise wire shall be by the exothermic welding process. 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. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer’s installation directions for proper methods of bonding copper wire to the light base. See also AC 150/5340-30 for galvanized light base exception.

   c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the 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. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

   a. Earth resistance testing methods shall be submitted to the 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.

   b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The 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:

   c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

   d. That all affected circuits (existing and new) are free from unspecified grounds.
e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms.

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the Engineer prior to performing the testing.

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** Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall include additional quantities required for slack.

**108-4.2** Ground rods shall be measured by each 10-foot section installed complete.

**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:

Item L-108-1  No. 8 AWG, 5 kV, L-824C Cable, Installed in Duct Bank or Conduit - per linear foot  
Item L-108-2  No. 2 AWG, Bare Solid Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit - per linear foot  
Item L-108-3  3/4” x 10’ Ground Rod, Copper-Clad Steel – per each  

MATERIAL REQUIREMENTS

AC 150/5340-26  Maintenance of Airport Visual Aid Facilities  
AC 150/5340-30  Design and Installation Details for Airport Visual Aids  
AC 150/5345-7  Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits  
AC 150/5345-26  Specification for L-823 Plug and Receptacle, Cable Connectors  
AC 150/5345-53  Airport Lighting Equipment Certification Program  
Commercial Item  Description A-A-59544 Cable and Wire, Electrical (Power, Fixed Installation)  
Commercial Item  Description A-A-55809 Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic  
ASTM B3  Standard Specification for Soft or Annealed Copper Wire  
ASTM B8  Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft  
ASTM B33  Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes  
ASTM D4388  Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes  
FED SPEC J-C-30  Cable and Wire, Electrical (Power, Fixed Installation)  
MIL-I-24391  Insulation Tape, Electrical, Plastic, Pressure Sensitive  

REFERENCE DOCUMENTS

NFPA-70  National Electrical Code (NEC)
NFPA-780        Standard for the Installation of Lightning Protection Systems

MIL-S-23586F    Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical


END OF ITEM L-104
ITEM L-110
AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer’s certification of compliance with the applicable specification when requested by the Engineer.

b. Manufacturer’s certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials, that comply with these specifications, at the Contractor’s cost.

c. All materials and equipment used to construct this item shall be submitted to the 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 products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12)
months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.

110-2.3 Plastic conduit. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
- Type II–Schedule 40 PVC suitable for either above ground or underground use.
- Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
- Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads, they shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1-inch maximum size coarse aggregate with a minimum 28-day compressive strength of 3,000 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 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. Fill shall be designed to achieve a 28-day compressive strength of 200 psi (1.4 MPa) under pavement.
110-2.8 Detectable warning tape. Plastic, detectable, American Wood Preservers Association (AWPA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The 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 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) 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 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be reclaned 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 (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).
Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) 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 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer’s recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per 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, per 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 per Item P-152.

It is the Contractor’s responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

b. Trenching, etc., in cable areas shall then proceed with approval of the 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 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inch (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the 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-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the 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 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport’s secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport’s secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.
Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the 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 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word “DUCT” or “CONDUIT” on each marker slab. Impression of letters shall be done in a manner, approved by the Engineer, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the Engineer. 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 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 Backfilling for conduits. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 “Excavation and Embankment” except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 “Excavation and Embankment” except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period’s construction, whichever is less.

Flowable backfill may alternatively be used.
Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the 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 sodding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD) and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, 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 per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-1 1-Way, 2-Inch Schedule 40 PVC, Concrete Encased Electrical Conduit - per linear foot

Item L-110-2 4-Way, 2-Inch Schedule 40 PVC, Concrete Encased Electrical Duct Bank - per linear foot
MATERIAL REQUIREMENTS

Advisory Circular (AC) 150/5340-30 Design and Installation Details for Airport Visual Aids

AC 150/5345-53 Airport Lighting Equipment Certification Program

ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

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/ft³(2,700 kN-m/m³))

ASTM D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

NFPA-70 National Electrical Code (NEC)

Underwriters Laboratories Standard 6 Electrical Rigid Metal Conduit – Steel

Underwriters Laboratories Standard 514B Conduit, Tubing, and Cable Fittings

Underwriters Laboratories Standard 514C Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers

Underwriters Laboratories Standard 1242 Electrical Intermediate Metal Conduit Steel

Underwriters Laboratories Standard 651 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

Underwriters Laboratories Standard 651A Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110
ITEM L-115
ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the 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 responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the Engineer) and replaced with materials that comply with these specifications at the Contractor’s cost.

c. All materials and equipment used to construct this item shall be submitted to the 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 products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications. The Engineer reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner’s discretion, with no additional cost to the Owner.
115-2.2 Concrete structures. Cast-in-place concrete structures shall be per 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 150,000 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 per the process defined in the General Provisions.

115-2.3 Junction boxes. Junction boxes shall be L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a galvanized steel blank cover, gasket, and stainless steel or coated steel hardware per FAA Engineering Brief (EB) #83. Covers shall be 3/4-inch (19-mm) 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 be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C6. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.5 Concrete. All concrete used in structures shall conform to the requirements of Item P-610, Structural Section 346 - Portland Cement Concrete.

115-2.6 Frames and covers. The frames shall conform to one of the following requirements:
   a. ASTM A48  Gray iron castings
   b. ASTM A47  Malleable iron castings
   c. ASTM A27  Steel castings
   d. ASTM A283, Grade D  Structural steel for grates and frames
   e. ASTM A536  Ductile iron castings
   f. ASTM A897  Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum load of 150,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.
Each cover shall have the word “ELECTRIC” or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a “DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER” safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

115-2.7 Ladders. 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 A615, 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, plastic, or aluminum. Cable trays shall be located as shown on the plans.


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 inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2 inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 MPa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.15 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 inch 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, per 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 inches (150 mm) 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 6 inches (150 mm) of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The 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 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the 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 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper 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. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 **Cleanup and repair.** After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer’s recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 **Restoration.** After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 **Inspection.** Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the...
fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 Manhole elevation adjustments. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall then install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. Finally, the Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 Duct extension to existing ducts. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes/handholes 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

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.

Payment will be made under:

Item L-115-1  Electrical Handhole - Per Each

MATERIAL REQUIREMENTS


Advisory Circular (AC) 150/5345-7  Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits

AC 150/5345-26  Specification for L-823 Plug and Receptacle, Cable Connectors

AC 150/5345-42  Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories

AC 150/5340-30  Design and Installation Details for Airport Visual Aids

AC 150/5345-53  Airport Lighting Equipment Certification Program

Commercial Item Description A-A 59544 Cable and Wire, Electrical (Power, Fixed Installation)

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 A283  Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A536  Standard Specification for Ductile Iron Castings

ASTM A615  Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A897  Standard Specification for Austempered Ductile Iron Castings

ASTM C144  Standard Specification for Aggregate for Masonry Mortar

ASTM C150  Standard Specification for Portland Cement
ASTM C206  Standard Specification for Finishing Hydrated Lime
FAA EB #83  In Pavement Light Fixture Bolts
MIL-P-21035  Paint High Zinc Dust Content, Galvanizing Repair
NFPA-70  National Electrical Code (NEC)

END OF ITEM L-115
ITEM L-125 INSTALLATION OF AIRPORT LIGHTING SYSTEMS

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars. The systems are installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

125-2.1 GENERAL.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be as approved under the Airport Lighting Equipment Certification Program described in the current version of Appendix 3 to Advisory Circular (AC) 150/5345-53.

b. Manufacturer’s certifications shall not relieve the Contractor of the Contractor’s responsibility to provide materials in accordance with these specifications, Appendix 3 to AC 150/5345-53 and as deemed 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 submitted data shall be sufficient, in the opinion of the Engineer, to determine compliance with the plans and specifications and AC 150/5345-53. 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.
125-2.2 CONCRETE. Concrete shall conform to Specification Item P610 Structural Section 346 Portland Cement Concrete.

125-2.3 CONDUIT. Conduit shall conform to Specification Item L-110 Installation of Airport Underground Electrical Duct.

125-2.4 CABLE AND COUNTERPOISE. Cable and Counterpoise shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.5 TAPE. Rubber electrical tape shall be a self-fusing Ethylene Propylene Rubber (EPR) based high-insulating voltage tape such Scotch Electrical Tape Number 23 as manufactured by 3M Company or an approved equal.

Plastic vinyl tape shall be 8.5 mil heavy duty, premium grade all-weather vinyl electrical insulating tape such as Scotch Premium Vinyl Electrical Tape 88 as manufactured by 3M Company or an approved equal.

125-2.6 CABLE CONNECTIONS. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.7 RETROREFLECTIVE MARKERS. Not Used.

125-2.8 LIGHT BASE AND TRANSFORMER HOUSINGS. Light Base and Transformer Housings shall conform to the requirements of 150/5345-42 and be listed in appendix 3 to AC 150/5345-53. Light bases shall be Type L-868, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.9 ISOLATION TRANSFORMERS. Isolation transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47 and be listed in appendix 3 to AC 150/5345-53.

125-2.10 TAXIWAY LIGHTS. Runway and Taxiway Edge Lights shall conform to the requirements of 150/5345-46 and be listed in appendix 3 to AC 150/5345-53.

a. Taxiway In-pavement Lights.
   (1) L-852T(L) Taxiway Edge Class 1, Mode 1 Style 3

b. Lamps and Filters
   Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract.

   Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

125-2.11 RUNWAY AND TAXIWAY SIGNS. Not Used.

125-2.12 RUNWAY END IDENTIFIER LIGHT (REIL) Not Used.
125-2.13 PRECISION APPROACH PATH INDICATOR
Not Used.

125-2.14 CIRCUIT SELECTOR CABINET
Not Used.

CONSTRUCTION

125-3.1 SHIPPING AND STORAGE
a. Equipment should be shipped in suitable packing material to prevent damage during shipping. Equipment and materials should be maintained in new condition and stored in areas protected from weather and physical damage.

b. Any equipment and materials, in the opinion of the Engineer, damaged during construction or storage shall be replaced by the contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired according to manufacturers recommendations.

125-3.2 INPAVEMENT LIGHTS
a. Water, debris, and other foreign substances shall be removed prior to installing light base and light.

b. A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixture shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. Outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

METHOD OF MEASUREMENT

125-4.1 Taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the Engineer.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete runway or taxiway light, guidance sign, reflective marker, runway end identification light, precision approach path indicator, or abbreviated precision approach path indicator installed by the Contractor and accepted by the Engineer. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-125-1</td>
<td>L-852T(L) LED In-Pavement TW Edge Light</td>
<td>per each</td>
</tr>
</tbody>
</table>
## MATERIAL REQUIREMENTS

<table>
<thead>
<tr>
<th>AC 150/5345-5</th>
<th>Circuit Selector Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 150/5345-26</td>
<td>L-823 Plug and Receptacle, Cable Connectors</td>
</tr>
<tr>
<td>AC 150/5345-28</td>
<td>Precision Approach Path Indicator (PAPI) Systems</td>
</tr>
<tr>
<td>AC 150/5345-42</td>
<td>Airport Light Bases, Transformer Houses, Junction Boxes and Accessories</td>
</tr>
<tr>
<td>AC 150/5345-44</td>
<td>Taxiway and Runway Signs</td>
</tr>
<tr>
<td>AC 150/5345-46</td>
<td>Runway and Taxiway Light Fixtures</td>
</tr>
<tr>
<td>AC 150/5345-47</td>
<td>Isolation Transformers for Airport Lighting Systems</td>
</tr>
<tr>
<td>AC 150/5345-51</td>
<td>Discharge-Type Flasher Equipment</td>
</tr>
</tbody>
</table>

END OF ITEM L-125
SECTION 121
FLOWABLE FILL

121-1 Description.
Furnish and place flowable fill as an alternative to compacted soil as approved by the Engineer. Applications for conventional flowable fill include beddings; encasements; closures for tanks and pipes; and general backfill for trenches, embankments and walls. Applications for cellular concrete flowable fill include beddings; encasements; closures for tanks and pipes; and general backfill for embankments and walls.

121-2 Materials.
Meet the following requirements:

- Fine Aggregate* Section 902
- Portland Cement (Types I, II, or III) Section 921
- Water Section 923
- Admixtures** Section 924
- Fly Ash, Slag and other Pozzolanic Materials Section 929
- Preformed Foam ASTM C 869

*Any clean fine aggregate with 100% passing a 3/8 inch mesh sieve and not more than 15% passing a No. 200 sieve may be used.

**High air generators or foaming agents may be used in lieu of conventional air entraining admixtures and shall be added at jobsite and mixed in accordance with the manufacturer’s recommendation.

121-3 Mix Design.
Conventional flowable fill is a mixture of portland cement, fly ash, fine aggregate, admixture and water. Flowable fill contains a low cementitious content for reduced strength development. Cellular concrete flowable fill is a low density concrete made with cement, water and preformed foam to form a hardened closed cell foam material. Cellular concrete flowable fill may also contain fine aggregate, fly ash, slag and admixtures.

Submit mix designs to the Engineer for approval. The following are suggested mix guides for excavatable, non-excavatable and cellular concrete flowable fill:

<table>
<thead>
<tr>
<th></th>
<th>Excavatable</th>
<th>Non-Excavatable</th>
<th>Cellular Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>75-100 lb/yd³</td>
<td>75-150 lb/yd³</td>
<td>Min-150 lb/yd³</td>
</tr>
<tr>
<td>Pozzolans or Slag</td>
<td>None</td>
<td>150-600 lb/yd³</td>
<td>Optional</td>
</tr>
<tr>
<td>Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Air**</td>
<td>5-35%</td>
<td>5-15%</td>
<td>****</td>
</tr>
<tr>
<td>28 Day Compressive Strength**</td>
<td>Maximum 100 psi</td>
<td>Minimum 125 psi</td>
<td>Minimum 80 psi</td>
</tr>
<tr>
<td>Unit Weight**</td>
<td>90-110 lb/ft³</td>
<td>100-125 lb/ft³</td>
<td>20-80 lb/ft³</td>
</tr>
<tr>
<td>Fine Aggregate</td>
<td>***</td>
<td>***</td>
<td>Optional</td>
</tr>
</tbody>
</table>

*Mix designs shall produce a consistency that will result in a flowable self-leveling product at time of placement.
**The requirements for percent air, compressive strength and unit weight are for laboratory designs only and are not intended for jobsite acceptance requirements.
***Fine Aggregate shall be proportioned to yield 1 yd³
****In cellular concrete, preformed foam shall be proportioned at the job site to yield 1 yd³ in accordance with the design requirements.
121-4 Production and Placing.
Use flowable fill manufactured at a production facility that meets the requirements of 347-3. Deliver flowable fill using concrete construction equipment. Revolution counter are waived. Place flowable fill by chute, pumping or other methods approved by the Engineer. Tremie flowable fill through water. Cellular concrete flowable fill may not be placed within three feet of the bottom elevation for roadway base courses.

121-5 Construction Requirements.
Use straps, soil anchors or other approved means of restraint to ensure correct alignment when flowable fill is used as backfill for pipe or where flotation or misalignment may occur.
Protect flowable fill from freezing for a period of 36 hours after placement. Place flowable fill to the designated fill line without vibration or other means of compaction. Do not place flowable fill during inclement weather, e.g. rain or ambient temperatures below 40ºF. Take all necessary precautions to prevent any damages caused by the hydraulic pressure of the fill during placement prior to hardening. Provide the means to confine the material within the designated space.

121-6 Acceptance.
Acceptance of flowable fill will be based on the following documentation and a minimum temperature of flowable fill at the point of delivery of 50ºF.
Furnish a delivery ticket to the Engineer for each load of flowable fill delivered to the worksite. Ensure that each ticket contains the following information:
1. Project designation,
2. Date,
3. Time,
4. Class and quantity of flowable fill,
5. Actual batch proportions,
6. Free moisture content of aggregates,
7. Quantity of water withheld.
Leave the fill undisturbed until the material obtains sufficient strength. Sufficient strength is 35 psi penetration resistance as measured using a hand held penetrometer in accordance with ASTM C-403. Provide a hand held penetrometer to measure the penetration resistance of the hardened flowable fill.

121-7 Basis of Payment.
No separate payment will be made for flowable fill. The cost of the work described in this item shall be considered incidental to the item in which it is being used for. When the item of flowable fill is included in the Contract, payment will be made at the Contract unit price per cubic yard. Such price and payment will include all cost of the mixture, in place and accepted, determined as specified above. No measurement and payment will be made for material placed outside the neat line limits or outside the adjusted limits, or for unused or wasted material.
Payment will be made under:
Item No. 121-70 Flowable Fill - per cubic yard.

END OF SECTION 121
SECTION 160
STABILIZING

160-1 Description.
Stabilize designated portions of the roadbed and pavement subgrade to provide a firm and unyielding subgrade, having the required bearing value specified in the Plans.

160-2 Materials.
160-2.1 Commercial Material: Meet the requirements of Section 914.
160-2.2 Local Material: Meet the requirements of Section 914. Test material from each source, or if authorized by the Engineer, test blended materials. Submit test results to the Engineer at least 14 days prior to the stabilization operation.
160-2.3 Existing Base: When the material from an existing base is used as all, or a portion, of the stabilizing additives, no further testing is required unless directed by the Engineer.
160-2.4 Granular Subbase: The Engineer may allow, at no additional cost to the Owner Department, the substitution of 6 inches of granular subbase meeting the requirements of 290-2 and 290-3, when 12 inches of stabilization requiring a limerock bearing ratio (LBR) value of 40 is specified.

160-3 Construction Methods.
160-3.1 General: Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the Plans. Prior to spreading any additive stabilizing material, bring the surface of the roadbed or pavement subgrade to a plane approximately parallel to the plane of the proposed finished surface. Isolated mixing operations will be considered as separate LOTs. Curb pads and shoulders compacted separately shall be considered separate LOTs. Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

For airfield subgrade stabilization under airside pavements (taxiways, and aprons), a LOT is defined as follows: A lot will consist of one day's production when production does not exceed 2,400 square yards (2,000 square meters). A lot will consist of one-half day's production when a day's production consists of between 2,400 and 4,800 square yards (2,000 and 4,000 square meters). Each lot shall be divided into two equal sublots. Two tests shall be made for each sublot. Sampling locations will be determined by the Quality Control Lab on a random basis in accordance with statistical procedures contained in ASTM D 3665. Soil samples shall be collected at the sampling locations and a composite sample prepared for moisture-density testing in accordance to ASTM D 1557 for the lot.

160-3.2 Application of Stabilizing Material: After substantially completing the roadbed or pavement subgrade grading operations, determine the type and quantity (if any) of stabilizing material necessary for compliance with the bearing value requirements. Before using any Fossil Fuel Combustion Products (FFCPs), provide documentation, at the preconstruction meeting or no later than 30 days prior to delivery of FFCP’s to the project, signed and sealed by the Specialty Engineer that these materials meet the requirements of 403.7047 F.S. Notify the Engineer of the approximate quantity to be added before spreading. When additive stabilizing materials are required, spread the material uniformly over the area to be stabilized.

160-3.2.1 Sampling and Testing of Local Material: Randomly select locations for sampling using a random number generator approved by the Engineer in accordance with FM 1-T 267 and test at the minimum frequency listed in the table below before mixing. The Engineer will reject the material for failing quality control (QC) test results. The Engineer will sample for Verification and Resolution testing at the minimum frequency listed in the table below.
Engineer will perform Verification tests at the minimum frequency listed in the table below.

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Quality Control</th>
<th>Verification</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Limit (LL), Plastic Index (PI), and Organic Content</td>
<td>One per two LOTs for other than airfields.</td>
<td>One per eight LOTs</td>
<td>One per eight LOTs</td>
</tr>
<tr>
<td></td>
<td>One per LOT for airfields.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 160-3.2.1 Verification Comparison Criteria and Resolution

**Procedures:** If the QC and the Department’s Verification tests meet the requirements of Section 914 then the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will submit the Resolution sample to the State Materials Office (SMO) or an AASHTO accredited laboratory designated by SMO to perform Resolution testing.

If the Resolution Test results meet the requirements of Section 914 then the Engineer will accept the LOTs in question. Otherwise remove the material and apply new material meeting the requirements of Section 914 and retest in accordance with 160-3.2.

#### 160-3.3 Mixing:
Perform mixing using rotary tillers, a plant or other equipment meeting the approval of the Engineer. The subgrade may be mixed in one course if the equipment and method of construction provides the uniformity, particle size limitation, compaction and other desired results of 160-4. Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.

Perform the mixing operations, as specified, (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

#### 160-3.4 Maximum Particle Size of Mixed Materials:
At the completion of the mixing, ensure that the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3 1/2 inch sieve and that the material does not have a plasticity index greater than eight or liquid limit greater than 30. Remove any materials not meeting the plasticity requirements from the stabilized area. Break down or remove from the stabilized area materials, including clay lumps or lumps made of clay-size particles (any particle size 2 microns or less), not meeting the gradation requirements.

#### 160-3.5 Bearing Value:
Meet the bearing value requirements for the subgrade in accordance with 160-4.

#### 160-3.6 Compaction:
After completing the mixing operations and satisfying the requirements for bearing value, uniformity, and particle size. Compact the materials at a moisture content permitting the specified compaction in 160-4.2.3. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

#### 160-3.7 Finish Grading:
Shape the completed stabilized subgrade to conform with the finished lines, grades, and cross-section indicated in the Plans. Check the subgrade using elevation stakes or other means approved by the Engineer.

#### 160-3.8 Requirements for Condition of Completed Subgrade:
After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the Plans.

Remove all soft and yielding material, and any other portions of the subgrade which will not compact readily, and replace it with suitable material so that the whole subgrade is brought to line and grade, with proper allowance for subsequent compaction.

#### 160-3.9 Maintenance of Completed Subgrade:
After completing the subgrade as
specified above, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, tools, etc. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs, replacement, etc., of curb and gutter, sidewalk, etc., which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the Owner Department. Construct and maintain ditches and drains along the completed subgrade section.

160-4 Acceptance Program.
160-4.1 General Requirements: Meet the requirements of 120-10, except use 160-4.2 instead of 120-10.2, 160-4.3 instead of 120-10.3, and 160-4.4 instead of 120-10.4.
160-4.2 Acceptance Criteria:
160-4.2.1 Bearing Value Requirements:
160-4.2.1.1 General: Within the entire limits of the width and depth of the areas to be stabilized, obtain the required minimum bearing value for each LOT. For any area where the bearing value obtained is deficient from the value indicated in the Plans, in excess of the tolerances established herein, spread and mix additional stabilizing material in accordance with 160-3.3. Perform this reprocessing for the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

Determine the quantity of additional stabilizing material to be used in reprocessing.

160-4.2.1.2 Under-tolerances in Bearing Value Requirements: The under-tolerances are allowed for the following specified Bearing Values:

<table>
<thead>
<tr>
<th>Specified Bearing Value</th>
<th>Under-tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBR 40</td>
<td>5.0 0.0</td>
</tr>
<tr>
<td>LBR 35</td>
<td>4.0</td>
</tr>
<tr>
<td>LBR 30 (and under)</td>
<td>2.5</td>
</tr>
</tbody>
</table>

The following unsoaked bearing value requirement is based on tests performed on samples obtained after completing mixing operations:

<table>
<thead>
<tr>
<th>Specified Bearing Value</th>
<th>Unsoaked Bearing Value Required</th>
<th>Under-tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBR 40</td>
<td>LBR 43</td>
<td>0.0</td>
</tr>
</tbody>
</table>

160-4.2.2 Mixing Depth Requirements: Do not exceed individual plan depth thickness by more than 2 inches or exceed LOT-average depth thickness by more than 1 inch measured to the nearest 0.25 inch. No undertolerance of mixing depth is allowed.

As an exception to the above mixing requirements, where the subgrade is of rock, the Engineer may waive the mixing operations (and the work of stabilizing), and the Department will not pay for stabilization for such sections of the roadway.

160-4.2.3 Density Requirements:
160-4.2.3.1 General: Within the entire limits of the width and depth of the areas to be stabilized, other than as provided in 160-4.2.3.2, obtain a minimum density at any location of 98%-100% of the Modified Proctor maximum density as determined by FM 1-T 180, Method D.

160-4.2.3.2 Exceptions to Density Requirements: The Contractor need not obtain the minimum density specified in 160-4.2.3.1 if within the following limits:
(a) The width and depth of areas which are to be subsequently
incorporated into a base course under the same contract. (b) The upper 6 inches of areas to be grassed under the same contract. Compact these areas to a reasonably firm condition as directed by the Engineer.

**160-4.2.4 Frequency:** The Contractor shall conduct Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Quality Control for other than airfields</th>
<th>Verification Quality Control for airfields</th>
<th>Verification for Shoulder-Only, Shared Use Path-and-Sidewalk-Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Proctor Maximum Density</td>
<td>One per two consecutive LOTs</td>
<td>One per LOT One per eight</td>
<td>One per four LOTs</td>
</tr>
<tr>
<td>Density</td>
<td>One per subLOT</td>
<td>Two per sublot One per four LOTs</td>
<td>One per two LOTs</td>
</tr>
<tr>
<td>Stabilizing Mixing Depth</td>
<td>Three per 500 feet</td>
<td>Three per sublot Witness one per LOT</td>
<td>Witness one per LOT</td>
</tr>
<tr>
<td>LBR</td>
<td>One per two consecutive LOTs</td>
<td>One per two consecutive LOTs</td>
<td>One per four LOTs</td>
</tr>
<tr>
<td>Gradation, LL/PI &amp; Soil Classification (Local materials)</td>
<td>Not Required</td>
<td>One per five consecutive LOTs</td>
<td>One per four LOTs</td>
</tr>
</tbody>
</table>

**160-4.3 Additional Requirements:**

**160-4.3.1 Quality Control Testing:**

**160-4.3.1.1 Bearing Values:** Test the stabilized subgrade sample collected in 160-4.3.1.3. Determine the LBR in accordance with FM 5-515 and 160-4.2.4.

**160-4.3.1.1 Unsoaked LBR:** If unsoaked LBR is desired, submit request for approval to the Engineer. Upon approval by the Engineer to consider the use of unsoaked LBR, randomly sample and test from three locations in the initial Lot for both soaked and unsoaked LBR in accordance with FM 5-515. Ensure all of the tests demonstrate the material achieves the LBR values in 160-4.2.1.2. Continue testing unsoaked LBR at the frequency shown in 160-4.2.4. Discontinue unsoaked LBR testing if any unsatisfactory QC LBR test result is obtained or resolution determines an unsatisfactory LBR.

**160-4.3.1.2 Mixing Depths:** Meet required plan mixing-depths by measuring from the proposed final grade line. Determine test locations, including stations and offsets, using the Random Number generator approved by the Owner Department. Notify the Engineer a minimum of 24 hours before checking mixing depths. Record results on Quality Control forms supplied by the Department.

**160-4.3.1.3 Modified Proctor Maximum Density Requirement:** Collect enough material to split and create three separate samples. Determine test locations, including stations and offsets, using the Random Number generator approved by the Owner Department for the two LOTs under consideration as indicated in 160-4.2.4. Retain the Verification and
Resolution samples for the Department until the Engineer accepts the LOTs represented by the samples.

**160-4.3.2 Department Verification Tests:**

**160-4.3.2.1 Bearing Value & Soil Classification:** The Engineer will collect a sample at a location other than the location where the sample was collected in 160-4.3.1.3, and test the stabilized subgrade for determination of the LBR in accordance with FM 5-515. The Engineer will select test locations, including stations and offsets, using a Random Number generator, based on the LOTs under consideration.

If local material is used for stabilizing, the Engineer will determine compliance with embankment utilization requirements and 160-3.4 by testing and classifying the stabilized subgrade in accordance with AASHTO T88 and AASHTO M 145 at the frequency shown in 160-4.2.4.

**160-4.3.2.1.1 Unsoaked LBR:** The Engineer will sample and test the initial LOT for one soaked and one unsoaked LBR if consideration of the unsoaked LBR has been approved.

**160-4.3.2.2 Mixing Depth:** The Engineer will witness the Contractor’s mixing depth checks to ensure compliance with 160-4.2.2. The Engineer will select test locations, including stations and offsets, using a Random Number generator.

**160-4.3.2.3 Modified Proctor Maximum Density:** The Engineer will randomly select one of the retained split samples and test in accordance with FM 1-T 180, Method D.

**160-4.4 Verification Comparison Criteria and Resolution Procedures:**

**160-4.4.1 Bearing Value & Soil Classification:** If the Department’s Verification test meets the requirements of 160-4.2.1 and embankment utilization requirements, the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will collect an additional sample in the same LOT the Verification sample was obtained. SMO or an AASHTO accredited laboratory designated by SMO will perform Resolution testing on the additional sample. The material will be sampled and tested in accordance with FM 5-515. If local material is used for stabilization, the sample will be tested in accordance with AASHTO T-88, and AASHTO M-145.

If the Resolution Testing results meet the requirements of 160-4.2.1 and embankment utilization requirements then the Engineer will accept the LOTs in question. Otherwise reprocess the corresponding LOTs in accordance with 160-3 and retest in accordance with 160-4.3.1.1.

**160-4.4.2 Mixing Depth Thickness:** The Department will witness the mixing depth checks.

1. If the depth checks meet the requirements of 160-4.2.2 the Engineer will accept that 500-foot section.
2. If the depth checks confirm shallow depth, re-mix the 500-foot section to an appropriate depth and re-measure in accordance with 160-4.3.1.2. The Engineer will repeat the witness process.
3. If the depth checks confirm extra deep mixing, conduct an additional QC density test after compaction for the bottom 12 inches of the subgrade for that 500-foot section in addition to a QC density test for the top 12 inches. The additional density test must meet the requirements of 160-4.2.3.

**160-4.4.3 Modified Proctor Maximum Density Determination:** The Engineer will compare the Verification test results of 160-4.3.2.3 to the corresponding QC test results. If the test result is within 4.5 lb/ft³ of the QC test result, the LOTs will be verified. Otherwise, the Engineer will collect the Resolution split sample corresponding to the Verification sample tested, SMO or an AASHTO accredited laboratory designated by SMO will perform Resolution testing. The material will be sampled and tested in accordance with FM 1-T 180, Method D.
The Engineer will compare the Resolution Test results with the QC test results. If the Resolution Test result is within 4.5 lb/ft$^3$ of the corresponding QC test result, the Engineer will use the QC test results for material acceptance purposes for each corresponding pair of LOTs. If the Resolution test result is not within 4.5 lb/ft$^3$ of the corresponding QC test, the Engineer will collect the remaining Verification split samples for testing. Verification Test results will be used for material acceptance purposes for the LOTs in question.

160-4.4.4 Density: When a Verification or Independent Verification density test does not meet 160-4.2.3 (Acceptance Criteria), retest at a site within a 5 feet radius of the Verification test location and observe the following:

1. If the QC retest meets the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will accept the LOTs in question.

2. If the QC retest does not meet the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will re-verify the LOTs in question.

3. If the QC retest and the Verification or Independent Verification test do not compare favorably, complete a new equipment comparison analysis as defined in 120-10.1.2. Once acceptable comparison is achieved, retest the LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

160-5 Method of Measurement.
The quantity to be paid for will be the plan quantity, in square yards, completed and accepted.

160-6 Basis of Payment.
Price and payment will constitute full compensation for all work and materials specified in this Section, including furnishing, spreading and mixing of all stabilizing material required and any reprocessing of stabilization areas necessary to attain the specified bearing value. The Department will make full payment for any areas where the existing subgrade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high-bearing materials from other sources within the limits of the stabilizing.

No separate payment shall be made for any commercial stabilizing material which the Contractor may elect to utilize in subgrade stabilization. No separate payment will be made for the work of utilizing of materials from an existing base in the stabilizing section. If the item of borrow excavation is included in the Contract, any stabilizing materials obtained from designated borrow areas will be included in the pay quantity for borrow excavation.

Payment will be made under:

Item 160-4 Subgrade Stabilization - per Square Yard

END OF SECTION 160
SECTION 200
ROCK BASE

200-1 Description.
Construct a base composed of base rock as called for in the Plans. Do not use recycled concrete aggregate (RCA) base on interstate roadways.

200-2 Materials.
200-2.1 General: Meet the requirements of Section 911 for the particular type of base to be constructed. The Contractor may use more than one source of base rock on a single Contract provided that a single source is used throughout the entire width and depth of a section of base. Obtain approval from the Engineer before placing material from more than one source. Place material to ensure total thickness single source integrity at any station location of the base. Intermittent placement or “blending” of sources is not permitted. Base rock may be referred to hereinafter as “rock”.

The reuse of existing base may be considered provided it meets the requirements of this Section. Submit as a Cost Savings Initiative Proposal in accordance with Section 4.

200-2.2 Existing Rock: Meet the following requirements for use of existing rock on the same project:
1. Notify the Engineer in writing prior to excavating existing rock.
2. Submit a process control plan, herein referred to as “Plan” consisting of the following:
   a. Locations where existing rock will be removed from the roadway.
   b. Locations where existing rock will be used for new construction.
   c. Method of excavation, transport, and placement to ensure excavated rock will be kept separate from other approved stockpiles. Excavation methods that may result in damage to the rock rendering it unfit to be used as base will not be approved.
   d. Proposed measures to prevent contamination and segregation.
   e. Proposed locations and methods for constructing stockpiles for sampling and Testing.
   f. Method for sampling and reporting test results.
3. The Engineer will coordinate the review of the “Plan” with the District Materials Office.
4. Upon the Engineer’s review of the “Plan”, build a preliminary stockpile, not to exceed 1,000 cubic yards.
5. Collect and test a minimum of three samples from the preliminary stockpile. Once the stockpile has been sampled, do not add any additional material to the stockpile. Determine compliance with 200-2.1, with the exception of carbonate contents. Reject any stockpile if the Limerock Bearing Ratio (LBR) is less than 100. The Contractor QC laboratory will sample and test the preliminary stockpile to verify compliance with this Section.
6. If all test results meet the requirements of this Section, the Engineer will notify the Contractor in writing of the approved status of the preliminary stockpile based on the analysis of test data performed by the District Materials Office Contractor’s Quality Control Laboratory.
7. If the use of existing rock is approved, continue to produce additional stockpiles not exceeding 1,000 cubic yards. Ensure the rock meets the requirements of this Section by sampling and testing each new stockpile at a minimum frequency of one sample per 400 cubic yards. Once a stockpile has been sampled, do not add additional material to that stockpile. The District Materials Office Engineer may also perform sampling and testing. Materials will be accepted if test results meet the requirements of this Section.
8. After 10 consecutive quality control (QC) LBR test results meet the requirements of the Section and no individual LBR test is less than 120, the sampling and testing frequency may be reduced to a minimum frequency of one sample per 800 cubic yards for each stockpile. Notify the Engineer in writing prior to reducing testing frequency. If any QC LBR test result falls below 120 or a stockpile is rejected, revert to original sampling frequency of one sample per 400 cubic yards.

9. Construct a new preliminary stockpile if there is a change in material, conditions not addressed in the “Plan” are encountered, or if production varies from the approved “Plan”.

200-3 Equipment.

Use mechanical rock spreaders, equipped with a device that strikes off the rock uniformly to laying thickness, capable of producing even distribution. For crossovers, intersections and ramp areas; roadway widths of 20 feet or less; the main roadway area when forms are used and any other areas where the use of a mechanical spreader is not practicable; the Contractor may spread the rock using bulldozers or blade graders.

200-4 Transporting Rock.

Transport the rock to its point of use, over rock previously placed, if practicable, and dump it on the end of the preceding spread. Hauling and dumping on the subgrade will be permitted only when, in the Engineer’s opinion, these operations will not be detrimental to the subgrade.

200-5 Spreading Rock.

200-5.1 Method of Spreading: Spread the rock uniformly. Remove all segregated areas of fine or coarse rock and replace them with properly graded rock.

200-5.2 Number of Courses: When the specified compacted thickness of the base is greater than 6 inches, construct the base in multiple courses of equal thickness. Individual courses shall not be less than 3 inches. The thickness of the first course may be increased to bear the weight of the construction equipment without disturbing the subgrade.

If, through field tests, the Contractor can demonstrate that the compaction equipment can achieve density for the full depth of a thicker lift, and if approved by the Engineer, the base may be constructed in successive courses of not more than 8 inches compacted thickness.

The Engineer will base approval on results of a test section constructed using the Contractor’s specified compaction effort. Notify the Engineer prior to beginning construction of a test section. Construct a test section of the length of one LOT. Perform five QC density tests at random locations within the test section. At each test site, test the bottom 6 inches in addition to the entire course thickness. All QC tests and a Department Verification test must meet the density required by 200-7.2.1. Identify the test section with the compaction effort and thickness in the Logbook. Remove the materials above the bottom 6 inches, at no expense to the Department. The minimum density required on the thicker lift will be the average of the five results obtained on the thick lift in the passing test section. Maintain the exposed surface as close to “undisturbed” as possible; no further compaction will be permitted during the test preparation. If unable to achieve the required density, remove and replace or repair the test section to comply with the specifications at no additional expense to the Department. The Contractor may elect to place material in 6 inches compacted thickness at any time.

Once approved, a change in the source of base material will require the construction of a new test section. Do not change the compaction effort once the test section is approved. The Engineer will periodically verify the density of the bottom 6 inches during thick lift operations.

The Engineer may terminate the use of thick lift construction and instruct the Contractor to revert to the 6 inches maximum lift thickness if the Contractor fails to achieve satisfactory results or meet applicable specifications.
200-5.3 Rock Base for Shoulder Pavement: Unless otherwise permitted, complete all rock base shoulder construction at any particular location before placing the final course of pavement on the traveled roadway. When dumping material for the construction of a rock base on the shoulders, do not allow material capable of scarring or contaminating the pavement surface on the adjacent pavement. Immediately sweep off any rock material that is deposited on the surface course.

200-6 Compacting and Finishing Base.

200-6.1 General: Construct mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts and retaining wall systems meeting the requirements of 120-8.1, except replace “embankment” with “base”.

Construct shoulder-only areas, shared use paths, and sidewalks. Meet the requirements of 120-8.1 except replace “embankment” with “base” meeting the acceptance criteria of 200-7.2. Shoulders compacted separately shall be considered separate LOTS.

Construct base in sections of not less than 300 feet in length or for the full length of the base.

For construction of landside pavement lanes and parking lots, a LOT is defined as a single lift of finished base not to exceed 500 feet.

For construction of sidewalks areas, a LOT is defined as a single lift of finished base not to exceed 2,000 feet.

Isolated compaction operations will be considered as separate LOTS. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

200-6.1.1 Single Course Base: After spreading, scarify the entire surface, then shape the base to produce the required grade and cross-section, free of scabs and laminations, after compaction.

200-6.1.2 Multiple Course Base: Clean the first course of foreign material, then blade and bring it to a surface cross-section approximately parallel to the finished base. Before spreading any material for the upper courses, allow the Engineer to make density tests for the lower courses to determine that the required compaction has been obtained. After spreading the material for the top course, scarify finish and shape its surface to produce the required grade and cross-section, free of scabs and laminations, after compaction.

200-6.2 Moisture Content: When the material does not have the proper moisture content to ensure the required density, wet or dry it as required. When adding water, uniformly mix it in to the full depth of the course that is being compacted. During wetting or drying operations, manipulate, as a unit, the entire width and depth of the course that is being compacted.

200-6.3 Thickness Requirements: Within the entire limits of the length and width of the finished base, meet the specified plan thickness in accordance with the requirements of 200-7.3.1.2.

200-6.4 Correction of Defects:

200-6.4.1 Contamination of Base Material: If, at any time, the subgrade material becomes mixed with the base course material, dig out and remove the mixture, and reshape and compact the subgrade. Then replace the materials removed with clean base material, and shape and compact as specified above. Perform this work at no expense to the Department.

200-6.4.2 Cracks and Checks: If cracks or checks appear in the base, either before or after priming, which, in the opinion of the Engineer, would impair the structural efficiency of the base, remove the cracks or checks by rescarifying, reshaping, adding base material where necessary, and recompacting.

200-6.5 Compaction of Widening Strips: Where base construction consists of widening strips and the trench width is not sufficient to permit use of standard base compaction equipment, compact the base using vibratory compactors, trench rollers or other special equipment which will achieve the density requirements specified herein.
When multiple course base construction is required, compact each course prior to spreading material for the overlaying course.

200-7 Acceptance Program.

200-7.1 General Requirements: Meet the requirements of 120-10, except use 200-7.2 instead of 120-10.2, 200-7.3 instead of 120-10.3 and 200-7.4 instead of 120-10.4.

200-7.2 Acceptance Criteria:

200-7.2.1 Density: Within the entire limits of the width and depth of the base, obtain a minimum density in any LOT of 98 100% of modified Proctor maximum density as determined by ASTM D1557 FM 1-T180, Method D or the Pit Proctor when using the Pit Proctor option. For shoulder only areas and bike/shared use paths, obtain a minimum density of 95% of the modified Proctor maximum density as determined by ASTM D1557 FM 1-T180, Method or the Pit Proctor when using the Pit Proctor option.

200-7.2.2 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer reserves the right to conduct QA testing as necessary. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Quality Control</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Proctor Maximum Density</td>
<td>One per eight consecutive LOTs</td>
<td>One per 16 consecutive LOTs</td>
</tr>
<tr>
<td>Density</td>
<td>One per LOT</td>
<td>One per four LOTs</td>
</tr>
<tr>
<td>Roadway Surface</td>
<td>Ten per LOT</td>
<td>Witness</td>
</tr>
<tr>
<td>Roadway Thickness</td>
<td>Three per LOT</td>
<td>Witness</td>
</tr>
</tbody>
</table>

Mainline Pavement Lanes, Turn Lanes, Ramps, Parking Lots, Concrete Box Culverts and Retaining Wall Systems

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Quality Control</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Proctor Maximum Density</td>
<td>One per two LOTs</td>
<td>One per four LOTs</td>
</tr>
<tr>
<td>Density</td>
<td>One per LOT</td>
<td>One per two LOTs</td>
</tr>
<tr>
<td>Surface</td>
<td>Five per 500 feet</td>
<td>Witness</td>
</tr>
<tr>
<td>Thickness</td>
<td>Three per 1000</td>
<td>Witness</td>
</tr>
</tbody>
</table>

Shoulder-Only, Shared Use Path and Sidewalk Construction

200-7.2.3 Pit Proctor: In lieu of Modified Proctor Maximum Density testing at the roadway, notify the Engineer in writing that the Contractor option to use the Pit Proctor supplied by the Department will be used. The Modified Proctor maximum density frequency requirements of 200-7.2.2 shall not apply. The Department will determine the Pit Proctor from statistical analysis of the base rock Modified Proctor maximum density at Department approved mines. For posting of Mines and Pit Proctors for each calendar quarter refer to the State Materials Office internet website at [http://www.dot.state.fl.us/statematerialsoffice/](http://www.dot.state.fl.us/statematerialsoffice/). Use the current posted Pit Proctor value in lieu of the Modified Proctor maximum density required by 200-7.2.1. Use the current posted Pit Proctor value for density acceptance during the quarter corresponding to the
posting. Notify the Engineer in writing if returning to the provisions of 200-7.2 and 200-7.2.2 but do not re-elect to use the Pit Proctor until the start of the next calendar quarter.

200-7.3 Additional Requirements:

200-7.3.1 Quality Control Testing:

200-7.3.1.1 Modified Proctor Maximum Density Requirement: Collect enough material to split and create three two separate samples and retain two one for the Engineer if required for verification.’s Verification and Resolution testing until the Engineer accepts the 16 LOTs represented by the samples.

200-7.3.1.2 Depth and Surface Testing Requirements: Notify the Engineer a minimum of 24 hours before checking base depths and surface checking. Determine test locations including Stations and Offsets, using the Random Number generator approved by the Department. Do not perform depth and surface checks until the Engineer is present to witness. Enter test results into the Department’s database. Perform thickness check on the finished base or granular subbase component of a composite base. Provide traffic control, coring/boring equipment, and an operator for the coring/boring equipment. Traffic control is to be provided in accordance with the standard maintenance of traffic requirements of the Contract.

The thickness is considered deficient, if the measured depth is over 1/2 inch less than the specified thickness. Correct all deficient areas of the completed base by scarifying and adding additional base material. As an exception, if authorized by the Department, such areas may be left in place without correction and with no payment.

Check the finished surface of the base course with a template cut to the required crown and with a 15 foot straightedge laid parallel to the centerline of the road. Correct all irregularities greater than 1/4 inch to the satisfaction of the Engineer by scarifying and removing or adding rock as required, and recompact the entire area as specified hereinbefore.

200-7.3.1.3 Surface & Thickness Reduced Testing Frequency: When no Resolution testing is required for 12 consecutive verified LOTs, or if required, the QC test data was upheld, reduce the QC surface and/or thickness checks to one half the minimum requirements as stated in 200-7.2.2 (e.g., reduce frequency from ten per LOT to ten per two LOTs) by identifying the substantiating tests and notifying the Engineer in writing prior to starting reduced frequency of testing. If the Verification test fails, and QC test data is not upheld by Resolution testing the QC testing will revert to the original frequency of 200-7.2.2. The results of the Independent Verification testing will not affect the frequency of the QC testing.

200-7.3.2 Department Verification Tests:

200-7.3.2.1 Maximum Density: The Engineer will randomly select one of the remaining two split samples and test in accordance with FM 1-T180, Method D.

200-7.3.2.2 Thickness and Surface Testing Requirements: The Department will witness the base depth and surface checks to ensure compliance with 200-7.3.1.2. If the QC test results are not deficient as defined in 200-7.3.1.2, the LOT or 500-footsection will be accepted. If the QC test results are deficient, resolve deficiencies in accordance with 200-7.3.1.2. Repeat acceptance testing. Provide traffic control, coring/boring equipment, and an operator for the coring/boring equipment.

200-7.4 Verification Comparison Criteria and Resolution Procedures:

200-7.4.1 Modified Proctor Maximum Density: The Engineer will compare the Verification test results of 200-7.3.2.1 to the corresponding QC test results. If the test result is within 4.5 lb/ft³ of the QC test result, the LOTs will be verified. Otherwise, the Engineer will collect the Resolution split sample corresponding to the Verification sample tested. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing. The material will be sampled and tested in accordance with FM 1-T180, Method D. The Engineer will compare the Resolution Test results with the QC test results. If the Resolution Test result is within 4.5 lb/ft³ of the corresponding QC test result, the Engineer will use the QC test results for material acceptance purposes for each corresponding set of LOTs. If
the Resolution test result is not within 4.5 lb/ft³ of the corresponding QC test, the Engineer will collect the remaining Verification split sample for testing. Verification Test results will be used for material acceptance purposes for the LOTs in question.

200-7.4.2 Pit Proctor: When using the Pit Proctor option, the Engineer will select a random location to sample and test at the minimum frequency in the table below, to obtain an Independent Verification (IV) maximum density as determined by FM 1-T180, Method D. The Engineer will collect enough material to split and hold a sample for Resolution testing.

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Mainline Pavement Lanes, Turn Lanes, Ramps, Parking Lots, Concrete Box Culverts</th>
<th>Shoulder-Only, Shared Use Path and Sidewalk Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV-Modified Proctor</td>
<td>One per 16 consecutive LOTs</td>
<td>One per 4 consecutive LOTs</td>
</tr>
</tbody>
</table>

The Engineer will compare the IV results with the Pit Proctor. If the IV result is lower than or equal to the Pit Proctor plus 4.5 pcf, keep the option to use the Pit Proctor. If the IV result is more than 4.5 pcf higher than the Pit Proctor the Engineer will test the Resolution sample and compare the Resolution result with the Pit Proctor. If the Resolution result is lower than or equal to the Pit Proctor plus 4.5 pcf, keep the option to use the Pit Proctor. Otherwise return to the provisions of 200-7.2.2, 200-7.3.1.1, 200-7.3.2.1, and 200-7.4.1.

200-7.4.3 Density: When a Verification or Independent Verification density test does not meet the requirements of 200-7.2.1 (Acceptance Criteria), retest at a site within a 5 feet radius of the Verification test location and observe the following:

1. If the QC retest meets the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will accept the LOTs in question.

2. If the QC retest does not meet the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will rework and retest the material in that LOT. The Engineer will re-verify the LOTs in question.

3. If the QC retest and the Verification or Independent Verification test do not compare favorably, complete a new equipment-comparison analysis as defined in 120-10.1.1. Once acceptable comparison is achieved, retest the LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

200-7.4.4 Thickness and Surface Testing Requirements: Resolve deficiencies in accordance with 200-7.3.1.2.

200-8 Priming and Maintaining.

200-8.1 Priming: Apply the prime coat only when the base meets the specified density requirements and when the moisture content in the top half of the base does not exceed the optimum moisture of the base material. At the time of priming, ensure that the base is firm, unyielding and in such condition that no undue distortion will occur. Ensure the prime coat adheres to the base course.

200-8.2 Maintaining: Maintain the true crown and template, with no rutting or other distortion, while applying the surface course.
200-9 Calculations for Average Thickness of Base.
For bases that are not mixed in place, the Engineer will determine the average thickness from the measurements specified in 200-10.1, calculated as follows:

1. When the measured thickness is more than 1/2 inch greater than the design thickness shown on the typical cross-section in the Plans, it will be considered as the design thickness plus 1/2 inch.
2. Average thickness will be calculated per typical cross-section for the entire job as a unit.
3. Any areas of base left in place with no payment will not be included in the calculations.
4. Where it is not possible through borings to distinguish the base materials from the underlying materials, the thickness of the base used in the measurement will be the design thickness.

200-10 Method of Measurement.

200-10.1 General: There will be no separate measurement for work in this section as it is incidental to section 285. The quantity to be paid for will be the plan quantity, adjusted as specified below.

200-10.2 Authorized Normal Thickness Base: The surface area of authorized normal thickness base to be adjusted will be the plan quantity as specified above, omitting any areas not allowed for payment under the provisions of 200-6.3 and omitting areas which are to be included for payment under 200-10.3. The adjustment shall be made by adding or deducting, as appropriate, the area of base represented by the difference between the calculated average thickness, determined as provided in 200-9, and the specified normal thickness, converted to equivalent square yards of normal thickness base.

200-10.3 Authorized Variable Thickness Base: Where the base is constructed to a compacted thickness other than the normal thickness as shown on the typical section in the Plans, as specified in the Plans or ordered by the Engineer for providing additional depths at culverts or bridges, or for providing transitions to connecting pavements, the volume of such authorized variable thickness compacted base will be calculated from authorized lines and grades, or by other methods selected by the Engineer, converted to equivalent square yards of normal thickness base for payment.

200-11 Basis of Payment.
There will be no separate payment for work under this section as it is considered incidental to the project. Price and payment will be full compensation for all the work specified in this Section, including dust abatement, correcting all defective surface and deficient thickness, removing cracks and checks as provided in 200-6.4.2, the prime coat application as directed in 300-8, and the additional rock required for crack elimination.

Payment shall be made under:

Item 285-7 Optional Base - per Square Yard

END OF SECTION 200
285-1 Description.
Construct a base course equivalent to that shown on the typical sections and composed of one of the optional materials shown on the typical cross-sections.

285-2 Materials.
Meet the material requirements as specified in the Section covering the particular type of base to be constructed.

Graded Aggregate ............................................. Section 204
Asphalt .............................................................. Section 234
Limerock ........................................................... Section 911
Shell Base ......................................................... Section 911
Shell-Rock ......................................................... Section 911
Cemented Coquina ........................................... Section 911
Recycled Concrete Aggregate (RCA) ................ Section 911

285-3 Selection of Base Option.
The Plans will include typical cross-sections indicating the various types of base construction (material and thickness) allowable.
Select one base option as allowed for each typical cross-section shown in the Plans. Only one base option is permitted for each typical cross-section.
Notify the Engineer in writing of the base option selected for each typical cross-section at least 45 calendar days prior to beginning placement of base material.

285-4 Construction Requirements.
Construct the base in accordance with the Section covering the particular type of base to be constructed.

Graded Aggregate ............................................. Section 204
Asphalt .............................................................. Section 234
Limerock ........................................................... Section 200
Shell Base ......................................................... Section 200
Shell Rock ......................................................... Section 200
Cemented Coquina ........................................... Section 200
Recycled Concrete Aggregate (RCA) ................ Section 200

285-5 Variation in Earthwork Quantities.
The Plans will identify the optional materials used by the Department for determining the earthwork quantities (Roadway Excavation, Borrow Excavation, Subsoil Excavation, Subsoil Earthwork, or Embankment). The Department will not revise the quantities, for those items having final pay based on plan quantity, to reflect any volumetric change caused by the Contractor’s selection of a different optional material.

285-6 Thickness Requirements.
285-6.1 Measurements: For non-asphalt bases, meet the requirements of 200-7.3.1.2.
For subbases, meet the thickness requirements of 290-4.
The Engineer will determine the thickness of asphalt base courses in accordance with 234-8.1.
285-6.2 Correction of Deficient Areas: For non-asphalt bases, correct all areas of the completed base having a deficiency in thickness in excess of 1/2 inch by scarifying and adding
additional base material. As an exception, if authorized by the Engineer, such areas may be left in place without correction and with no payment.

For asphalt bases, correct all areas of deficient thickness in accordance with 234-8.

285-7 Calculation of Average Thickness of Base.

For bases that are not mixed in place, the Engineer will determine the average thickness from the measurements specified in 285-6.1, calculated as follows;

(a) When the measured thickness is more than 1/2 inch greater than the design thickness shown on the typical cross-section in the Plans, it will be considered as the design thickness plus 1/2 inch.

(b) Average thickness will be calculated per typical cross-section for the entire job as a unit.

(c) Any areas of base left in place with no payment will not be included in the calculations.

(d) Where it is not possible through borings to distinguish the base materials from the underlying materials, the thickness of the base used in the measurement will be the design thickness.

(e) For Superpave asphalt base course, the average spread rate of each course shall be constructed in compliance with 234-8.

285-8 Method of Measurement.

The quantity to be paid for will be the plan quantity area in square yards, omitting any areas where under-thickness is in excess of the allowable tolerance as specified in 285-6. The pay area will be the surface area, determined as provided above, adjusted in accordance with the following formula:

\[
\text{Pay Area} = \frac{\text{Calculated Average Thickness per 285-7}}{\text{Plan Thickness}} \times \text{Surface Area}
\]

The pay area shall not exceed 105% of the surface area.

There will be no adjustment of the pay area on the basis of thickness for base courses constructed utilizing mixed-in-place operations.

For Superpave asphalt base course, the quantity to be paid for will be the plan quantity.

285-9 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section, including tack coat between base layers, prime coat, cover material for prime coat, bituminous material used in bituminous plant mix, and cement used in soil-cement.

Where the Plans include a typical cross-section which requires the construction of an asphalt base only, price adjustments for bituminous material provided for in 9-2.1.2 will apply to that typical cross-section. For typical cross-sections which permit the use of asphalt or other materials for construction of an optional base, price adjustments for bituminous material provided for in 9-2.1.2 will not apply.

Payment will be made under:

Item 285-7-1 Optional Base Course 1, 4-Inch Limerock – per Square Yard
Item 285-7-9 Optional Base Course 9, 10-inch Limerock – per Square Yard

END OF SECTION 285
SECTION 300
PRIME AND TACK COATS

300-1 Description.
Apply bituminous prime coats on previously prepared landside bases, and apply bituminous tack coats on previously prepared landside bases and on existing landside pavement surfaces.

300-2 Materials.
300-2.1 Prime Coat: For prime coat, use a product listed on the Department’s Approved Product List (APL), meeting the requirements of 916-2, or other types and grades of bituminous material if specified in the Contract Documents.
Where prime coats are to be diluted, certify that the dilution was done in accordance with the specific dilution requirements for each product and for each load of material used.

The Contractor may select any of the approved prime coats unless the Contract Documents indicate the use of a specific material. The Engineer may allow types and grades of bituminous material other than those specified above if the Contractor can show the alternate material will properly perform the function of prime coat material.

300-2.2 Cover Material for Prime Coat: Uniformly cover the primed base by a light application of cover material. However, if using EPR-1 prime material, the Engineer may waive the cover material requirement if the primed base is not exposed to general traffic and construction traffic does not mar the prime coat so as to expose the base. The Contractor may use either sand or screenings for the cover material. For the sand, meet the requirements as specified in 902-2 or 902-6, and for the screenings, meet the requirements as specified in 902-5. If the primed base course will be exposed to general traffic, apply a cover material that has been coated with 2 to 4% asphalt cement. Apply the asphalt coated material at approximately 10 lb/yd². Roll the entire surface of asphalt coated prime material with a traffic roller as required to produce a reasonably dense mat.

300-2.3 Tack Coat: Unless the Contract Documents call for a specific type or grade of tack coat, use PG 52-28 meeting the requirements of 916-1, heated to a temperature of 250 to 300°F or use an undiluted emulsion listed on the APL, meeting the requirements of 916-2. Heat the emulsion to the temperature recommended by the tack coat manufacturer.
For night paving, use PG 52-28 tack coat. The Engineer may approve an emulsified tack coat for night paving if the Contractor demonstrates, at the time of use, that the emulsion will break and not affect the progress of the paving operation.

300-3 Equipment.
300-3.1 Pressure Distributor: Provide a pressure distributor that is equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface. Ensure that the distance between the centers of openings of the outside nozzles of the spray bar is equal to the width of the application required, within an allowable variation of 2 inches. Ensure that the outside nozzle at each end of the spray bar has an area of opening not less than 25% or more than 75% in excess of the other nozzles. Ensure that all other nozzles have uniform openings. When the application covers less than the full width, the Contractor may allow the normal opening of the end nozzle at the junction line to remain the same as those of the interior nozzles.

300-3.2 Sampling Device: Equip all pressure distributors and transport tanks with an approved spigot-type sampling device.

300-3.3 Temperature Sensing Device: Equip all pressure distributors and transport tanks with an approved dial type thermometer.

Use a thermometer with a temperature range from 50 to 500°F with maximum
25°F increments with a minimum dial diameter of 2 inches. Locate the thermometer near the midpoint in length and within the middle third of the height of the tank, or as specified by the manufacturer (if in a safe and easily accessible location). Enclose the thermometer in a well with a protective window or by other means as necessary to keep the instrument clean and in the proper working condition.

300-4 Contractor’s Quality Control.

Provide the necessary quality control of the prime and tack coats and application in accordance with the Contract requirements. If the rate of application varies by more than 5% from the rate set by the Engineer or varies beyond the range established in 300-7 or 300-8, immediately make all corrections necessary to bring the spread rate into the acceptable range. The Engineer may take additional measurements at any time. The Engineer will randomly check the Contractor’s measurement to verify the spread rate.

300-5 Cleaning Base and Protection of Adjacent Work.

Before applying any bituminous material, remove all loose material, dust, dirt, caked clay and other foreign material which might prevent proper bond with the existing surface for the full width of the application. Take particular care in cleaning the outer edges of the strip to be treated, to ensure that the prime or tack coat will adhere.

When applying the prime or tack coat adjacent to curb and gutter, valley gutter, or any other concrete surfaces, cover such concrete surfaces, except where they are to be covered with a bituminous wearing course, with heavy paper or otherwise protect them as approved by the Engineer, while applying the prime or tack coat. Remove any bituminous material deposited on such concrete surfaces.

300-6 Weather Limitations.

Do not apply prime and tack coats when the air temperature in the shade and away from artificial heat is less than 40°F at the location where the application is to be made or when weather conditions or the surface conditions are otherwise unfavorable.

300-7 Application of Prime Coat.

300-7.1 General: Clean the surface to be primed and ensure that the moisture content of the base does not exceed the optimum moisture. Heat the prime coat material to the temperature recommended by the prime coat manufacturer. Apply the material with a pressure distributor. Determine the application amount based on the character of the surface. Use an amount sufficient to coat the surface thoroughly and uniformly with no excess.

300-7.2 Rate of Application:

300-7.2.1 Limerock, Limerock Stabilized, and Local Rock Bases: For these bases, use a rate of application that is not less than 0.10 gal/yd², unless a lower rate is directed by the Engineer. Determine the application rate at the beginning of each day’s production, and as needed to control the operation, a minimum of twice per day.

300-7.2.2 Sand-Clay, Shell and Shell Stabilized Bases: For these bases, use a rate of application that is not less than 0.15 gal/yd², unless a lower rate is directed by the Engineer. Determine the application rate at the beginning of each day’s production, and as needed to control the operation, a minimum of twice per day.

300-7.3 Sprinkling: If so required by the Engineer, lightly sprinkle the base with water and roll it with a traffic roller in advance of the application of the prime coat.

300-7.4 Partial Width of Application: If traffic conditions warrant, the Engineer may require that the application be made on only 1/2 the width of the base at one time, in which case use positive means to secure the correct amount of bituminous material at the joint.
300-8 Application of Tack Coat.

300-8.1 General: Where the Engineer requires a tack coat prior to laying a bituminous surface, apply the tack coat as specified herein below.

300-8.2 Where Required: Place a tack coat on all asphalt layers prior to constructing the next course. In general, the Engineer will not require a tack coat on primed bases except in areas that have become excessively dirty and cannot be cleaned, or in areas where the prime has cured to the extent that it has lost all bonding effect.

300-8.3 Method of Application: Apply the tack coat with a pressure distributor except that on small jobs, if approved by the Engineer, apply it by other mechanical devices or by hand methods. Heat the bituminous material to a suitable temperature as designated by the Engineer, and apply it in a thin, uniform layer.

300-8.4 Rate of Application: Use a rate of application as defined in Table 300-1. Control the rate of application to be within plus or minus 0.01 gallon per square yard of the target application rate. The target application rate may be adjusted by the Engineer to meet specific field conditions. Determine and record the rate of application a minimum of twice per day, once at the beginning of each day’s production and again as needed to control the operation. When using PG 52-28, multiply the target rate of application by 0.6.

<table>
<thead>
<tr>
<th>Table 300-1 Tack Coat Application Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Mixture Type</td>
</tr>
<tr>
<td>Base Course, Structural Course, Dense Graded Friction Course</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Open Graded Friction Course</td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

300-8.5 Curing and Time of Application: Apply the tack coat sufficiently in advance of the laying of the bituminous mix to permit drying, but do not apply the tack coat so far in advance that it might lose its adhesiveness as a result of being covered with dust or other foreign material.

300-8.6 Protection: Keep the tack coat surface free from traffic until the subsequent layer of bituminous hot mix has been laid.

300-9 Method of Measurement.

300-9.1 General: The bituminous material for prime and tack coat will not be measured for payment. The quantity specified will be the volume, in gallons of bituminous material actually applied and accepted. This spread rate will be determined from measurements made by the Contractor and verified by the Engineer based on tank calibrations, as specified in 300-9.2. Where it is specified that prime coat or tack coat material is to be diluted with water, the amount specified for the spread rate will be the volume after dilution.

300-9.2 Calibration of Tanks: Ensure that all distributors used for applying tack or prime coats are calibrated prior to use by a reliable and recognized firm engaged in calibrating tanks. Provide a certification of calibration and the calibration chart to the Engineer prior to use. In lieu of a volumetrically calibrated distributor, use a distributor that is equipped with a calibrated meter and is approved by the Engineer.

300-9.3 Temperature Correction: Measure the volume and increase or decrease the...
volume actually measured to a corrected volume at a temperature of 60ºF.
Make the correction for temperature by applying the applicable conversion factor
(K), as shown below.
For petroleum oils having a specific gravity (60ºF/60ºF) above 0.966, K = 0.00035
per degree.
For petroleum oils having a specific gravity (60ºF/60ºF) of between 0.850 and
0.966, K = 0.00040 per degree.
For emulsified asphalt, K = 0.00025 per degree.
When volume-correction tables based on the above conversion factors are not
available, use the following formula in computing the corrections for volumetric change:
\[ V = \frac{V_1}{K(T - 60) + 1} \]
Where:
V = Volume of the bituminous material at 60ºF (pay volume).
V_1 = Volume of bituminous material as measured.
K = Correction factor (Coefficient of Expansion).
T = Temperature (in ºF), of the bituminous material when measured.

300-10 Basis of Payment.
There is no direct payment for the work specified in this Section, it is incidental to, and is
to be included in the other items of related work.

END OF SECTION 300
SECTION 320
HOT MIX ASPHALT – PLANT METHODS AND EQUIPMENT

320-1 General.
This Section specifies the basic equipment and operational requirements for hot mix asphalt (including warm mix asphalt) production facilities used in the construction of asphalt pavements and bases utilizing FDOT specifications. Establish and maintain a quality control system that provides assurance that all materials and products submitted for acceptance meet Contract requirements.

320-2 Quality Control (QC) Requirements.

320-2.1 Minimum Producer QC Requirements: Perform as a minimum the following activities:

1. Stockpiles:
   a. Assure materials are placed in the correct stockpile;
   b. Assure good stockpiling techniques;
   c. Inspect stockpiles for separation, contamination, segregation, and other similar items;
   d. Properly identify and label each stockpile.

2. Incoming Aggregate:
   a. Obtain gradations and bulk specific gravity (Gsb) values from aggregate supplier for reference;
   b. Determine the gradation of all component materials and routinely compare gradations and Gsb values to mix design.

3. Cold Bins:
   a. Calibrate the cold gate/feeder belt for each material;
   b. Determine cold gate/feeder belt settings;
   c. Observe operation of cold feeder for uniformity;
   d. Verify accuracy of all settings;
   e. Verify that the correct components are being used, and that all modifiers or additives or both are being incorporated into the mix.

4. Batch Plants:
   a. Determine percent used and weight to be pulled from each bin to assure compliance with the mix design;
   b. Check mixing time;
   c. Check operations of weigh bucket and scales.

5. Drum Mixer Plants:
   a. Determine aggregate moisture content;
   b. Calibrate the weigh bridge on the charging conveyor.

6. Control Charts: Maintain QC data and charts (updated daily) for all QC Sampling and Testing and make available upon demand. Provide the following charts:
   a. All components used to determine the composite pay factor (No. 8 sieve, No. 200 sieve, asphalt binder content, air voids, and density);
   b. Gradation of incoming aggregate;
   c. Gradation, asphalt binder content and maximum specific gravity ($G_{mm}$) of RAP;
   d. Any other test result or material characteristic (as determined by the Contractor) necessary for process control.

The above listed minimum activities are to be considered normal activities necessary to control the production of hot mix asphalt at an acceptable quality level. Depending on the type of process or materials, some of the activities listed may not be
necessary and in other cases, additional activities may be required. The frequency of these activities will also vary with the process and the materials. When the process varies from the defined process average and variability targets, the frequency of these activities will be increased until the proper conditions have been restored.

320-2.2 Minimum Process Control Testing Requirements: Perform, as a minimum, the following activities at the testing frequencies provided in Table 320-1. QC tests used in the acceptance decision may be used to fulfill these requirements.

| Table 320-1 |
| Asphalt Plant - Materials Testing Frequencies |
| --- | --- | --- |
| Material | Property | Minimum Testing Frequency |
| Aggregate | Gradation | Once per 1,000 tons of incoming aggregate |
| Asphalt Mix | Asphalt Binder Content | If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. * |
| Asphalt Mix | Bulk Specific Gravity (Gmb) | If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. * |
| Asphalt Mix | Gradation | If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. * |
| Asphalt Mix | Maximum Specific Gravity (Gmm) | If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. * |
| Asphalt Mix | Temperature | Each of first 5 loads, then once every 5 loads thereafter, per day per mix design. |
| RAP | Asphalt Binder Content | Once per 1,000 tons RAP |
| RAP | Gradation | Once per 1,000 tons RAP |
| RAP | Maximum Specific Gravity (Gmm) | Once per 5,000 tons RAP |

*If less than 100 tons of mix is produced on each of successive days of production, resulting in a cumulative quantity of greater than 100 tons, then perform the indicated test.

320-2.3 Personnel Qualifications: Provide QC Technicians in accordance with Specification 00 72 00 Section 100 405.

320-2.4 Hot Mix Asphalt Testing Laboratory Requirements: Furnish a fully equipped asphalt laboratory at the production site. The laboratory must be qualified under the Department's Laboratory Qualification Program, as described in Specification 00 72 00 Section 100 405. In addition, the laboratory shall meet the following requirements:

1. Area - The effective working area of the laboratory shall be a minimum of 180 square feet, with a layout of which will facilitate multiple tests being run simultaneously by two technicians. This area does not include the space for desks, chairs and file cabinets. Any variations shall be approved by the Engineer.

2. Lighting - The lighting in the lab must be adequate to illuminate all areas of
the work.

3. Temperature Control - Equip the lab with heating and air conditioning units that provide a satisfactory working environment.

4. Ventilation - Equip the lab with exhaust fans that will remove all hazardous fumes from within the laboratory in accordance with OSHA requirements.

5. Equipment and Supplies - Furnish the lab with the necessary sampling and testing equipment and supplies for performing contractor QC and Department Verification Sampling and Testing. A detailed list of equipment and supplies required for each test is included in the appropriate FDOT, AASHTO, or ASTM Test Method. In the event testing equipment goes out of service during production, the Contractor may elect to use replacement equipment at another laboratory qualified, as described in Specification 00 72 00 Section 100 405, for up to 72 hours upon notification of the Engineer.

6. Personal Computer - Provide a personal computer capable of running a Microsoft Excel™ spreadsheet program, along with a printer.

7. Communication - Provide a telephone and fax machine (with a private line) for the use of the testing facility’s QC personnel. In addition, provide an internet connection capable of uploading data to the Department’s database and for e-mail communications.

320-3 Requirements for All Plants.

320-3.1 General: Design, manufacture, coordinate, and operate the asphalt plant in a manner that will consistently produce a mixture within the required tolerances and temperatures specified.

320-3.2 Electronic Weigh Systems: Equip the asphalt plant with an electronic weigh system that: 1) has an automatic printout, 2) is certified every six months by an approved certified scale technician, and 3) meets monthly comparison checks with certified truck scales as specified in 320-3.2.4. Weigh all plant produced hot mix asphalt on the electronic weigh system, regardless of the method of measurement for payment.

Include, as a minimum, the following information on the printed delivery ticket:

(a) Sequential load number
(b) Project number
(c) Date
(d) Name and location of plant
(e) Mix design number
(f) Place for hand-recording mix temperature
(g) Truck number
(h) Gross, tare, and net tonnage per truck (as applicable) (i) Daily total tonnage of mix for the mix design

Print the delivery ticket with an original and at least one copy. Furnish the original to the Engineer at the plant and one copy to the Engineer at the paving site.

Utilize any one of the following three electronic weigh systems.

320-3.2.1 Electronic Weigh System on the Truck Scales: Provide an electronic weigh system on all truck scales, which is equipped with an automatic recordation system that is approved by the Engineer. Use scales of the type that directly indicate the total weight of the loaded truck. Use scales meeting the requirements for accuracy, condition, etc., of the Bureau of Weights and Measures of the Florida Department of Agriculture, and re-certify such fact every six months, either by the Bureau of Weights and Measures or by a registered scale technician.

320-3.2.2 Electronic Weigh System on Hoppers Beneath a Surge or Storage Bin: Provide an electronic weigh system on the hopper (hopper scales or load cells) beneath the surge or storage bin, which is equipped with an automatic recordation system approved by the Engineer.
320-3.2.3 Automatic Batch Plants with Printout: For batch plants, provide an approved automatic printer system which will print the individual or cumulative weights of aggregate and liquid asphalt delivered to the pugmill and the total net weight of the asphalt mix measured by hopper scales or load cell type scales. Use the automatic printer system only in conjunction with automatic batching and mixing control systems that have been approved by the Engineer.

320-3.2.4 Monthly Electronic Weigh System Comparison Checks: Check the accuracy of the electronic weighing system at the commencement of production and thereafter at least every 30 days during production by one of the following two methods and maintain a record of the weights in the Scale Check Worksheet.

320-3.2.4.1. Electronic Weigh System on Truck Scales:
(a) The Engineer will randomly select a loaded truck of asphalt mix, a loaded aggregate haul truck, or another vehicle type approved by the Engineer and record the truck number and gross weight from the Contractor’s delivery ticket.
(b) Weigh the selected truck on a certified truck scale, which is not owned by the Contractor and record the gross weight for the comparison check. If another certified truck scale is not available, the Engineer may permit another set of certified truck scales owned by the Contractor to be used. The Engineer may elect to witness the scale check.
(c) The gross weight of the loaded truck as shown on the Contractor’s delivery ticket will be compared to the gross weight of the loaded truck from the other certified truck scale. The maximum permissible deviation is 8 pounds per ton of load, based on the certified truck scale weight.
(d) If the distance from the asphalt plant to the nearest certified truck scale is enough for fuel consumption to affect the accuracy of the comparison checks, a fuel adjustment may be calculated by using the truck odometer readings for the distance measurement, and 6.1 miles per gallon for the fuel consumption rate, and 115 ounces per gallon for fuel weight.
(e) During production, when an additional certified truck scale is not available for comparison checks, the Engineer may permit the Contractor to weigh the truck on his certified scales used during production and then weigh it on another certified truck scale, as soon the other scale is available for the comparison checks.

In addition to the periodic checks as specified above, check the scales at any time the accuracy of the scales becomes questionable. When such inaccuracy does not appear to be sufficient to seriously affect the weighing operations, the Engineer will allow a period of two calendar days for the Contractor to conduct the required scale check. However, in the event the indicated inaccuracy is sufficient to seriously affect the mixture, the Engineer may require immediate shut-down until the accuracy of the scales has been checked and necessary corrections have been made. Include the cost of all scale checks in the bid price for asphalt concrete, at no additional cost to the Owner Department.

320-3.2.4.2. Electronic Weigh System on Hoppers Beneath a Surge or Storage Bin and Automatic Batch Plants with Printout:
(a) The Engineer will randomly select a loaded truck of asphalt mix and record the truck number, and the net weight of the asphalt mix from the Contractor’s delivery ticket.
(b) Weigh the selected truck on a certified truck scale, which is not owned by the Contractor and record the gross weight for the comparison check. If another certified truck scale is not available, the Engineer may permit another set of certified truck scales owned by the Contractor to be used. The Engineer may elect to witness the scale check.
(c) Deliver the asphalt mix to the project, then weigh the selected
empty truck on the same certified truck scales. Record the tare weight of the truck.

(d) Compare the net weight of the asphalt mix from the delivery ticket to the calculated net weight of the asphalt mix as determined by the certified truck scale weights. The maximum permissible deviation is 8 pounds per ton of load, based on the certified truck scale weight.

(e) Use the fuel adjustment as specified in 320-3.2.4.1(d), when the distance from the asphalt plant to the nearest certified truck scale is enough for fuel consumption to affect the accuracy of the comparison checks.

(f) During production, when an additional certified truck scale is not available for comparison checks, the Engineer may permit the Contractor to load a truck with aggregate from the pugmill, surge or storage bin, and follow the above procedures to conduct the comparison checks as soon as certified truck scale is available.

If the check shows a greater difference than the tolerance specified above, then recheck on a second set of certified scales. If the check and recheck indicate that the printed weight is out of tolerance, have a certified scale technician check the electronic weigh system and certify the accuracy of the printer. While the system is out of tolerance and before its adjustment, the Engineer may allow the Contractor to continue production only if provisions are made to use a set of certified truck scales to determine the truck weights.

320-3.3 Asphalt Binder: Meet the following requirements:

320-3.3.1 Transportation: Deliver the asphalt binder to the asphalt plant at a temperature not to exceed 370°F, and equip the transport tanks with sampling and temperature sensing devices meeting the requirements of 300-3.2.

320-3.3.2 Storage: Equip asphalt binder storage tanks to heat the liquid asphalt binder to the temperatures required for the various mixtures. Heat the material in such a manner that no flame comes in contact with the binder. Heat or insulate all pipe lines and fittings. Use a circulating system of adequate size to ensure proper and continuous circulation during the entire operating period. Locate a thermometer, reading from 200 to 400°F, either in the storage tank or in the asphalt binder feed line. Maintain the asphalt binder in storage within a range of 230 to 370°F in advance of mixing operations. Locate a sampling device on the discharge piping exiting the storage tank or at a location as approved by the Engineer.

320-3.4 Aggregate: Meet the following requirements:

320-3.4.1 Stockpiles: Place each aggregate component in an individual stockpile, and separate each from the adjacent stockpiles, either by space or by a system of bulkheads. Prevent the intermingling of different materials in stockpiles at all times. Identify each stockpile, including RAP, as shown on the mix design.

Form and maintain stockpiles in a manner that will prevent segregation. If a stockpile is determined to be segregated, discontinue the use of the material on the project until the appropriate actions have been taken to correct the problem.

320-3.4.2 Blending of Aggregates: Stockpile all aggregates prior to blending or placing in the cold feed bins. If mineral filler or hydrated lime is required in the mix, feed or weigh it in separately from the other aggregates.

320-3.4.2.1 Cold Feed Bin: Provide a separate cold feed bin for each component of the fine and coarse aggregate required by the mix design. Equip the cold feed bins with accurate mechanical means for feeding the aggregate uniformly into the dryer in the proportions required for the finished mix to maintain uniform production and temperature. When using RAP as a component material, prevent any oversized RAP from being incorporated into the completed mixture by the use of: a grizzly or grid over the RAP bin; in-line roller or impact crusher; screen; or other suitable means. If oversized RAP material appears in the completed recycled mix, take the appropriate corrective action immediately. If the
appropriate corrective actions are not immediately taken, stop plant operations.

Use separate bin compartments in the cold aggregate feeder that are constructed to prevent any spilling or leakage of aggregate from one cold feed bin to another. Ensure that each cold feed bin compartment has the capacity and design to permit a uniform flow of aggregates. Mount all cold feed bin compartments over a feeder of uniform speed, which will deliver the specified proportions of the separate aggregates to the drier at all times. If necessary, equip the cold feed bins with vibrators to ensure a uniform flow of the aggregates at all times.

320-3.4.2.2 Gates and Feeder Belts: Provide each cold feed bin compartment with a gate and feeder belt, both of which are adjustable to assure the aggregate is proportioned to meet the requirements of the mix design.

320-3.4.3 Screening Unit: Remove any oversized pieces of aggregate by the use of a scalping screen. Do not return this oversized material to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen. Ensure that the quantity of aggregates being discharged onto the screens does not exceed the capacity of the screens to actually separate the aggregates into the required sizes.

320-3.5 Dryer: Provide a dryer of satisfactory design for heating and drying the aggregate. Use a dryer capable of heating the aggregate to within the specified temperature range for any mix, and equip the dryer with an electric pyrometer placed at the discharge chute to automatically register the temperature of the heated aggregates.

320-3.6 Asphalt Binder Control Unit: Provide a satisfactory means, either by weighing, metering, or volumetric measuring, to obtain the proper amount of asphalt binder material in the mix, within the tolerance specified for the mix design.

320-3.7 Contractor’s Responsibilities: Acceptance of any automatic delivery ticket printout, electronic weight delivery ticket, other evidence of weight of the materials or approval of any particular type of material or production method will not constitute agreement by the Owner Department that such matters are in accordance with the Contract Documents and it shall be the Contractor’s responsibility to ensure that the materials delivered to the project are in accordance with the Contract Documents.

320-4 Additional Requirements for Batch Plants.

320-4.1 Heating and Drying: Heat and dry the aggregate before screening. Control the temperature of the aggregate so the temperature of the completed mixture at the plant falls within the permissible range allowed by this Section.

320-4.2 Gradation Unit: Provide plant screens capable of separating the fine and coarse aggregates and of further separating the coarse aggregate into specific sizes. In addition, equip the gradation unit with a scalping screen to restrict the maximum size of the aggregates. In the event that the plant is equipped with cold feed bins that are capable of adequately controlling the gradation of the mixture, the use of plant screens is optional.

320-4.3 Hot Bins: Provide storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. Provide hot bins with divided compartments to ensure separate and adequate storage of the appropriate fractions of the aggregate. Equip each compartment with an overflow chute of suitable size and location to prevent any backing up of material into other bins.

320-4.4 Weigh Box or Hopper: Equip the batch plant with a means for accurately weighing each bin size of aggregate and the mineral filler into the weigh box or hopper.

320-4.5 Pugmills: Utilize a pugmill capable of mixing the aggregate and the asphalt binder.
320-5 Additional Requirements for Drum Mixer Plants.

320-5.1 Weight Measurements of Aggregate: Equip the plant with a weigh-in-motion scale capable of measuring the quantity of aggregate (and RAP) entering the dryer.

320-5.2 Synchronization of Aggregate Feed and Asphalt Binder Feed: Couple the asphalt binder feed control with the total aggregate weight device, including the RAP feed, in such a manner as to automatically vary the asphalt binder feed rate as necessary to maintain the required proportions.

320-5.3 Hot Storage or Surge Bins: Equip the plant with either a surge bin or storage silo that is capable of storing an adequate amount of material to assure a uniform and consistent product.

320-6 Preparation of the Mixture.

320-6.1 Mixing: After the aggregate is dried and properly proportioned, mix the aggregate, along with any other components, with the asphalt binder to produce a thoroughly and uniformly coated mixture.

320-6.2 Storage: If necessary, store the asphalt mixture in a surge bin or hot storage silo for a maximum of 72 hours. For FC-5 mixtures, store the asphalt mixture in a surge bin or hot storage silo for a maximum of one hour.

320-6.3 Mix Temperature: Produce the mixture with a temperature within the master range as defined in Table 320-2.

320-6.3.1 Test Requirements: Determine the temperature of the completed mixture using a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. Locate a 1/4 inch hole on both sides of the truck body within the middle third of the length of the body, and at a distance from 6 to 10 inches above the surface supporting the mixture. If a truck body already has a hole located in the general vicinity of the specified location, use this hole. At the Engineer's discretion, the Contractor may take the temperature of the load over the top of the truck in lieu of using the hole in the side of the truck.

320-6.3.2 Test Frequency: The normal frequency for taking asphalt mix temperatures will be for each day, for each design mix on the first five loads and one out of every five loads thereafter. Take the temperature of the asphalt mix at the plant and at the roadway before the mix is placed at the normal frequency. Record the temperature on the front of the respective delivery ticket. The Engineer shall review the plant and roadway temperature readings and may require the Contractor to take additional temperature measurements at any time.

If any single load at the plant or at the roadway is within the master range shown in Table 320-2 but does not meet the criteria shown in Table 320-3 (for single measurements or the average of five consecutive measurements), the temperature of every load will be monitored until the temperature falls within the specified tolerance range in Table 320-3; at this time the normal frequency may be resumed. For warm mix asphalt, the Contractor may produce the first five loads of the production day and at other times when approved by the Engineer, at a hot mix asphalt temperature not to exceed 330°F for purposes of heating the asphalt paver. For this situation, the upper tolerances of Tables 320-2 and 320-3 as applied to the warm mix asphalt mix design do not apply.

320-6.3.3 Rejection Criteria: Reject any load or portion of a load of asphalt mix at the plant or at the roadway with a temperature outside of its respective master range shown in Table 320-2. Notify the Engineer of the rejection immediately.
### Table 320-2

<table>
<thead>
<tr>
<th>Location</th>
<th>Acceptable Temperature Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant</td>
<td>Mixing Temperature ±30°F</td>
</tr>
<tr>
<td>Roadway</td>
<td>Compaction Temperature ±30°F</td>
</tr>
</tbody>
</table>

### Table 320-3

<table>
<thead>
<tr>
<th>Mix Temperature Tolerance From Verified Mix Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Single Measurement</td>
</tr>
<tr>
<td>Average of Any Five Consecutive Measurements</td>
</tr>
</tbody>
</table>

320-7 Transportation of the Mixture.

Transport the mix in trucks of tight construction, which prevents the loss of material and the excessive loss of heat and previously cleaned of all foreign material. After cleaning, thinly coat the inside surface of the truck bodies with soapy water or an asphalt release agent as needed to prevent the mixture from adhering to the beds. Do not allow excess liquid to pond in the truck body. Do not use a release agent that will contaminate, degrade, or alter the characteristics of the asphalt mix or is hazardous or detrimental to the environment. Petroleum derivatives (such as diesel fuel), solvents, and any product that dissolves asphalt are prohibited. Provide each truck with a tarpaulin or other waterproof cover mounted in such a manner that it can cover the entire load when required. When in place, overlap the waterproof cover on all sides so that it can be tied down. Cover each load during cool and cloudy weather and at any time it appears rain is likely during transit with a tarpaulin or waterproof cover. Cover and tie down all loads of friction course mixtures.

END OF SECTION 320
SECTION 330
HOT MIX ASPHALT - GENERAL CONSTRUCTION REQUIREMENTS

330-1 Description.
This Section specifies the basic equipment and construction requirements for hot mix asphalt (including warm mix asphalt) pavements and bases. Establish and maintain a quality control system that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

330-2 Quality Control (QC) Requirements.
330-2.1 Minimum QC Requirements: Perform as a minimum, the following activities necessary to maintain process control and meet Specification requirements:

1. Pavement Density: Monitor and document the pavement temperature with an infrared temperature device so that compaction is completed before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement. Monitor and document the roadway density with either 6 inch diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of ten (10) times per each day of paving once per 1,500 feet of pavement.

2. Mix Temperature: Determine the mix temperature at the roadway for the first five loads and one out of every five loads thereafter.

3. Mix Spread Rate: Monitor the mix spread rate at the beginning of each day’s production, and as needed to control the operations, at a minimum of once per 200 tons placed. When determining the spread rate, use, at a minimum, an average of five truckloads of mix.

4. Pavement Texture: Monitor the pavement texture to minimize pavement segregation. Use density gauges, infrared temperature measurement devices, or roadway cores at the beginning of each day’s production, and as necessary, both at truck exchanges and during normal paving operations.

5. Reporting: Ensure the accuracy of the Quality Control Roadway Reports on a the Department’s approved form approved by the Engineer to reflect the actual surface area of the finished work and be in compliance with the requirements of the Contract Documents.

330-2.2 Personnel Qualifications: Provide QC Technicians in accordance with Section 014500 405.

330-3 Limitations of Operations.
330-3.1 Weather Limitations: Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the paving operations.

330-3.2 Limitations of Paving Operations:
330-3.2.1 General: Place the mixture only when the surface upon which it is to be placed has been previously prepared, is intact, firm, dry, clean, and the tack or prime coat, with acceptable spread rate, is properly broken or cured. Do not place friction course until the adjacent shoulder area has been dressed and grassed.

330-3.2.2 Ambient Air Temperature: Place the mixture only when the air temperature in the shade and away from artificial heat meets requirements of Table 330-1. The minimum ambient temperature requirement may be reduced by 5°F when using warm mix technology, if mutually agreed to by both the Engineer and the Contractor.
Table 330-1

<table>
<thead>
<tr>
<th>Layer Thickness or Asphalt Binder Type</th>
<th>Minimum Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1 inch</td>
<td>50</td>
</tr>
<tr>
<td>Any mixture &gt; 1 inch containing a PG asphalt binder having a high temperature designation ≥ 76°C</td>
<td>45</td>
</tr>
<tr>
<td>Any mixture &gt; 1 inch containing a PG asphalt binder having a high temperature designation &lt; 76°C</td>
<td>40</td>
</tr>
<tr>
<td>FC-5(1)</td>
<td>65</td>
</tr>
</tbody>
</table>

(1) As an exception, place the mixture at temperatures no lower than 60°F, only when approved by the Engineer based on the Contractor’s demonstrated ability to achieve a satisfactory surface texture and appearance of the finished surface. The minimum ambient temperature may be further reduced to 55°F when using warm mix technology, if agreed to by both the Engineer and the Contractor.

330-3.2.3 Rain and Surface Conditions: Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is water on the surface to be covered. Once the rain has stopped and standing water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in 320-6.3, the Contractor may then place the mixture caught in transit.

330-3.2.4 Wind: Do not place the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

330-4 Surface Preparation.

330-4.1 Cleaning: Prior to placing the mixture, clean the surface of the base or underlying pavement of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

330-4.1.1 Application over Asphalt Rubber Membrane Interlayer (ARMI): Where an asphalt mix is to be placed over a newly constructed ARMI, do not sweep or otherwise disturb the cover material prior to placing the asphalt mix, unless directed by the Engineer.

330-4.2 Tacking: Apply a tack coat on all existing pavement surfaces that are to be overlaid with an asphalt mix as specified in Section 300 and between successive layers of all asphalt mixes. Apply a tack coat on freshly primed bases only when so directed by the Engineer.

330-5 Paving Equipment.

330-5.1 General Requirements: Use equipment that is mechanically sound and capable of consistently meeting the requirements of these Specifications.

330-5.2 Asphalt Paver:

330-5.2.1 General: Provide an asphalt paver that is self-propelled, can be steered, and is equipped with a receiving and distribution hopper and a mechanical screed. Use a mechanical screed capable of adjustment to regulate the depth of material spread and to produce the desired cross-section.

330-5.2.2 Automatic Screed Control: For all asphalt courses placed with an asphalt paver, equip the paver with automatic longitudinal screed controls of either the skid type, traveling stringline type, or non-contact averaging ski type with a minimum length of 25
feet. On the final layer of asphalt base, overbuild, and structural courses, and for friction courses, use the joint matcher in lieu of the skid, traveling stringline, or non-contact averaging ski on all passes after the initial pass. Equip the asphalt paver with electronic cross slope controls.

330-5.2.3 Screed Width: Provide an asphalt paver having a screed width greater than 8 feet when required to pave full width lanes. Do not use extendable screed strike-off devices that do not provide preliminary compaction of the mat in place of fixed screed extensions. Use a strike-off device only on irregular areas that would normally be done by hand and on shoulders 5 feet or less in width. When using the strike-off device on shoulders in lieu of an adjustable screed extension, demonstrate the ability to obtain an acceptable texture, density, and thickness.

When using an extendable screed device to extend the screed’s width on the full width lane or shoulder by 24 inches or greater, the Engineer will require an auger extension, paddle, or kicker device unless written documentation from the manufacturer is provided that these are not necessary.

330-5.3 Rollers:

330-5.3.1 Steel-Wheeled Rollers: Provide compaction equipment capable of meeting the density requirements described in these Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a tandem steel-wheeled roller weighing 5 to 15 tons for breakdown rolling. For finish rolling, use a separate roller with a weight of 5 to 15 tons. Variations from these requirements shall be approved by the Engineer.

330-5.3.2 Traffic Rollers: Provide compaction equipment capable of meeting the density requirements described in the Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a self-propelled, pneumatic-tired traffic roller equipped with at least seven smooth-tread, low pressure tires, equipped with pads or scrapers on each tire. Maintain the tire pressure between 50 and 55 psi or as specified by the manufacturer. Use rollers with a minimum weight of 6 tons. Do not use wobble-wheeled rollers. Variations from these requirements shall be approved by the Engineer.

330-5.3.3 Prevention of Adhesion: Do not allow the mixture to adhere to the wheels of any rollers. Do not use fuel oil or other petroleum distillates to prevent adhesion. Do not use any method which results in water being sprinkled directly onto the mixture.

330-5.4 Coring Equipment: Furnish a suitable saw or drill for obtaining the required density cores.

330-5.5 Hand Tools: Provide the necessary hand tools such as rakes, shovels, and other similar tools, and a suitable means for keeping them clean. Do not use diesel fuel or other petroleum based solvents contained in an open container for cleaning purposes on the paver.

330-6 Placing Mixture.

330-6.1 Requirements Applicable to All Pavement Types:

330-6.1.1 Alignment of Edges: Place all asphalt mixtures by the stringline method to obtain an accurate, uniform alignment of the pavement edge. As an exception, pavement edges adjacent to curb and gutter or other true edges do not require a stringline. Control the unsupported pavement edge to ensure that it will not deviate more than plus or minus 1.5 inches from the stringline.

330-6.1.2 Paving Width: If necessary due to the traffic requirements, place the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, place the mixture to the full width with machines traveling in
echelon.

330-6.1.3 Mix Temperature: Maintain the temperature of the mix at the time of paving within the master range as defined in 320-6.3. The minimum frequency for taking mix temperatures on the roadway will be as indicated in 320-6.3. Any load or portion of a load of asphalt mix on the roadway with a temperature outside of the master range shall be rejected for use on the project. Immediately notify the Engineer of the rejection.

330-6.1.4 Speed of Paver: Establish the forward speed of the asphalt paver based on the rate of delivery of the mix to the roadway but not faster than the optimum speed needed to adequately compact the pavement.

330-6.1.5 Thickness and Spread Rate of Layers: Construct each layer as defined in the following table:

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>Specification Section and Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type SP</td>
<td>334-1</td>
</tr>
<tr>
<td>Type FC</td>
<td>337-8</td>
</tr>
<tr>
<td>Type B</td>
<td>234-8</td>
</tr>
<tr>
<td>ATPB</td>
<td>287-8</td>
</tr>
</tbody>
</table>

330-6.1.5.1 Thickness Control: Ensure the spread rate is within plus or minus 5% of the target spread rate. When determining the spread rate, use, at a minimum, an average of five truckloads of mix and at a maximum, an average of 10 truckloads of mix. When the average spread rate is beyond plus or minus 5% of the target spread rate, monitor the thickness of the pavement layer closely and adjust the construction operations.

When the average spread rate for two consecutive days is beyond plus or minus 5% of the target spread rate, stop the construction operation until the issue is resolved.

330-6.1.5.2 Maximum Spread Rate Tolerances: When an individual spread rate, measured in accordance with 330-6.1.5.1, is beyond plus or minus 20% of the target spread rate, stop the construction operation until the issue is resolved. Address the unacceptable pavement in accordance with 330-9.5. The following areas are exempt from a work stoppage solely on the calculated spread rate: median crossovers, turnouts, variable thickness overbuild courses, leveling courses, miscellaneous asphalt pavement, as well as, turn lanes and ramps less than 1,000 feet.

As an exception, the Engineer may allow the Contractor to leave areas in place if it is determined by the Engineer that the deficiency is not a significant detriment to the pavement quality. For areas of deficient thickness, a reduction to the pay item quantity will be made in accordance with 330-9.5.2.

330-6.1.6 Correcting Defects: Before starting any rolling, check the surface; correct any irregularities; remove all drippings, sand accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

330-6.1.7 Hand Work: In limited areas where the use of the paver is impossible or impracticable, the Contractor may place and finish the mixture by hand.

330-7 Compacting Mixture.

330-7.1 General Requirements: When density testing for acceptance is required, select equipment, sequence, and coverage (number of times the roller passes over a given area of pavement) of rolling to meet the specified density requirement. Regardless of the rolling
procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-7.2 Standard Rolling Procedure: When density testing for acceptance is not required, propose an alternative rolling pattern to be approved by the Engineer or use the following standard rolling procedure:

1. Breakdown rolling: Provide two static coverages with a tandem steel-wheeled roller, following as close behind the paver as possible without pick-up, undue displacement, or blistering of the material.

2. Intermediate rolling: Provide five static coverages with a pneumatic-tired roller, following as close behind the breakdown rolling operation as the mix will permit.

3. Finish rolling: Provide one static coverage with a tandem steel-wheeled roller, after completing the breakdown rolling and intermediate rolling, but before the surface pavement temperature drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-7.3 Rolling Procedures: Utilize procedures that will uniformly compact the pavement layer to the desired density level, while meeting the appropriate smoothness requirements, without damaging the pavement surface, crushing aggregate or leaving excessive roller marks, roller heads, or ripples. While rolling is in progress, monitor the surface continuously, and adjust the compaction operations to comply with the surface requirements.

330-7.4 Compaction of Areas Inaccessible to Rollers: Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, gutters, bridges, manholes, etc.

330-7.5 Correcting Defects: Do not allow the compaction equipment to deposit contaminants onto the pavement surface. Remove and replace any areas damaged by such deposits as directed by the Engineer. Correct any depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. Correct all defects prior to laying the subsequent course.

330-7.6 Use of Traffic Roller: Use a traffic roller on the first overbuild course. Use a traffic roller or vibratory roller (unless restricted by the Contract Documents) on the first structural layer placed on an ARMI.

330-7.7 Compaction at Bridge Structures: Compact asphalt mixtures placed over bridge decks and approach slabs using static compaction only. Utilize the standard rolling procedure described in 330-7.2 or an alternative procedure approved by the Engineer.

330-8 Joints.

330-8.1 General: When laying fresh mixture against the exposed edges of joints, place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

330-8.2 Transverse Joints: Place the mixture as continuously as possible to minimize transverse joints. When constructing permanent transverse joints, meet the surface requirements as defined in 330-9. Construct temporary transverse joints in such a manner to allow traffic to pass over it. When resuming the paving operation, construct a transverse joint by cutting back on the previously placed pavement at a location where the straightedge requirements are met. At the project limits, tie into the adjoining pavement layers as shown in the Plans.

330-8.3 Longitudinal Joints: Place each layer of pavement so that all longitudinal
construction joints are offset 6 to 12 inches laterally between successive layers. Plan offsets in advance so that longitudinal joints of the friction course are not in wheel path areas. The longitudinal joints for friction course layers should be within 6 inches of the lane edge or at the center of the lane. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

330-8.4 Placing Asphalt Next to Concrete Pavement: When placing asphalt next to concrete pavement, construct the joint as shown in the Plans.

330-9 Surface Requirements.

330-9.1 General: Construct a smooth pavement with good surface texture and the proper cross-slope.

330-9.2 Texture of the Finished Surface of Paving Layers: Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Address any pavement not meeting the requirements of this specification in accordance with 330-9.5.

For dense graded structural and friction course mixtures, in areas not defined to be a density testing exception per 334-5.1.2, obtain for the Engineer three 6 inch diameter roadway cores at locations visually identified by the Engineer to be segregated. The Engineer will Contractor’s testing laboratory shall determine the density of each core in accordance with FM 1-T 166 and calculate the percent $G_{mm}$ of the segregated area using the average $G_{mm}$ of the roadway cores and the QC subgroup $G_{mm}$ for the questionable material. If the average percent $G_{mm}$ is less than 90.0, address the segregated area in accordance with 330-9.5.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface unless the section is greater than or equal to one mile in length and across the full width of the pavement, including shoulders and turn lanes. Exceptions to these requirements will be permitted if approved by the Engineer.

330-9.3 Cross Slope: Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish an electronic level with a length of 4 feet and an accuracy of 0.1 degree, approved by the Engineer for the control of cross slope. Make this electronic level available at the jobsite at all times during paving operations.

330-9.3.1 QC Requirements: Calibrate the electronic levels a minimum of once per day before paving operations begin, in accordance with manufacturer’s instructions.

Compare the QC level with the Verification level before paving operations begin, and at any time as directed by the Engineer. If the comparison between the QC and Verification levels is within the comparison tolerance of plus or minus 0.2%, the QC level is considered to compare favorably and can be used for measurement and acceptance of cross slopes. If the levels do not compare favorably, perform a second comparison using another calibrated electronic level (FDOT or Contractor) for resolution. If this resolution level compares favorably with the QC level, the QC level is considered to be verified. If the second level does not compare favorably with the QC level, discontinue the use of the QC electronic level and obtain another approved electronic level that meets the requirements of this specification. Regardless of the comparison analysis outcome, the Contractor assumes all risk associated with placing the pavement at the correct cross slope.

Measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline or the face of the building. Record all measurements to the nearest 0.1% on the Cross Slope Measurement Data Form and submit to the Engineer for documentation.

1. Tangent Sections: Measure the cross slope at a minimum frequency of one measurement every 400 50 feet along paved areas at locations acceptable to
the Engineer per lane. Calculate the absolute deviation of each cross slope measurement and then average the absolute deviations of ten consecutive cross slope measurements. (The absolute deviation is the positive value of a deviation) When the average absolute deviation cross slope is consistently within the acceptance tolerance as shown in Table 330-4 and upon the approval of the Engineer, the frequency of cross slope measurements can be reduced to one measurement every 200 feet during paving operations.

2. Superelevated Sections: Measure the cross slope every 100 feet per lane within the length of the full superelevation. Calculate the absolute deviation of each measurement and then average the absolute deviations of ten consecutive cross slope measurements. For the transition sections, measure the cross slope at control points identified in the Plans, or if not shown in the Plans, at a control point at the location of 0.0% cross slope and calculate the absolute deviation. For curves where the length of full superelevation is less than 250 feet, measure the cross slope at the beginning point, midpoint and ending point of the fully superelevated sections, calculate the absolute deviation, and average. When the number of measurements is less than ten and the length of full superelevation is greater than 250 feet, average the absolute deviation of all measurements.

If the average absolute deviation of the cross slope measurements falls outside the acceptance tolerance, as shown in Table 330-4, stop the paving operation and make adjustments until the problem is resolved to the satisfaction of the Engineer. If an individual cross slope deviation falls outside the acceptance tolerance as shown in Table 330-4, make corrections at no cost to the Owner Department in accordance with 330-9.5 to address the deficient area of the structural course. Complete all corrections before placement of the final pavement surface layer, unless stated otherwise in the Plans, or as determined by the Engineer. For pavement with multiple layers, the deficient areas for the structural course may be left in place, upon the approval of the Engineer. For friction course layers, make corrections in accordance with 330-9.5.

If the average absolute deviation of the cross slope measurements falls outside the acceptance tolerance, as shown in Table 330-4, stop the paving operation and make adjustments until the problem is resolved to the satisfaction of the Engineer. If an individual cross slope deviation falls outside the acceptance tolerance as shown in Table 330-4, make corrections at no cost to the Owner Department in accordance with 330-9.5 to address the deficient area of the structural course. Complete all corrections before placement of the final pavement surface layer, unless stated otherwise in the Plans, or as determined by the Engineer. For pavement with multiple layers, the deficient areas for the structural course may be left in place, upon the approval of the Engineer. For friction course layers, make corrections in accordance with 330-9.5.

The limits of deficient areas requiring correction may be verified and adjusted with more accurate measurement methods, including survey instruments, upon approval by the Engineer at no cost to the Owner Department.

Should the Contractor wish to have any corrections waived, submit a request to the Engineer for approval. The Engineer may waive the corrections at no reduction in payment if the deficiencies are sufficiently separated so as not to affect the overall traffic safety, surface drainage and ride quality characteristics of the pavement and the corrective action would unnecessarily mar the appearance of the finished pavement.

For intersections, tapers, crossovers, transitions at the beginning and end of the project, bridge approaches and similar areas, adjust the cross slope to match the actual site conditions, or as directed by the Engineer.

<table>
<thead>
<tr>
<th>Roadway Feature</th>
<th>Individual Absolute Deviation</th>
<th>Average Absolute Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangent section (including turn lanes)</td>
<td>0.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Superelevated curve</td>
<td>0.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Shoulder</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

In the event that the distance between two edges of deficient areas is less than 100 feet, the correction work shall include the area between the deficient sections.

330-9.3.2 Verification: The Engineer reserves the right to perform verification testing as they deem appropriate. The Engineer will verify the Contractor’s cross slope...
measurements by randomly taking a minimum of ten cross slope measurements per lane per mile in tangent sections, control points in transition sections, and a minimum of three cross slope measurements on fully superelevated sections over a day's production. The Engineer will measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. If the average absolute deviation or an individual cross slope deviation falls outside of the acceptance tolerance as shown in Table 330-4, immediately make a comparison check at the QC test locations to verify the QC measurements in the section. If the comparisons are beyond the acceptable comparison tolerance in accordance with 330-9.3.1, stop the paving operations until the issue is resolved to the satisfaction of the Engineer. Correct any cross slope not meeting the individual deviation acceptance tolerance in accordance with 330-9.5 at no cost to the Department. The Engineer reserves the right to check the pavement cross slope at any time by taking cross slope measurements at any location.

330-9.4 Pavement Smoothness:

330-9.4.1 General: Construct a smooth pavement meeting the requirements of this Specification.

330-9.4.2 Test Method: The Contractor shall perform all straightedge testing in accordance with FM 5-509 in the outside wheel path of each lane. The Engineer may require additional testing at other locations within the lane.

330-9.4.3 Traffic Control: Provide traffic control in accordance with the Plans Section 102 and the Design Standards Index Nos. 607 or 619 during all testing. When traffic control cannot be provided in accordance with Index Nos. 607 or 619, submit an alternative Traffic Control Plan for review and approval by the Engineer as specified in 102-4. Include the cost of this traffic control in the Contract bid prices for the asphalt items.

330-9.4.4 Process Control Testing: Assume full responsibility for controlling all paving operations and processes such that the requirements of these Specifications are met at all times.

330-9.4.5 QC Testing:

330-9.4.5.1 General: Straightedge the final Type SP structural layer and friction course layer in accordance with 330-9.4.2, with the exception that if the method of acceptance is by laser profiler, then straightedging of the friction course layer is not required. Test all pavement lanes and ramps where the width is constant and document all deficiencies in excess of 3/16 inch on a form approved by the Engineer.

330-9.4.5.2 Straightedge Exceptions: Straightedge testing will not be required in the following areas: shoulders, intersections, tapers, crossovers, sidewalks, shared use paths, parking lots and similar areas, or in the following areas when they are less than 250 feet in length: turn lanes, acceleration/deceleration lanes and side streets. The limits of the intersection will be from stop bar to stop bar for both the mainline and side streets.

As an exception, in the event the Engineer identifies a surface irregularity in the above areas that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8 inch in accordance with 330-9.5.

The Engineer may waive straightedge requirements for transverse joints at the beginning and end of the project, at the beginning and end of bridge structures, at manholes, and at utility structures if the deficiencies are caused by factors beyond the control of the Contractor, as determined by the Engineer. In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.
330-9.4.5.3 Intermediate Layers and Temporary Pavement: When the design speed is 55 mph or greater and the intermediate Type SP layer or temporary pavement is to be opened to traffic, if the Engineer identifies a surface irregularity that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8 inch within 72 hours of placement in accordance with 330-9.5.

330-9.4.5.4 Final Type SP Structural Layer: Straightedge the final Type SP structural layer in accordance with 330-9.4.2, either behind the final roller of the paving train or as a separate operation. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straight edging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5.

When the final structural course is to be opened to traffic and the design speed is 55 mph or greater, if any defect is 3/8 inch or greater, the Engineer may require deficiencies to be corrected within 72 hours after opening to traffic.

330-9.4.5.5 Friction Course Layer: Where required per 330-9.4.5.1, straightedge the friction course layer in accordance with 330-9.4.2, either behind the final roller of the paving train or as a separate operation upon completion of all paving operations. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straightedging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5.

330-9.4.6 Acceptance:

330-9.4.6.1 Straightedge Acceptance: For areas of roadways, access driveways, and parking lots where the design speed is less than 55 miles per hour, acceptance for pavement smoothness of the friction course will be based on verified QC measurements using the straightedge as required by 330-9.4.5. The Engineer will verify the straightedge testing by observing the QC straightedging operations.

330-9.4.6.2 Laser Acceptance: For areas of high speed roadways where the design speed is equal to or greater than 55 miles per hour, acceptance testing for pavement smoothness of the friction course (for mainline traffic lanes only) will be based on the Laser Profiler. Ramps, acceleration and deceleration lanes, and other areas not suitable for testing with the Laser Profiler will be tested and accepted with the straightedge in accordance with 330-9.4.5.5 and 330-9.4.6.1.

The pavement smoothness of each lane will be determined by a Laser Profiler furnished and operated by the Department in accordance with FM 5-549 and a report issued with the Ride Number (RN) reported to one decimal place. If corrections are made, as required following Laser Acceptance, the pavement will not be retested for smoothness using the Laser Profiler.

For this testing, the pavement will be divided into 0.1 mile segments. Partial segments equal to or greater than 0.01 mile will be considered as a 0.1 mile segment. The pavement will be accepted as follows:

1) For segments with a RN greater than or equal to 4.0, the pavement will be accepted at full pay.
2) For segments with a RN less than 4.0, the Engineer will further evaluate the data in 0.01 mile intervals for both wheel paths.
   - If the RN is 3.5 or above for all 0.01 mile intervals in both wheel paths, the segment will be accepted at full payment.
   - If the RN is less than 3.5 for one or more 0.01 mile intervals, the segment will be tested with the rolling straightedge in both wheel paths in...
accordance with FM 5-509. If approved by the Engineer, this straightedging may be completed (in both wheel paths) as part of the QC straightedging operations described in 330-9.4.5.5, prior to testing with the laser profiler. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straightedging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.6.

Test and accept areas at the beginning and ending of the project, bridge approaches and departures, and areas where the segment is less than 0.01 mile, with the straightedge in accordance with 330-9.4.5.5 and 330-9.4.6.1.

330-9.4.6.3 Grade Acceptance: Pavement spot elevations (or grade) will be evaluated to determine the acceptability of finished pavements. The Contractor shall obtain spot elevations of the finished pavement surface on a 25-foot grid spacing, or as specified elsewhere in the Contract Documents, and at all grade breaks and edges of pavement. This survey shall be conducted by a Florida licensed surveyor. If more than 15% of the spot elevations within a given LOT are more than ½ inch off of plan grade, the LOT will be considered unacceptable and the failed area(s) shall be removed and replaced at no additional cost to the Owner. If a single spot elevation within a LOT is more than 1 inch off of plan grade then that LOT will be considered unacceptable and the failed area(s) shall be removed and replaced at no additional cost to the Owner.

330-9.5 Unacceptable Pavement:
330-9.5.1 Corrections: Address all areas of unacceptable pavement at no cost to the Owner Department. Retest all corrected areas and assure the requirements of these Specifications are met.

330-9.5.1.1 Structural Layers: Correct all deficiencies, as defined in these Specifications, in the Type SP structural layers by removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane.

As an option, for high straightedge deficiencies only, mill the pavement surface the full lane width to a depth and length that is adequate to remove the deficiency. This option only applies if the structural layer is not the final surface layer.

330-9.5.2 Friction Course: Correct deficiencies in the friction course or final surface layer by removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane. As an exception, the Engineer may allow the Contractor to leave these areas in place if it is determined by the Engineer that the deficiency is not a significant detriment to the pavement quality. A reduction to the pay item quantity will be made in accordance with 330-9.5.2.

330-9.5.2 Reduction in Pay Item Quantity: There will be no adjustments in pay factor or pay item quantity. All deficient asphalt shall be removed and replaced. When the Engineer elects to waive corrections, the Department will reduce the pay quantity for the pay item in question by the amount of material that the Contractor would have removed and replaced had the correction been made. When the pay quantity is in tons, the Department will base the reduction on the volume of material that the Contractor would have removed (the length by the lane width by layer thickness) multiplied by the maximum specific gravity of the mix as determined through the following equation:

\[ \text{Quantity (tons)} = L \times W \times t \times G_{\text{max}} \times 0.0024 \]

Where: \( L = \) Lane length (ft.) \( W = \) Lane width (ft.)
For FC-5 open-graded friction course, the Owner Department will base the reduction on the area that the Contractor would have removed (the length by lane width) multiplied by a spread rate of 80 lb/yd² as determined through the following equation:

\[ \text{Quantity (tons)} = L \times W \times 0.0044 \]

Where: 
- \( L \) = Lane length (ft.)
- \( W \) = Lane width (ft.)

330-10 Protection of Finished Surface.

Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.

Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

Equip blade graders operating adjacent to the pavement during shoulder construction with a 2 inch by 8 inch or larger board, or other attachment providing essentially the same results, attached to their blades in such manner that it extends below the blade edge in order to protect the pavement surface from damage by the grader blade.

To prevent rutting or other distortion, protect sections of newly finished dense-graded friction course and the last structural layer prior to the friction course from traffic until the surface temperature has cooled below 160ºF.

The Contractor may use artificial methods to cool the pavement to expedite paving operations. The Engineer Department may direct the Contractor to use artificial cooling methods when maintenance of traffic requires opening the pavement to traffic at the earliest possible time.

END OF SECTION 330
SECTION 334
SUPERPAVE ASPHALT CONCRETE

334-1 Description.

334-1.1 General: Construct a Superpave Asphalt Concrete pavement with the type of mixture specified in the Contract Documents, or when offered as alternates, as selected. Superpave mixes are identified as Type SP-12.5 or Type SP-19.0.

Obtain Superpave Asphalt Concrete from a plant that is currently on the Department’s Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. Producers must meet the requirements of Section 320 for plant and equipment and the general construction requirements of Section 330.

334-1.2 Traffic Levels: The requirements for Type SP Asphalt Concrete mixtures are based on the design traffic level of the project, expressed in 18,000 pound Equivalent Single Axle Loads (ESAL’s). The five traffic levels are as shown in Table 334-1.

<table>
<thead>
<tr>
<th>Traffic Level</th>
<th>Traffic Level (1x10^6 ESAL’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≤0.3</td>
</tr>
<tr>
<td>B</td>
<td>0.3 to &lt;3</td>
</tr>
<tr>
<td>C</td>
<td>3 to &lt;10</td>
</tr>
<tr>
<td>D</td>
<td>10 to &lt;30</td>
</tr>
<tr>
<td>E</td>
<td>≥30</td>
</tr>
</tbody>
</table>

The traffic levels for the project are as specified in the Contract Documents. Traffic Level B shall be the minimum used for this project. A Type SP mix one traffic level higher than the traffic level specified in the Contract Documents may be substituted, at no cost to the Owner Department (i.e., Traffic Level C may be substituted for Traffic Level B, etc.).

334-1.3 Gradation Classification: The Superpave mixes are classified as fine and are defined in 334-3.2.2.

The equivalent AASHTO nominal maximum aggregate size Superpave mixes are as follows:

- Type SP-12.5 ........................................................... 12.5 mm
- Type SP-19.0 ........................................................... 19.0 mm

334-1.4 Thickness: The total thickness of the Type SP asphalt layers will be the plan thickness as shown in the Contract Documents. Before paving, propose a thickness for each individual layer meeting the requirements of this specification, which when combined with other layers (as applicable) will equal the plan thickness. For construction purposes, the plan thickness and individual layer thickness will be converted to spread rate based on the maximum specific gravity of the asphalt mix being used, as well as the minimum density level, as shown in the following equation:

\[
\text{Spread rate (lbs/\text{yd}^2)} = t \times G_{\text{mm}} \times 43.3
\]

Where: \( t \) = Thickness (in.) (plan thickness or individual layer thickness)

\( G_{\text{mm}} \) = Maximum specific gravity from the verified mix design

The weight of the mixture shall be determined as provided in 320-3.2. For target purposes only, spread rate calculations should be rounded to the nearest whole number.
Note: Plan quantities are based on a $G_{mm}$ of 2.540, corresponding to a spread rate of 110 lbs/yd$^2$-in. Pay quantities will be based on the actual maximum specific gravity of the mix being used.

334-1.4.1 Layer Thicknesses - Fine Mixes: The allowable layer thicknesses for fine Type SP Asphalt Concrete mixtures are as follows:

- Type SP-12.5 ........................................ 1-1/2 to 2-1/2 inches
- Type SP-19.0 ....................................... 2 to 3-1/2 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on fine mixes when used as a structural course:

- Type SP-9.5 – May not be used on Traffic Level D and E applications.
- Type SP-19.0 – May not be used in the final (top) structural layer below FC-5 mixtures.
- Type SP-19.0 mixtures are permissible in the layer directly below FC-9.5 and FC-12.5 mixtures.

334-1.4.2 Additional Requirements: The following requirements also apply to Type SP Asphalt Concrete mixtures:

1. A minimum 1-1/2 inch initial lift is required over an Asphalt Rubber Membrane Interlayer (ARMI).
2. When construction includes the paving of adjacent shoulders (less than or equal to 5 feet wide), the layer thickness for the upper pavement layer and shoulder must be the same and paved in a single pass, unless called for differently in the Contract Documents.
3. All overbuild layers must be fine Type SP Asphalt Concrete designed at the traffic level as stated in the Contract Documents. Use the minimum and maximum layer thicknesses as specified above unless called for differently in the Contract Documents. On variable thickness overbuild layers, the minimum and maximum allowable thicknesses will be as specified below, unless called for differently in the Contract Documents.
   - Type SP-12.5 ........................................ 1/2 to 3 inches
   - Type SP-19.0 ....................................... 1-1/2 to 3-1/2 inches

4. Variable thickness overbuild layers constructed using a SP-12.5 mixtures may be tapered to zero thickness provided the contract documents require a minimum of 1-1/2 inches of dense-graded mix placed over the variable thickness overbuild layer.

334-2 Materials.

334-2.1 General Requirements: Meet the material requirements specified in FDOT Standard Specifications Division III. Specific references are as follows:

- Superpave PG Asphalt Binder .................................. Section 916
- Coarse Aggregate ............................................. Section 901
- Fine Aggregate ................................................ Section 902

334-2.2 Superpave Asphalt Binder: Unless specified otherwise in the Contract Documents, use a PG 67-22 asphalt binder. In addition, meet the requirements of 334-2.3.

334-2.3 Reclaimed Asphalt Pavement (RAP) Material:

334-2.3.1 General requirements: RAP may be used as a component of the asphalt mixture, subject to the following requirements:

1. When using a PG 76-22 (PMA), or PG 76-22 (ARB), or PG 82-22 (PMA) asphalt binder, limit the amount of RAP material used in the mix to a maximum of 20% by weight of total aggregate. As an exception, amounts greater than 20% RAP by weight of total aggregate can be used if no more than 20% by weight of the total asphalt binder comes from the RAP material.

2. Assume full responsibility for the design, production and construction of asphalt mixes which incorporate RAP as a component material.

3. Use RAP from a Department approved stockpile or millings from a
4. Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.

5. Provide RAP material having a minimum average asphalt binder content of 4.0% by weight of RAP. As an exception, when using fractionated RAP, the minimum average asphalt binder content for the coarse portion of the RAP shall be 2.5% by weight of the coarse portion of the RAP. The coarse portion of the RAP shall be the portion of the RAP retained on the No. 4 sieve. The Engineer may sample the stockpiles to verify that this requirement is met.

334-2.3.2 Material Characterization for Mix Design: Assume responsibility for establishing the asphalt binder content, gradation, and bulk specific gravity ($G_{sb}$) of the RAP material based on a representative sampling of the material by roadway cores or stockpile samples. For roadway core samples, assume responsibility for the degradation that will occur during the milling operation.

334-2.3.3 RAP Stockpile Approval: Prior to the incorporation of RAP into the asphalt mixture, stockpile the RAP material and obtain approval for the stockpile by one of the following methods:

1. Continuous stockpile: When RAP is obtained from one or multiple sources and is either processed, blended, or fractionated, and stockpiled in a continuous manner, assure an adequate number of test results are obtained for stockpile approval. Test the RAP material for gradation and asphalt content at a minimum frequency of one sample per 1000 tons with a minimum of six test results. Test the RAP material for $G_{mm}$ (for $G_{sb}$ determination) at a minimum frequency of one sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled material. In addition, address the details and specifics of the processing, sampling, testing and actions to be taken in the Producer Quality Control (QC) Plan.

2. Non-continuous single stockpile: When an individual stockpile is being constructed, obtain representative samples at random locations and test the RAP material for gradation and asphalt content at a minimum frequency of one sample per 1000 tons with a minimum of six test results. Test the RAP material for $G_{mm}$ (for $G_{sb}$ determination) at a minimum frequency of one sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled material. Once the RAP stockpile has been approved, do not add additional material without prior approval of the Engineer.

Determine the asphalt binder content and gradation of the RAP material in accordance with FM 5-563 and FM 1-T 030, respectively. Establish the $G_{sb}$ of the RAP material by using one of the following methods:

a. Calculate the $G_{sb}$ value based upon the effective specific gravity ($G_{se}$) of the RAP material, determined on the basis of the asphalt binder content and maximum specific gravity ($G_{mm}$) of the RAP material. The Engineer will approve the estimated asphalt binder absorption value used in the calculation.

b. Measure the $G_{sb}$ of the RAP aggregate, in accordance with FM 1-T 084 and FM 1-T 085. Obtain the aggregate by using a solvent extraction method.

334-2.3.4 Pavement Coring Report: When the Contract includes milling of the existing asphalt pavement, the Pavement Coring Report may be available on the Department's website.

334-2.3.5 Asphalt Binder for Mixes with RAP: Select the appropriate asphalt binder grade based on Table 334-2. Obtain a sample of the mixture for the Engineer within the first 1,000 tons of production and at a continuing frequency of one sample per 4,000 tons of mix. The Engineer reserves the right to change the asphalt binder grade at design based on the characteristics of the RAP asphalt binder, and reserves the right to make changes during
production.

<table>
<thead>
<tr>
<th>Percent RAP</th>
<th>Asphalt Binder Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 15</td>
<td>PG 67-22</td>
</tr>
<tr>
<td>16 - 30</td>
<td>PG 58-22</td>
</tr>
<tr>
<td>&gt;30</td>
<td>PG 52-28</td>
</tr>
</tbody>
</table>

**Table 334-2**

Asphalt Binder Grade for Mixes Containing RAP

334-2.4 Recycled Crushed Glass: Recycled crushed glass shall not be used in this project, may be used as a component of the asphalt mixture subject to the following requirements:

1. Consider the recycled crushed glass a local material and meet all requirements specified in 902-6.
2. Limit the amount of recycled crushed glass to a maximum of 15% by weight of total aggregate.
3. Use an asphalt binder that contains a minimum of 0.5% anti-stripping agent by weight of binder. The anti-strip additive shall be one of the products listed on the Approved Product List (APL). The anti-strip additive shall be introduced into the asphalt binder by the supplier during loading.
4. Do not use recycled crushed glass in friction course mixtures or in structural course mixtures which are to be used as the final wearing surface.

334-3 General Composition of Mixture.

334-3.1 General: Compose the asphalt mixture using a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate fractions to meet the grading and physical properties of the mix design. Aggregates from various sources may be combined.

334-3.2 Mix Design:

334-3.2.1 General: Design the asphalt mixture in accordance with AASHTO R 35-12, except as noted herein. Prior to the production of any asphalt mixture, submit the proposed mix design with supporting test data indicating compliance with all mix design criteria to the Engineer. For Traffic Level B through C mix designs, include representative samples of all component materials, including asphalt binder. Allow the State Materials Engineer a maximum of four weeks to either conditionally verify or reject the mix as designed.

Do not use more than four one mix designs per nominal maximum aggregate size per traffic level per binder grade per year, where the year starts at the Notice to Proceed. Exceeding this limitation will result in a maximum Composite Pay Factor (CPF) of 1.00 as defined in 334-8.2 for all designs used beyond this limit.

Warm mix technologies (additives, foaming techniques, etc.) listed on the Department’s website may be used in the production of the mix. The URL for obtaining this information, if available, is:

http://www.dot.state.fl.us/statematerialsoffice/quality/programs/warmmixasphalt/index.shtm

The Engineer will consider any marked variations from original test data for a mix design or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of the mix design.

334-3.2.2 Mixture Gradation Requirements: Combine the coarse and fine aggregate in proportions that will produce an asphalt mixture meeting all of the requirements defined in this specification and conform to the gradation requirements at design as defined in AASHTO M 323-12, Table 3. Aggregates from various sources may be combined.
334-3.2.2.1 Mixture Gradation Classification: Plot the combined mixture gradation on an FHWA 0.45 Power Gradation Chart. Include the Control Points from AASHTO M 323-12, Table-3, as well as the Primary Control Sieve (PCS) Control Point from AASHTO M 323-12, Table 4. Fine mixes are defined as having a gradation that passes above the primary control sieve control point and above the maximum density line for all sieve sizes smaller than the primary control sieve and larger than the No. 100 sieve.

334-3.2.3 Aggregate Consensus Properties: For Traffic Level C through E mixtures, meet the following consensus properties at design for the aggregate blend. Aggregate consensus properties do not apply to Traffic Level A and B mixtures.

334-3.2.3.1 Coarse Aggregate Angularity: When tested in accordance with ASTM D 5821-01 (2006), meet the percentage of fractured faces requirements specified in AASHTO M 323-12, Table 5.

334-3.2.3.2 Fine Aggregate Angularity: When tested in accordance with AASHTO T 304-11, Method A, meet the uncompacted void content of fine aggregate specified in AASHTO M 323-12, Table 5.

334-3.2.3.3 Flat and Elongated Particles: When tested in accordance with ASTM D 4791-10, (with the exception that the material passing the 3/8 inch sieve and retained on the No. 4 sieve shall be included), meet the requirements specified in AASHTO M 323-12, Table 5. Measure the aggregate using the ratio of 5:1, comparing the length (longest dimension) to the thickness (shortest dimension) of the aggregate particles.

334-3.2.3.4 Sand Equivalent: When tested in accordance with AASHTO T 176-08, meet the sand equivalent requirements specified in AASHTO M 323-12, Table 5.

334-3.2.4 Gyratory Compaction: Compact the design mixture in accordance with AASHTO T 312-12, with the following exception: use the number of gyrations at $N_{\text{design}}$ as defined in Table 334-3. Measure the inside diameter of gyratory molds in accordance with AASHTO T 312-12.

<table>
<thead>
<tr>
<th>Traffic Level</th>
<th>$N_{\text{design}}$</th>
<th>Number of Gyrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

334-3.2.5 Design Criteria: Meet the requirements for nominal maximum aggregate size as defined in AASHTO M 323-12, as well as for relative density, VMA, VFA, and dust-to-binder ratio as specified in AASHTO M 323-12, Table 6. $N_{\text{initial}}$ and $N_{\text{maximum}}$ requirements are not applicable.

334-3.2.6 Moisture Susceptibility:
1. For Traffic Level A and B mixtures, use a liquid anti-strip additive, at a rate of 0.5% by weight of the asphalt binder. The anti-strip additive must be listed on the APL. Other rates of anti-strip additive may be used upon approval of the Engineer.
2. For Traffic Level C through E mixtures, test 4 inch specimens in accordance with FM 1-T 283. Provide a mixture having a retained tensile strength ratio of at least 0.80 and a minimum tensile strength (unconditioned) of 100 psi. If necessary, add a liquid anti-stripping agent and/or hydrated lime (meeting the requirements of Section 337) in order to meet these criteria. The anti-strip additive must be listed on the APL.
334-3.2.7 Additional Information: In addition to the requirements listed above, provide the following information with each proposed mix design submitted for verification:

1. The design traffic level and the design number of gyrations ($N_{\text{design}}$).
2. The source and description of the materials to be used.
3. The Department source number and the Department product code of the aggregate components furnished from a Department approved source.
4. The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation caused by handling and processing as necessary.
5. A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly material passing the No. 200 sieve) should be accounted for and identified.
6. The bulk specific gravity ($G_{sb}$) value for each individual aggregate and RAP component, as identified in the Department’s aggregate control program.
7. A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%.
8. A target temperature for the mixture at the plant (mixing temperature) and a target temperature for the mixture at the roadway (compaction temperature) in accordance with 320-6.3. Do not exceed a target temperature of 340°F for PG 82-22 (PMA) asphalt binders, 330°F for PG 76-22 (PMA) and PG 76-22 (ARB) asphalt binders, and 315°F for unmodified asphalt binders.
9. Provide the physical properties achieved at four different asphalt binder contents. One of which must be at the optimum asphalt content, and must conform to all specified physical requirements.
10. The name of the Construction Training Qualification Program (CTQP) Qualified Mix Designer.
11. The ignition oven calibration factor.
12. The warm mix technology, if used.

334-3.3 Mix Design Revisions: During production, the Contractor may request a target value revision to a mix design, subject to meeting the following requirements: (1) the target change falls within the limits defined in Table 334-4, (2) appropriate data exists demonstrating that the mix complies with production air voids specification criteria, and (3) the mixture gradation meets the basic gradation requirements defined in 334-3.2.2.
Table 334-4
Limits for Potential Adjustments to Mix Design Target Values

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Limit from Original Mix Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 8 sieve and Coarser</td>
<td>± 5.0%</td>
</tr>
<tr>
<td>No. 16 sieve</td>
<td>± 4.0%</td>
</tr>
<tr>
<td>No. 30 sieve</td>
<td>± 4.0%</td>
</tr>
<tr>
<td>No. 50 sieve</td>
<td>± 3.0%</td>
</tr>
<tr>
<td>No. 100 sieve</td>
<td>3.0%</td>
</tr>
<tr>
<td>No. 200 sieve</td>
<td>1.0%</td>
</tr>
<tr>
<td>Asphalt Binder Content(1)</td>
<td>0.3%</td>
</tr>
<tr>
<td>Each Component of Aggregate Blend(2)</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

(1) Reductions to the asphalt binder content will not be permitted if the VMA during production is lower than 1.0% below the design criteria.
(2) Revisions to FC-5 mixtures to be determined by the Engineer.

Submit all requests for revisions to mix designs, along with supporting documentation, to the Engineer. In order to expedite the revision process, the request for revision or discussions on the possibility of a revision may be made verbally, but must be followed up by a written request. The verified mix design will remain in effect until the Engineer authorizes a change. In no case will the effective date of the revision be established earlier than the date of the first communication between the Contractor and the Engineer regarding the revision.

A new design mix will be required if aggregate sources change, or for any substitution of an aggregate product with a different aggregate code, unless approved by the Engineer.

334-4 Producer Process Control (PC).
Assume full responsibility for controlling all operations and processes such that the requirements of these Specifications are met at all times. Perform any tests necessary at the plant and roadway for process control purposes. Enter all PC test data into the Department’s database. The Engineer will not use these test results in the acceptance payment decision.

Address in the Producer QC Plan how PC failures will be handled. When a PC failure occurs, investigate, at a minimum, the production process, testing equipment and/or sampling methods to determine the cause of the failure, and make any necessary changes to assure compliance with these Specifications. Obtain a follow up sample immediately after corrective actions are taken to assess the adequacy of the corrections. In the event the follow-up PC sample also fails to meet Specification requirements, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the QC Manager.

334-5 Acceptance of the Mixture.
334-5.1 General: The mixture will be accepted at the plant with respect to gradation (P-8 and P-200), asphalt content (Pb), and volumetrics (volumetrics is defined as air voids at N\text{design}). The mixture will be accepted on the roadway with respect to density of roadway cores. Acceptance will be on a LOT by LOT basis (for each mix design) based on tests of random samples obtained within each sublot taken at a frequency of one set of samples per sublot. A roadway LOT and a plant production LOT shall be the same. Acceptance of the mixture will be based on Contractor QC certified test results submitted to the Engineer for acceptance. The Engineer may require independent verification of test results on a random basis that have been verified by the Department.

334-5.1.1 Sampling and Testing Requirements: Obtain the samples in
obtain samples at the plant of a sufficient quantity of approximately 35 pounds to be split into three smaller samples; one for QC, and another 35 pound sample if the Engineer requests to run an independent test. one for Verification testing and one for Resolution testing; each sample at approximately 35 pounds. The split samples for Verification testing and Resolution testing shall be reduced in size and stored in three boxes each. The approximate size of each box must be 12 inches x 8 inches x 4 inches. Provide, label and safely store sample boxes in a manner agreed upon by the Engineer for future testing.

The asphalt content of the mixture will be determined in accordance with FM 1-T 168. The gradation of the recovered aggregate will be determined in accordance with FM 1-T 030. Volumetric testing will be in accordance with AASHTO T 312-12 and FM 1-T 209. Prior to testing volumetric samples, condition the test-sized sample for one hour, plus or minus five minutes, at the target roadway compaction temperature in a shallow, flat pan, such that the mixture temperature at the end of the one hour conditioning period is within plus or minus 20°F of the roadway compaction temperature. Test for roadway density in accordance with FM 1-T 166.

334-5.1.2 Acceptance Testing Exceptions: When the total combined quantity of hot mix asphalt for the project, as indicated in the Plans for Type SP and Type FC mixtures only, is less than 2000 tons, the Engineer will accept the mix on the basis of visual inspection. The Engineer may require the Contractor to run process control tests for informational purposes, or may run independent verification tests to determine the acceptability of the material.

Density testing for acceptance will not be performed on widening strips or shoulders with a width of 5 feet or less, open-graded friction courses, variable thickness overbuild courses, leveling courses, any asphalt layer placed on subgrade (regardless of type), miscellaneous asphalt pavement, shared use paths, crossovers, or any course with a specified thickness less than 1 inch or a specified spread rate that converts to less than 1 inch as described in 334-1.4. Density testing for acceptance will not be performed on asphalt courses placed on bridge decks or approach slabs; compact these courses in static mode only per the requirements of 330-7.7. In addition, density testing for acceptance will not be performed on the following areas when they are less than 1,000 feet (continuous) in length: turning lanes, acceleration lanes, deceleration lanes, shoulders, parallel parking lanes or ramps. Do not perform density testing for acceptance in situations where the areas requiring density testing is less than 50 tons within a subplot.

Density testing for acceptance will not be performed in intersections. The limits of the intersection will be from stop bar to stop bar for both the mainline and side streets. A random core location that occurs within the intersection shall be moved forward or backward from the intersection at the direction of the Engineer.

Where density testing for acceptance is not required, compact these courses (with the exception of open-graded friction courses) in accordance with the rolling procedure (equipment and pattern) as approved by the Engineer or with Standard Rolling Procedure as specified in 330-7.2. In the event that the rolling procedure deviates from the procedure approved by the Engineer, or the Standard Rolling Procedure, placement of the mix shall be stopped.

The density pay factor (as defined in 334-8.2) for areas not requiring density testing for acceptance will be paid at the same density pay factor as for the areas requiring density testing within the same LOT. If the entire LOT does not require density testing for acceptance, the LOT will be paid at a density pay factor of 1.00.

334-5.2 Full LOTS: The access road area shall be divided in four LOTS and the parking lot in two LOTS. Each LOT shall be subdivided into two equal sublots. (as selected by the Contractor prior to the start of the LOT) as either (1) 2,000 tons, with each LOT subdivided into four equal sublots of 500 tons each, or (2) 4,000 tons, with each LOT subdivided into four equal sublots of 1,000...
tons each. As an exception to this, the initial LOT of all new mix designs shall be defined as 2,000 tons, subdivided into four equal sublots of 500 tons each. Before the beginning of a LOT, the Engineer will Contractor's Testing Laboratory shall develop a random sampling plan for approval by the Engineer for each sublot and direct the Contractor on sample points, based on tonnage, for each sublot during construction.

334-5.3 Partial LOTs: A partial LOT is defined as a LOT size that is less than a full LOT. A partial LOT may occur due to the following:

1. The completion of a given mix type or mix design on a project.
2. Closure of the LOT due to time. LOTs will be closed 30 calendar days after the start of the LOT. Time periods other than 30 calendar days may be used if agreed to by both the Engineer and the Contractor, but under no circumstances shall the LOT be left open longer than 60 days.
3. A LOT is terminated per 334-5.4.4.

All partial LOTs will be evaluated based on the number of tests available, and will not be redefined. If a LOT is closed before the first plant random sample is obtained, then the LOT will be visually accepted by the Engineer and the LOT pay factor will be 1.00.

334-5.4 QC Sampling and Testing: Obtain all samples randomly as directed by the Engineer.

Should the Engineer determine that the QC requirements are not being met or that unsatisfactory results are being obtained, or should any instances of falsification of test data occur, acceptance of the Producer's QC Plan will be suspended and production will be stopped.

334-5.4.1 Lost or Missing Verification/Resolution Samples: In the event that any of the Verification and/or Resolution samples that are in the custody of the Contractor are lost, damaged, destroyed, or are otherwise unavailable for testing, the minimum possible pay factor for each quality characteristic as described in 334-8.2 will be applied to the entire LOT in question, unless called for otherwise by the Engineer. Specifically, if the LOT in question has more than two sublots, the pay factor for each quality characteristic will be 0.55. If the LOT has two or less sublots, the pay factor for each quality characteristic will be 0.80. In either event, the material in question will also be evaluated in accordance with 334-5.9.5.

If any of the Verification and/or Resolution samples that are in the custody of the Department are lost, damaged, destroyed or are otherwise unavailable for testing, the corresponding QC test result will be considered verified, and payment will be based upon the Contractor's data.

334-5.4.2 Plant Sampling and Testing Requirements: Obtain one random sample of mix per sublot in accordance with 334-5.1.1 as directed by the Engineer. Test the QC split sample for gradation, asphalt binder content and volumetrics in accordance with 334-5.1.1. Complete all QC testing within one working day from the time the samples were obtained.

334-5.4.3 Roadway Sampling and Testing Requirements: Obtain five 6 inch diameter roadway cores within 24 hours of placement at random locations as directed by the Engineer within each sublot. Test these QC samples for density (G_{mb}) in accordance with 334-5.1.1. Obtain a minimum of three cores per sublot at random locations as identified by the Engineer in situations where the sublot/LOT was closed or terminated before the random numbers were reached or where it is impractical to cut five cores per sublot. Do not obtain cores any closer than 12 inches from an unsupported edge. The Engineer may adjust randomly generated core locations for safety purposes or as the Engineer deems necessary. Maintain traffic during the coring operation; core the roadway, patch the core holes (within three days of coring); and trim the cores to the proper thickness prior to density testing.

Density for the sublot shall be based on the average value for the cores cut from the sublot with the target density being the maximum specific gravity (G_{mm}) of the sublot. Once the average density of a sublot has been determined, do not retest the samples unless approved by the Engineer. Ensure proper handling and storage of all cores until the LOT in
question has been accepted.

334-5.4.4 Individual Test Tolerances for QC Testing: Terminate the LOT if any of the following QC failures occur:

1) An individual test result of a sublot for air voids does not meet the requirements of Table 334-5,
2) The average sublot density does not meet the requirements of Table 334-5,
3) Two consecutive test results within the same LOT for gradation or asphalt binder content do not meet the requirements of Table 334-5.

When a LOT is terminated due to a QC failure, stop production of the mixture until the problem is resolved to the satisfaction of the QC Manager and/or Asphalt Plant Level II technician responsible for the decision to resume production after a QC failure, as identified in Section 100 of the General Provisions. In the event that it can be demonstrated that the problem can immediately be or already has been resolved, it will not be necessary to stop production. When a LOT is terminated, make all necessary changes to correct the problem. Do not resume production until appropriate corrections have been made. Inform the Engineer of the problem and corrections made to correct the problem. After resuming production, sample and test the material to verify that the changes have corrected the problem. Summarize this information and provide it to the Engineer prior to the end of the work shift when production resumes.

In the event that a QC failure is not addressed as defined above, the Engineer’s approval will be required prior to resuming production after any future QC failures.

Address any material represented by a failing test result in accordance with 334-5.9.5. Any LOT terminated under this subarticle will be limited to a maximum Pay Factor of 1.00 (as defined in 334-8.2) for each quality characteristic.

In the event that a G_mm test result differs by more than 0.040 from the mix design G_mm, investigate the causes of the discrepancy and report the findings and proposed actions to the Engineer.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Tolerance(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Binder Content (%)</td>
<td>Target ±0.55</td>
</tr>
<tr>
<td>Passing No. 200 Sieve (%)</td>
<td>Target ±1.50</td>
</tr>
<tr>
<td>Air Voids (%)</td>
<td>2.30 – 6.00</td>
</tr>
<tr>
<td>Density (minimum % G_mm)(2)</td>
<td>90.00</td>
</tr>
</tbody>
</table>

(1) Tolerances for sample size of n = 1 from the verified mix design
(2) Based on an average of 5 randomly located cores

334-5.5 Verification Testing: In order to determine the validity of the Contractor’s QC test results prior to their use in the Acceptance decision, the Engineer will run verification tests.

334-5.5.1 Plant Testing: At the completion of each LOT, the Engineer will test a minimum of one Verification split sample randomly selected from the LOT. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed. Verification samples shall be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. In lieu of the 1-1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1.
The Verification test results will be compared with the QC test results based on the between-laboratory precision values shown in Table 334-6.

<table>
<thead>
<tr>
<th>Property</th>
<th>Maximum Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>$G_{\text{mm}}$</td>
<td>0.016</td>
</tr>
<tr>
<td>$G_{\text{mb}}$ (gyratory compacted samples)</td>
<td>0.022</td>
</tr>
<tr>
<td>$G_{\text{mb}}$ (roadway cores)</td>
<td>0.015</td>
</tr>
<tr>
<td>$P_2$</td>
<td>0.44%</td>
</tr>
<tr>
<td>$P_{-200}$</td>
<td>FM 1-T 030 (Figure 2)</td>
</tr>
<tr>
<td>$P_{-8}$</td>
<td>FM 1-T 030 (Figure 2)</td>
</tr>
</tbody>
</table>

If all of the specified mix characteristics compare favorably, then the LOT will be accepted, with payment based on the Contractor’s QC test data for the LOT. If any of the results do not compare favorably, then the Resolution samples from the LOT will be sent to the Resolution laboratory for testing, as described in 334-5.6.

334-5.5.2 Roadway Testing: At the completion of each LOT, the Engineer will determine the density ($G_{\text{mb}}$) of each core (previously tested by QC) as described in 334-5.1.1. from the same sublot as the plant samples. For situations where roadway density is not required for the random sublot chosen, then another sublot shall be randomly chosen for roadway density cores only. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed.

The individual Verification test results will be compared with individual QC test results by the Engineer based on the between-laboratory precision values given in Table 334-6.

If each of the core test results compare favorably, then the LOT will be accepted with respect to density, with payment based on the Contractor’s QC test data for the LOT.

If any of the results do not compare favorably, then the core samples from the LOT will be sent to the Resolution laboratory for testing as specified in 334-5.6.

334-5.6 Resolution System:

334-5.6.1 Plant Samples: In the event of an unfavorable comparison between the Contractor’s QC test results and the Engineer’s Verification test results on any of the properties listed in Table 334-6, the Resolution laboratory will test all of the split samples from the LOT for only the property (or properties) in question. Resolution samples shall be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. In lieu of the 1-1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1.

334-5.6.2 Roadway Samples: In the event of an unfavorable comparison between the Contractor’s QC test data and the Engineer’s Verification test data on the density results, the Resolution laboratory will test all of the cores from the LOT. Testing will be as described in 334-5.1.1. Any damaged roadway cores will not be included in the evaluation; replace damaged cores with additional cores at the direction of the Engineer.

334-5.6.3 Resolution Determination: The Resolution test results (for the property or properties in question) will be compared with the QC test results based on the between-laboratory precision values shown in Table 334-6.
If the Resolution test results compare favorably with all of the QC results, then acceptance and payment for the LOT will be based on the QC results, and the Department will bear the costs associated with Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution test results do not compare favorably with all of the QC results, then acceptance and payment for the LOT will be based on the Resolution test data for the LOT, and the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing. In addition, in the event that the application of the Resolution test results in a failure to meet the requirements of Table 334-5, address any material represented by the failing test result in accordance with 334-5.9.5.

In the event of an unfavorable comparison between the Resolution test results and QC test results, make the necessary adjustments to assure that future comparisons are favorable.

### 334-5.7 Independent Verification (IV) Testing:

#### 334-5.7.1 Plant:
The Contractor shall provide sample boxes and take samples as directed by the Engineer for IV testing. Obtain enough material for three complete sets of tests (two samples for IV testing by the Engineer and one sample for testing by the Contractor). If agreed upon by both the Engineer and the Contractor, only one sample for IV testing by the Engineer may be obtained. IV samples will be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. The Contractor's split sample, if tested immediately after sampling, shall be reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. If the Contractor's sample is not tested immediately after sampling, then the sample shall be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. For the IV and Contractor's samples, in lieu of the 1-1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1. The Contractor's test results shall be provided to the Engineer within one working day from the time the sample was obtained.

If any of the IV test results do not meet the requirements of Table 334-5, then a comparison of the IV test results and the Contractor's test results, if available, will be made. If a comparison of the IV test results and the Contractor's test results meets the precision values of Table 334-6 for the material properties in question, or if the Contractor's test results are not available, then the IV test results are considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

If a comparison of the IV test results and the Contractor's test results does not meet the precision values of Table 334-6 for the material properties in question, then the second IV sample shall be tested by the Engineer for the material properties in question. If a comparison between the first and second IV test results does not meet the precision values of Table 334-6 for the material properties in question, then the first IV test results are considered unverified for the material properties in question and no action shall be taken.

If a comparison between the first and second IV test results meets the precision values of Table 334-6 for the material properties in question, then the first IV sample is considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already
has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

The Engineer has the option to use the IV sample for comparison testing as specified in 334-6.

334-5.7.2 Roadway: Obtain five 6 inch diameter roadway cores within 24 hours of placement, as directed by the Engineer, for IV testing. In situations where it is impractical to cut five cores per sublot, obtain a minimum of three cores per sublot at random locations, as identified by the Engineer. These independent cores will be obtained from the same LOTs and sublots as the Independent Verification Plant samples, or as directed by the Engineer. The density of these cores will be obtained as described in 334-5.1.1. If the average of the results for the sublot does not meet the requirements of Table 334-5 for density, then a comparison of the IV $G_{max}$ test results and the Contractor’s $G_{max}$ test results, if available, will be made in accordance with the procedure provided in 334-5.7.1. Address any material represented by the failing test results in accordance with 334-5.9.5.

334-5.8 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 330-9.

334-5.9 Minimum Acceptable Quality Levels: Acceptable quality levels will be determined by calculating Composite Pay Factors (CPFs) in accordance with 334-8.

334-5.9.1 CPFs Below 0.90: In the event that an individual pay factor for any quality characteristic of a LOT falls below 0.90, take steps to correct the situation and report the actions to the Engineer. In the event that the pay factor for the same quality characteristic for two consecutive LOTs is below 0.90, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.2 CPFs Less Than 0.90 and Greater Than or Equal to 0.80: If the composite pay factor for the LOT is less than 0.90 and greater than or equal to 0.80, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.3 CPFs Less Than 0.80 and Greater Than or Equal to 0.75: If the CPF for the LOT is less than 0.80 and greater than or equal to 0.75, address the defective material in accordance with 334-5.9.5.

334-5.9.4 CPFs Less Than 0.75: If the CPF for the LOT is less than 0.75, remove and replace the defective LOT at no cost to the Owner, or as approved by the Engineer.

334-5.9.5 Defective Material: Assume responsibility for removing and replacing all defective material placed on the project, at no cost to the Owner Department.

As an exception to the above and upon approval of the Engineer, obtain an engineering analysis in accordance with Section 6 by an independent laboratory (as approved by the Engineer) to determine the disposition of the material. The engineering analysis must be signed and sealed by a Professional Engineer licensed in the State of Florida.

The Engineer may determine that an engineering analysis is not necessary or may perform an engineering analysis to determine the disposition of the material.

Any material that remains in place will be accepted with a CPF as determined by 334-8, or as determined by the Engineer.

If the defective material is due to a gradation, asphalt binder content or density failure as indicated in the QC tests, upon the approval of the Engineer the Contractor may perform delineation tests on roadway cores in lieu of an engineering analysis to determine the limits of the defective material that may require removal and replacement. Prior to any delineation testing, all sampling locations shall be approved by the Engineer. All delineation
sampling and testing shall be monitored and verified by the Engineer. For materials that are
defective due to air voids, an engineering analysis is required.

When evaluating defective material by engineering analysis or
delineation testing, at a minimum, evaluate all material located between passing QC, PC or IV
test results. Exceptions to this requirement shall be approved by the Engineer.

334-6 Comparison Testing.

At the start of the project (unless waived by the Engineer) and at other times as
determined necessary by the Engineer, provide split samples for comparison testing with the
Engineer. The purpose of these tests is to verify that the testing equipment is functioning properly
and that the testing procedures are being performed correctly. In the event that the Engineer
determines that there is a problem with the Contractor’s testing equipment and/or testing
procedures, immediately correct the problem to the Engineer’s satisfaction. In the event that the
problem is not immediately corrected, cease production of the asphalt mixture until the problem
is adequately resolved to the satisfaction of the Engineer.

If so agreed to by both the Contractor and the Engineer, the split sample used for
comparison testing may also be used for the QC sample. The split sample used for comparison
testing must also meet the requirements for IV testing described in 334-5.7.

334-7 Method of Measurement.

For the work specified under this Section (including the pertinent provisions of Sections
320 and 330), the quantity to be paid for will be the weight of the mixture, in tons. For each pay
item, excluding overbuild, the pay quantity will be based on the quantity placed on the project,
limited to 105% of the adjusted plan quantity for the pay item. The adjusted plan quantity will be
determined by dividing the pay item’s original plan quantity (including any Engineer approved
quantity revisions) by the design $G_{mm}$ stated in 334-1.14, then multiplying it by the tonnage-
weighted average $G_{mm}$ of the mixes used for the pay item.

The bid price for the asphalt mix will include the cost of the liquid asphalt and the tack coat
application as directed in 300-8. There will be no separate payment or unit price adjustment for
the asphalt binder material in the asphalt mix. For the calculation of unit price adjustments of
bituminous material, the average asphalt content will be based on the percentage specified in 9-
2.1.2. The weight will be determined as provided in 320-3.2 (including the provisions for the
automatic recordation system).

Prepare a Certification of Quantities, using the Department’s current approved form, for
the certified Superpave asphalt concrete pay item. Submit this certification to the Engineer, based
on the quantity of asphalt produced and accepted on the roadway per Contract. The certification
must include the Contract Number, FPID Number, Certification Number, Certification Date, period
represented by Certification and the tons produced for each asphalt pay item.

334-8 Basis of Payment.

334-8.1 General: Price and payment will be full compensation for all the work specified
under this Section (including the applicable requirements of Sections 320 and 330).

For materials accepted in accordance with 334-5, based upon the quality of the material,
a pay adjustment will be applied to the bid price of the material as determined on a LOT by LOT
basis. The pay adjustment will be assessed by calculating a Pay Factor for considering the
following individual quality characteristics: pavement density, air voids, asphalt binder content,
and the percentage passing the No. 200 and No. 8 sieves. The pay adjustment will be computed
by multiplying a Composite Pay Factor (CPF) for the LOT by the bid price per ton.

334-8.2 Pay Factors:

334-8.2.1 Partial LOTs: For Partial LOTs where no random sample is obtained
due to insufficient tonnage, a CPF of 1.00 shall be applied.
334-8.2.2 Two Sublot Test Results: Since this project is based on two sublot test results for a LOT, Pay Factors will be determined based on Table 334-7, using the average of the accumulated deviations from the target value. (Deviations are absolute values with no plus or minus signs.) Use the 2-Tests column for the two sublots.

<table>
<thead>
<tr>
<th>Pay Factor</th>
<th>2 Sublot Test Average Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asphalt Binder Content</td>
</tr>
<tr>
<td>1.05</td>
<td>0.00-0.16</td>
</tr>
<tr>
<td>1.00</td>
<td>0.17-0.32</td>
</tr>
<tr>
<td>0.90</td>
<td>0.33-0.39</td>
</tr>
<tr>
<td>0.80</td>
<td>&gt;0.39</td>
</tr>
<tr>
<td>No. 8 Sieve</td>
<td></td>
</tr>
<tr>
<td>1.05</td>
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</tr>
<tr>
<td>1.00</td>
<td>1.60-3.18</td>
</tr>
<tr>
<td>0.90</td>
<td>3.19-3.89</td>
</tr>
<tr>
<td>0.80</td>
<td>&gt;3.89</td>
</tr>
<tr>
<td>No. 200 Sieve</td>
<td></td>
</tr>
<tr>
<td>1.05</td>
<td>0.00-0.39</td>
</tr>
<tr>
<td>1.00</td>
<td>0.40-0.78</td>
</tr>
<tr>
<td>0.90</td>
<td>0.79-1.06</td>
</tr>
<tr>
<td>0.80</td>
<td>&gt;1.06</td>
</tr>
<tr>
<td>Air Voids</td>
<td></td>
</tr>
<tr>
<td>1.05</td>
<td>0.00-0.35</td>
</tr>
<tr>
<td>1.00</td>
<td>0.36-0.71</td>
</tr>
<tr>
<td>0.90</td>
<td>0.72-1.20</td>
</tr>
<tr>
<td>0.80</td>
<td>1.21-1.41</td>
</tr>
<tr>
<td>0.70</td>
<td>1.42-1.77</td>
</tr>
<tr>
<td>0.55</td>
<td>&gt;1.77</td>
</tr>
<tr>
<td>Density(1)</td>
<td></td>
</tr>
<tr>
<td>1.05</td>
<td>0.00-0.35</td>
</tr>
<tr>
<td>1.00</td>
<td>0.36-0.71</td>
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<tr>
<td>0.95</td>
<td>0.72-1.41</td>
</tr>
<tr>
<td>0.90</td>
<td>1.42-2.12</td>
</tr>
<tr>
<td>0.80</td>
<td>&gt;2.12</td>
</tr>
</tbody>
</table>

(1) Each density test result is the average of five cores. The target density is 93.00 percent of $G_{mm}$ (92.00 percent when compaction is limited to the static mode or for layers specified to be one inch thick). When compaction is limited to the static mode, no vibratory mode in the vertical direction will be allowed. Other vibratory modes will be allowed, if approved by the Engineer. In this case, the target density is 92.00 percent of $G_{mm}$.

334-8.2.3 Three or More Sublot Test Results: When three or more sublot test results are available for a LOT, the variability unknown, standard deviation method will be used to determine the estimated percentage of the LOT that is within the specification limits. The number of significant figures used in the calculations will be in accordance with requirements of AASHTO R11-06, Absolute Method.

334-8.2.3.1 Percent Within Limits: The percent within limits (PWL) and
Pay Factors for the LOT will be calculated as described below. Variables used in the calculations are as follows:

- \( x \) — individual test value (sublot)
- \( n \) — number of tests (sublots)
- \( s \) — sample standard deviation
- \( \Sigma(x^2) \) — summation of squares of individual test values
- \( (\Sigma x)^2 \) — summation of individual test values squared
- \( Q_U \) — upper quality index
- \( USL \) — upper specification limit (target value plus upper specification limit from Table 334-8)
- \( Q_L \) — lower quality index
- \( LSL \) — lower specification limit (target value minus lower specification limit from Table 334-8)
- \( P_U \) — estimated percentage below the USL
- \( P_L \) — estimated percentage above the LSL

1. Calculate the arithmetic mean \( \bar{x} \) of the test values:

\[
\bar{x} = \frac{\Sigma x}{n}
\]

2. Calculate the sample standard deviation \( s \):

\[
s = \sqrt{\frac{n \Sigma(x^2) - (\Sigma x)^2}{n(n-1)}}
\]

3. Calculate the upper quality index \( Q_U \):

\[
Q_U = \frac{USL - \bar{x}}{s}
\]

4. Calculate the lower quality index \( Q_L \):

\[
Q_L = \frac{\bar{x} - LSL}{s}
\]

5. From Table 334-9, determine the percentage of work below the USL \( (P_U) \).
6. From Table 334-9, determine percentage of work above the LSL \( (P_L) \). Note: If USL or LSL is not specified; percentages within (USL or LSL) will be 100.
7. If \( Q_U \) or \( Q_L \) is a negative number, then calculate the percent within limits for \( Q_U \) or \( Q_L \) as follows: enter Table 334-9 with the positive value of \( Q_U \) or \( Q_L \) and obtain the corresponding percent within limits for the proper sample size. Subtract this number from 100.00. The resulting number is the value to be used in the next step (Step 8) for the calculation of quality level.
8. Calculate the percent within limits \( (PWL) = (P_U + P_L) - 100 \)
9. Calculate the Pay Factor \( (PF) \) for each quality characteristic using the equation given in 334-8.2.3.2.

<table>
<thead>
<tr>
<th>Quality Characteristic</th>
<th>Specification Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 334-8 Specification Limits</td>
<td></td>
</tr>
</tbody>
</table>
### Table 334-9

**Percent Within Limits**

<table>
<thead>
<tr>
<th>Quality Index</th>
<th>Percent within Limits for Selected Sample Size</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>( n = 3 )</td>
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<tr>
<td>0.00</td>
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</tr>
<tr>
<td>0.05</td>
<td>51.38</td>
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<td>54.15</td>
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Table 334-9
Percent Within Limits

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</tr>
<tr>
<td>2.20</td>
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<tr>
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</tr>
<tr>
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<tr>
<td>2.60</td>
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<td>100.00</td>
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</tr>
<tr>
<td>2.65</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

334-8.2.3.2 Pay Factors (PF): Pay Factors will be calculated by using the following equation:
Pay Factor = (55 + 0.5 x PWL) / 100
The PWL is determined from Step (8) of 334-8.2.3.1.

334-8.3 Composite Pay Factor (CPF): A CPF for the LOT will be calculated based on the individual PFs with the following weighting applied: 35% Density (D), 25% Air Voids (Va), 25% asphalt binder content (Pb), 10% Passing No. 200 (P-200) and 5% Passing No. 8 (P-8). Calculate the CPF by using the following formula:
CPF = [(0.350 x PF D) + (0.250 x PF Va) + (0.250 x PF Pb) + (0.100 x PF P-200) + (0.050 x PF P-8)]
Where the PF for each quality characteristic is determined in either 334-8.2.2 or 334-8.2.3, depending on the number of sublot tests. Note that the number after each multiplication will be rounded to the nearest 0.01.

The pay adjustment shall be computed by multiplying the CPF for the LOT by the bid price per ton.

334-8.4 Payment:

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Price Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>334-1</td>
<td>Superpave Asphaltic Concrete, SP-12.5 Surface Course</td>
<td>- per Ton</td>
</tr>
<tr>
<td>334-2</td>
<td>Superpave Asphaltic Concrete, SP-12.5 Base Course</td>
<td>- per Ton</td>
</tr>
</tbody>
</table>

END OF SECTION 334
346-1 Description.
Use concrete composed of a mixture of portland cement, aggregate, water, and, where specified, admixtures, pozzolan and ground granulated blast furnace slag. Deliver the portland cement concrete to the site of placement in a freshly mixed, unhardened state.

Obtain concrete from a plant that is currently on the Department’s Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. If the concrete production facility’s Quality Control (QC) Plan is suspended, the Contractor is solely responsible to obtain the services of another concrete production facility with an accepted QC Plan or await the re-acceptance of the affected concrete production facility’s QC Plan prior to the placement of any further concrete on the project. There will be no changes in the Contract Time or completion dates. Bear all delay costs and other costs associated with the concrete production facility’s QC Plan acceptance or re-acceptance.

346-2 Materials.

346-2.1 General: Meet the following requirements:
Coarse Aggregate..........................................................Section 901
Fine Aggregate*..........................................................Section 902
Portland Cement..........................................................Section 921
Water..........................................................Section 923
Admixtures**..........................................................Section 924
Pozzolans and Slag..........................................................Section 929

*Use only silica sand except as provided in 902-5.2.3.
**Use products listed on the Department’s Approved Product List (APL).

Do not use materials containing hard lumps, crusts or frozen matter, or that is contaminated with dissimilar material in excess of that specified in the above listed Sections.

346-2.2 Types of Cement: Unless a specific type of cement is designated elsewhere, use Type I, Type IP, Type IS, Type II, Type II (MH) or Type III cement in all classes of concrete. Use Type II (MH) for all mass concrete elements.

Use only the types of cements designated for each environmental condition in structural concrete. A mix design for a more aggressive environment may be substituted for a lower aggressive environmental condition.

<p>| TABLE 1 |
| BRIDGE SUPERSTRUCTURES |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Slightly Aggressive Environment</th>
<th>Moderately Aggressive</th>
<th>Extremely Aggressive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precast. Superstructure and Prestressed Elements</td>
<td>Type I or Type III</td>
<td>Type I, Type II, Type III, Type IP, or Type IS</td>
<td>Type II (MH)</td>
</tr>
<tr>
<td>Cast In Place</td>
<td>Type I</td>
<td>Type I, Type II, Type IP, or Type IS</td>
<td>Type II (MH)</td>
</tr>
</tbody>
</table>

BRIDGE SUBSTRUCTURE, DRAINAGE STRUCTURES AND OTHER STRUCTURES
346-2.3 Pozzolans and Slag: Fly ash or slag materials are required in all classes of concrete. Use fly ash or slag materials as a cement replacement, on an equal weight replacement basis with the following limitations:

(1) Mass Concrete:
   a. Fly Ash - Ensure that the quantity of cement replaced with fly ash is 18% to 50% by weight, except where the core temperature is expected to rise above 165°F. In that case, ensure that the percentage of fly ash is 35% to 50% by weight.
   b. Slag - Ensure that the quantity of cement replaced with slag is 50% to 70% by weight. Ensure that slag is 50% to 55% of total cementitious content by weight when used in combination with silica fume, ultrafine fly ash and/or metakaolin.
   c. Fly Ash and Slag - Ensure that there is at least 20% fly ash by weight and 40% portland cement by weight for mixes containing portland cement, fly ash and slag.

(2) Drilled Shaft:
   a. Fly Ash - Ensure that the quantity of cement replaced with fly ash is 33% to 37% by weight.
   b. Slag - Ensure that the quantity of cement replaced with slag is 58% to 62% by weight.
   c. Fly Ash and Slag (Ternary Blend) - Ensure that there is 10% to 20% fly ash, 50% to 60% slag by weight, and 30% portland cement by weight for mixes containing portland cement, fly ash and slag.

(3) Precast Concrete – Ensure that the precast concrete has a maximum of 25% fly ash or a maximum of 70% slag. In extremely aggressive environments, ensure that the precast concrete has a minimum of 18% fly ash or a minimum of 50% slag.

For fly ash and slag (ternary blend), ensure that there is 10% to 20% fly ash, 50% to 60% slag by weight, and 30% portland cement by weight for mixes containing portland cement, fly ash and slag.

(4) For all other concrete uses not covered in (1), (2) and (3) above,
   a. Fly Ash - Ensure that the quantity of cement replaced with fly ash is 18% to 30% by weight.
   b. Slag - Ensure that the quantity of cement replaced with slag is 25% to 70% for slightly and moderately aggressive environments and 50% to 70% by weight when used in extremely aggressive environments. Ensure that slag is 50% to 55% of total cementitious content by weight when used in combination with silica fume, ultra fine fly ash and/or metakaolin.
   c. Fly Ash and Slag (Ternary Blend) - Ensure that there is 10% to 20% fly ash, 50% to 60% slag by weight, and 40% portland cement by weight for mixes containing portland cement, fly ash and slag.

(5) Blended Cements:
   a. Type IS - Ensure that the quantity of slag in Type IS is less than or equal to 70% by weight.
   b. Type IP - Ensure that the quantity of the pozzolan in Type IP is less than or equal to 40% by weight.

(6) Highly Reactive Pozzolans: Highly reactive pozzolans are considered to be silica fume, metakaolin and ultrafine fly ash. When silica fume, metakaolin or ultrafine fly ash is used, it must be used in combination with fly ash or slag and cured in accordance with the manufacturer's recommendations and approved by the Engineer.
   a. Silica Fume - Ensure that the quantity of cement replaced with silica fume is 3% to 9% by weight of the total cementitious material.
b. Metakaolin - Ensure that the quantity of cement replaced with metakaolin is 8% to 12% by weight of the total cementitious material.

c. Ultrafine Fly Ash - Ensure that the quantity of cement replaced with ultrafine fly ash is 8% to 12% by weight of the total cementitious material.

346-2.4 Coarse Aggregate Gradation: Produce all concrete using Size No. 57, 67 or 78 coarse aggregate. With the Engineer’s approval, Size No. 8 or Size No. 89 may be used either alone or blended with Size No. 57, 67 or 78 coarse aggregate. The Engineer will consider requests for approval of other gradations individually. Submit sufficient statistical data to establish production quality and uniformity of the subject aggregates, and establish the quality and uniformity of the resultant concrete. Furnish aggregate gradations sized larger than nominal maximum size of 1.5 inch as two components.

For Class I and Class II, excluding Class II (Bridge Deck), the coarse and fine aggregate gradation requirements set forth in Sections 901 and 902 are not applicable and the aggregates may be blended; however, the aggregate sources must be approved by the Department. Do not blend the aggregate if the size is smaller than Size No. 78.

346-2.5 Admixtures: Use admixtures in accordance with the requirements of this subarticle. Chemical admixtures not covered in this subarticle may be approved by the Engineer Department. Submit statistical evidence supporting successful laboratory and field trial mixes which demonstrate improved concrete quality or handling characteristics.

Use admixtures in accordance with the manufacturer’s recommended dosage rate. Dosage rates outside of this range may be used with written recommendation from the admixture producer’s technical representative. Do not use admixtures or additives containing calcium chloride (either in the raw materials or introduced during the manufacturing process) in reinforced concrete.

346-2.5.1 Water-Reducer/Water-Reducer Retardant Admixtures: When a water-reducing admixture is used, meet the requirements of a Type A. When a water-reducing and retarding admixture is used, meet the requirements of a Type D.

346-2.5.2 Air Entrainment Admixtures: Use an air entraining admixture in all concrete mixes except counterweight concrete. For precast concrete products, the use of air entraining admixture is optional for Class I and Class II concrete.

346-2.5.3 High Range Water-Reducing Admixtures:

346-2.5.3.1 General: When a high range water-reducing admixture is used, meet the requirements of a Type F or Type I. When a high range water-reducing and retarding admixture is used, meet the requirements of a Type G or Type II. When silica fume or metakaolin is incorporated into a concrete mix design, use a high range water-reducing admixture Type I, II, F or G. Do not use high range water-reducing admixtures for pavements.

346-2.5.3.2 Flowing Concrete Admixtures for Precast/Prestressed Concrete: Use a Type I, II, F or G admixture for producing flowing concrete. If Type F or G admixture is used, verify the distribution of aggregates in accordance with ASTM C 1610 except allow for minimal vibration for consolidating the concrete. The maximum allowable difference between the static segregation is less than or equal to 15 percent. Add the flowing concrete admixtures at the concrete production facility.

346-2.5.4 Corrosion Inhibitor Admixture: Use only with concrete containing Type II cement, or Type II (MH) cement, and a water-reducing retardant admixture, Type D, or High Range Water-Reducer retarder admixture, Type G, to normalize the setting time of concrete. Ensure that all admixtures are compatible with the corrosion inhibitor admixture.

346-2.5.5 Accelerating Admixture for Precast Drainage and Incidental Concrete Products: The use of non-chloride admixtures Type C or Type E is allowed in the manufacturing of precast concrete products.
346-3 Classification, Strength, Slump and Air Content.

346-3.1 General: The separate classifications of concrete covered by this Section are designated as Class I, Class II, Class III, Class IV, Class V and Class VI. Strength and slump are specified in Table 2. The air content range for all classes of concrete is 1.0 to 6.0%, except for Class IV (Drilled Shaft) which is 0.0 to 6.0%. All concrete for this project including concrete pavement shall be Class I.

The concrete used for pavements shall be Class I (pavement) except that the concrete mixture shall produce a minimum flexural strength of 650 psi. The target air content shall be 4%. A target slump of 2-inches shall be used for fixed-form paving. A target slump of 1-inch shall be used for slip-form paving. As part of the concrete pavement submittal the Contractor shall provide concrete cylinder and beam test results for the concrete mixture proposed for this project so that flexural strength can be directly correlated to compressive strength for the specific mix proposed. Only one approved concrete pavement mix design shall be utilized for this project unless written approval has been given by the Engineer to change the mix.

Substitution of a higher class concrete in lieu of a lower class concrete may be allowed for concretes other than those used for pavements when the substituted concrete mixes are included as part of the QC Plan, or for precast concrete, the Precast Concrete Producer QC Plan. The substituted higher class concrete must meet or exceed the requirements of the lower class concrete and both classes must contain the same types of mix ingredients. When the compressive strength acceptance data is less than the minimum compressive strength of the higher design mix, notify the Engineer. Acceptance is based on the requirements in Table 2 for the lower class concrete.

<table>
<thead>
<tr>
<th>CLASS OF CONCRETE</th>
<th>SPECIFIED MINIMUM STRENGTH</th>
<th>TARGET SLUMP VALUE (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRUCTURAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I (a) (Miscellaneous Site)</td>
<td>3,000</td>
<td>3 (b)</td>
</tr>
<tr>
<td>I (Pavement)</td>
<td>3,000 650 psi flex</td>
<td>1 or 2</td>
</tr>
<tr>
<td>II (a)</td>
<td>3,400</td>
<td>3 (b)</td>
</tr>
<tr>
<td>II (Bridge Deck)</td>
<td>4,500</td>
<td>3 (b)</td>
</tr>
<tr>
<td>III</td>
<td>5,000</td>
<td>3 (b)</td>
</tr>
<tr>
<td>III</td>
<td>3,000</td>
<td>3 (b)</td>
</tr>
<tr>
<td>IV</td>
<td>5,500</td>
<td>3 (b)</td>
</tr>
<tr>
<td>IV (Drilled Shaft)</td>
<td>4,000</td>
<td>8.5</td>
</tr>
<tr>
<td>V (Special) (d)(f)</td>
<td>6,000</td>
<td>3 (b)</td>
</tr>
<tr>
<td>V</td>
<td>6,500</td>
<td>3 (b)</td>
</tr>
<tr>
<td>V</td>
<td>8,500</td>
<td>3 (b)</td>
</tr>
</tbody>
</table>

(a) For precast three-sided culverts, box culverts, endwalls, inlets, manholes and junction boxes, the target slump value and air content will not apply. The maximum allowable slump is 6 inches, except as noted in (b). The Contractor is permitted to use concrete meeting the requirements of ASTM C 478 4,000 psi in lieu of Class I or Class II concrete for precast endwalls, inlets, manholes and junction boxes.

(b) The Engineer may allow a higher target slump when a Type F, G, I or II admixture is used, except when flowing concrete is used. The maximum target slump shall be 7 inches.

(c) For a reduction in the target slump for slip-form operations, submit a revision to the mix design to the Engineer.

(d) When the use of silica fume, ultrafine fly ash, or metakaolin is required as a pozzolan in Class IV, Class V, Class V (Special) or Class VI concrete, ensure that the concrete meets or exceeds a resistivity of 29 KOhm-cm at 28 days.
346-3.2 Drilled Shaft Concrete: Notify the Engineer at least 48 hours before placing drilled shaft concrete. Obtain slump loss tests results demonstrating that the drilled shaft concrete maintains a slump of at least 5 inches throughout the concrete elapsed time before drilled shaft concrete operations begin.

Obtain slump loss test results from an approved laboratory or from a field demonstration. Slump loss test results for drilled shafts requiring 30 cubic yards of concrete or less and a maximum elapsed time of five hours or less may be done in a laboratory. Obtain all other slump loss test results in the field. Technicians performing the slump test must be ACI Field Grade I qualified.

Ambient temperature conditions for placement of drilled shaft concrete for summer condition is 85° or higher, and below 85° for normal condition. Perform the slump loss test in one of the above ambient temperature conditions.

The concrete elapsed time is defined in Section 455. Obtain the Engineer’s approval for use of slump loss test results including elapsed time before concrete placement begins.

Test each load of concrete for slump to ensure the slump is within the limits of 346. Initially cure acceptance cylinders for 48 hours before transporting to the laboratory.

If the elapsed time during placement exceeds the slump loss test data, provide an engineering analysis performed by a Professional Engineer, registered in the State of Florida, and knowledgeable in the area of foundations, to determine if the shaft is structurally sound and there are no voids in the drilled shaft concrete. At the direction of the Engineer, excavate the drilled shaft for inspection. Obtain approval from the Engineer before placing any additional shafts.

346-3.3 Mass Concrete: When mass concrete is designated in the Contract Documents, provide an analysis of the anticipated thermal developments in the mass concrete elements for all expected project temperature ranges using the selected mix design, casting procedures, and materials. Mass concrete control provisions do not apply to drilled shafts supporting sign, signal, lighting, or intelligent transportation system (ITS) structures.

Use a Specialty Engineer competent in the design and temperature control of concrete in mass elements. The Specialty Engineer shall follow the procedure outlined in Section 207 of the ACI Manual of Concrete Practice to formulate, implement, administer, and monitor a temperature control plan, making adjustments as necessary to ensure compliance with the Contract Documents. The Specialty Engineer shall select the concrete design mix proportions that will generate the lowest maximum temperatures possible to ensure that a 35°F differential temperature between the concrete core and the exterior surface is not exceeded. The mass concrete maximum allowable temperature is 180°F. If either the differential temperature or the maximum allowable temperature is exceeded, the Specialty Engineer shall be available for immediate consultation.

Describe the measures and procedures intended for use to maintain a temperature differential of 35°F or less between the interior core center and exterior surface(s) of the designated mass concrete elements during curing. Submit both the mass concrete mix design
and the proposed mass concrete plan to monitor and control the temperature differential to the Engineer for acceptance. Provide temperature monitoring devices to record temperature development between the interior core center and exterior surface(s) of the elements in accordance with the accepted mass concrete plan.

The Specialty Engineer, or a person designated by the Specialty Engineer, must personally inspect and approve the installation of monitoring devices and verify that the process for recording temperature readings is effective for the first placement of each size and type mass component. Submit to the Engineer for approval the qualification of all technicians employed to inspect or monitor mass concrete placements. Designate an employee(s) approved by the Specialty Engineer, as qualified to inspect monitoring device installation, to record temperature readings, to be in contact at all times with the Specialty Engineer if adjustments must be made as a result of the temperature differential or the maximum allowable temperature being exceeded, and to immediately implement adjustments to temperature control measures as directed by the Specialty Engineer. Read the monitoring devices and record the readings at intervals no greater than 6 hours. The readings will begin when the mass concrete placement is complete and continue until the maximum temperature differential and the temperature is reached and a decreasing temperature differential is confirmed as defined in the temperature control plan. Do not remove the temperature control mechanisms until the core temperature is within 50°F of the ambient temperature. Furnish a copy of all temperature readings to the Engineer. Provide determined temperature differentials, the summary sheet from the data logger, which includes the maximum temperature, the maximum temperature differential and a final report within three calendar days of completion of monitoring of each element.

Request approval of reduced monitoring of same least dimensioned mass concrete elements containing the same mix design, concrete placement temperatures (within plus 3°F), and insulation thermal resistance value. The Specialty Engineer may monitor and record the temperature for the first element only. Each subsequent element must be started within one hour of the first placement and be completed within one hour of the completion of the first element. Each mass concrete element must be instrumented with monitoring devices in case of failure in meeting the one hour time limit.

Changes or adjustments made to the monitored element must be made to all elements. Failure to follow this will require an Engineering Analysis Report (EAR) for the elements not monitored even if the element that was monitored had a temperature differential well below the maximum allowed. The reduced monitoring option will not be allowed by the Engineer if the Contractor fails to comply with these requirements.

If the 35°F differential or the 180°F maximum allowable temperature has been exceeded, take immediate action as directed by the Specialty Engineer to retard further growth of the temperature differential. Describe methods of preventing thermal shock in the temperature control plan. Use a Specialty Engineer to revise the previously accepted plan to ensure compliance on future placements. Do not place any mass concrete until the Engineer has accepted the mass concrete plan(s). When mass concrete temperature differentials or maximum allowable temperature has been exceeded, provide all analyses and test results deemed necessary by the Engineer for determining the structural integrity and durability of the mass concrete element, to the satisfaction of the Engineer. The Department will make no compensation, either monetary or time, for the analyses or tests or any impacts upon the project.

346-3.4 Flowing Concrete for Precast/Prestressed Concrete: Produce flowing concrete mix with target slump of 9 inches.

Subsequent to the laboratory trial batch, perform a field demonstration of the proposed mix design by production and placement of at least three batches, 3 cubic yard minimum size each, of concrete containing flowing concrete HRWR admixture. Take representative samples from each batch and perform slump, air content, density (unit weight), and temperature tests on these samples. Cast specimens from each sample for compressive strength tests. Record
the ambient air temperature during the test. Ensure that the concrete properties are within the required specification limits. The plants that are producing concrete with batch sizes of less than 3 cubic yards are required to produce and place at least a total amount of 9 cubic yards and perform the aforementioned tests on at least three randomly selected batches.

Determine the workability of the demonstration concrete batches by performing the slump tests on the samples taken at 15 minute intervals from each batch. Continue sampling and testing until the slump measures 6 inches or less. From the plot of slump versus time, determine the time for each batch when the slump is at 7.5 inches. The shortest time period determined from three consecutive batches, at 7.5 inches slump, is considered the cutoff time of the proposed concrete mix. For production concrete, ensure that the time between the batching and depositing of each load of concrete is less than the cutoff time of the mix and also does not exceed the allowable time limit specified in this Section.

Ensure that the demonstration concrete is mixed, delivered, placed, consolidated and cured in accordance with the proposed method and sequence. Produce the flowing concrete batches at slumps between 7.5 inches to 10.5 inches.

Perform inspection of the demonstration concrete during batching, delivery, placement and post-placement. During placement, ensure that the concrete batches meet all plastic property requirements of the specifications and maintain their cohesive nature without excessive bleeding, segregation, or abnormal retardation.

Dispose of concrete produced for demonstration purposes at no expense to the Owner Department. Subject to the Engineer’s approval, the Contractor may incorporate this concrete into non-reinforced concrete items and may be included for payment, provided it meets Contract requirements for slump, entrained air, and strength.

After removal of the forms, perform the post-placement inspection of the in-place concrete. Observe for any signs of honeycombs, cracks, aggregate segregation or any other surface defects and ensure that the hardened concrete is free from these deficiencies. The Engineer may require saw cutting of the mock-up products to verify the uniform distribution of the aggregates within the saw cut surfaces and around the reinforcing steel and prestressing strands. The Engineer will require saw cutting of the demonstration mock-up products for plants that are demonstrating the use of the flowing concrete for the first time. Obtain core samples from different locations of mock-up products to inspect the aggregate distribution in each sample and compare it with the aggregate distribution of other core samples. Perform surface resistivity tests on the core samples or test cylinders at 28 days.

Submit the results of the laboratory trial batch tests and field demonstration of verified test data and inspection reports to the Engineer, along with certification stating that the results of the laboratory trial batch tests and field demonstration tests indicate that the proposed concrete mix design meets the requirements of the specifications. For the proposed mix design, state the anticipated maximum time limit between the batching and when the concrete of each batch is deposited during the production.

Upon the review and verification of the laboratory trial batch, field demonstration test data, inspection reports and contractor’s certification statement, the Engineer Department will approve the proposed mix design.

The Engineer Department may approve proposed flowing concrete mixes, centrally mixed at the placement site, without the production of demonstration batches, provided that the proposed mix meets the following two criteria:

1. A previously approved flowing concrete mix of the same class has demonstrated satisfactory performance under the proposed job placing conditions with a minimum of fifteen consecutive Department acceptance tests, which met all plastic and hardened concrete test requirements.

2. The cementitious materials and chemical admixtures, including the flowing concrete HRWR admixture, used in the proposed mix are the same materials from the
same source used in the previously approved mix, (1) above.

Do not produce or place concrete until the design mixes have been approved.

346-4 Composition of Concrete.

346-4.1 Master Proportion Table: Proportion the materials used to produce the various classes of concrete in accordance with Table 3:

<table>
<thead>
<tr>
<th>Class of Concrete</th>
<th>Minimum Total Cementitious Materials Content pounds per cubic yard</th>
<th>Maximum Water to Cementitious Materials Ratio pounds per pounds*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>470</td>
<td>0.53</td>
</tr>
<tr>
<td>I (Pavement)</td>
<td>470</td>
<td>0.50 0.45</td>
</tr>
<tr>
<td>II (Bridge Deck)</td>
<td>470</td>
<td>0.53</td>
</tr>
<tr>
<td>III (Pavement)</td>
<td>611</td>
<td>0.44</td>
</tr>
<tr>
<td>III (Bridge Deck)</td>
<td>611</td>
<td>0.44</td>
</tr>
<tr>
<td>IV (Pavement)</td>
<td>611</td>
<td>0.44</td>
</tr>
<tr>
<td>IV (Seal)</td>
<td>611</td>
<td>0.44</td>
</tr>
<tr>
<td>V (Drilled Shaft)</td>
<td>658</td>
<td>0.41**</td>
</tr>
<tr>
<td>V (Special)</td>
<td>658</td>
<td>0.37**</td>
</tr>
<tr>
<td>VI (Drilled Shaft)</td>
<td>752</td>
<td>0.37**</td>
</tr>
<tr>
<td>VII (Special)</td>
<td>752</td>
<td>0.37**</td>
</tr>
</tbody>
</table>

*The calculation of the water to cementitious materials ratio (w/cm) is based on the total cementitious material including cement and any supplemental cementitious materials that are used in the mix.

**When the use of silica fume or metakaolin is required, the maximum water to cementitious material ratio will be 0.35. When the use of ultrafine fly ash is required, the maximum water to cementitious material ratio will be 0.30.

346-4.2 Chloride Content Limits for Concrete Construction:

346-4.2.1 General: Use the following maximum chloride content limits for the concrete application and/or exposure environment shown:

<table>
<thead>
<tr>
<th>Application/Exposure Environment</th>
<th>Maximum Allowable Chloride Content, pounds per cubic yard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Reinforced Concrete</td>
<td>No Test Needed</td>
</tr>
<tr>
<td>Reinforced Concrete</td>
<td>Slightly Aggressive Environment</td>
</tr>
<tr>
<td></td>
<td>Moderately or Extremely Aggressive Environment</td>
</tr>
<tr>
<td>Prestressed Concrete</td>
<td></td>
</tr>
</tbody>
</table>

346-4.2.2 Control Level for Corrective Action: If chloride test results exceed the limits of Table 4, suspend concrete placement immediately for every mix design represented by the failing test results, until corrective measures are made. Perform an engineering analysis to demonstrate that the material meets the intended service life of the structure on all concrete
produced from the mix design failing chloride test results to the previous passing test results. Supply this information within 30 business days of the failing test results from a Professional Engineer registered in the State of Florida, and knowledgeable in the areas of corrosion and corrosion control.

Perform concrete sampling and testing in accordance with the following methods:

| TABLE 5 |
| Description | Method |
| Slump of Hydraulic Cement Concrete | ASTM C 143 |
| Air Content of Freshly Mixed Concrete by the Pressure Method* | ASTM C 231 |
| Air Content of Freshly Mixed Concrete by the Volumetric Method* | ASTM C 173 |
| Making and Curing Test Specimens in the Field** | ASTM C 31 |
| Compressive Strength of Cylindrical Concrete Specimens*** | ASTM C 39 |
| Obtaining and Testing Drilled Core and Sawed Beams of Concrete | ASTM C 42 |
| Initial Sampling of Concrete from Revolving Drum Truck Mixers or Agitators | FM 5-501 |
| Low Levels of Chloride in Concrete and Raw Materials | FM 5-516 |
| Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete | ASTM C 138 |
| Temperature of Freshly Mixed Portland Cement Concrete | ASTM C 1064 |
| Sampling Freshly Mixed Concrete**** | ASTM C 172 |
| Static Segregation of Self Consolidaing Concrete using Column Techniques | ASTM C 1610 |

*The Department will use the same type of meter for Verification testing as used for QC testing. When using pressure type meters, use an aggregate correction factor determined by the concrete producer for each mix design to be tested. Record and certify test results for correction factors for each type of aggregate at the concrete production facility.

** Provide curing facilities that have the capacity to store all QC, Verification, “hold” and Independent Verification cylinders simultaneously for the initial curing.

***The Verification technician will use the same size cylinders as the Quality Control technician.

**** Take the test sample from the middle portion of the batch in lieu of collecting and compositing samples from two or more portions, as described in ASTM C172.

346-6 Quality Control.
346-6.1 General:
Perform QC activities to ensure materials, methods, techniques, personnel, procedures and
processes utilized during production meet the specified requirements. For precast/prestressed operations, ensure that the QC testing is performed by the producer.

Accept the responsibility for QC inspections on all phases of work. Ensure all materials and workmanship incorporated into the project meet the requirements of the Contract Documents.

346-6.2 Concrete Design Mix: Provide concrete that has been produced in accordance with an Engineer approved design mix, in a uniform mass free from balls and lumps. For slump target values in excess of 6 inches or self-consolidating concrete, utilize a grate over the conveyance equipment to capture any lumps or balls that may be present in the mix. The grate must cover the entire opening of the conveyance equipment and have an opening that is a maximum of 2 1/2 inches in any one direction. Remove the lumps or balls from the grate and discard them. Discharge the concrete in a manner satisfactory to the Engineer. Perform demonstration batches to ensure complete and thorough placements in complex elements, when requested by the Engineer.

Do not place concretes of different compositions such that the plastic concretes may combine, except where the plans require concrete both with and without silica fume, ultrafine fly ash, metakaolin or calcium nitrite in a continuous placement. Produce these concretes using separate design mixes. For example, designate the mix with calcium nitrite as the original mix and the mix without calcium nitrite as the redesigned mix. Ensure that both mixes contain the same cement, fly ash or slag, coarse and fine aggregates and compatible admixtures. Submit both mixes for approval as separate mix designs, both meeting all requirements of this Section. Ensure that the redesigned mix exhibits plastic and hardened qualities which are additionally approved by the Engineer as suitable for placement with the original mix. The Engineer will approve the redesigned mix for commingling with the original mix and for a specific project application only. Alternately, place a construction joint at the location of the change in concretes.

346-6.3 Delivery Certification: Ensure that an electronic delivery ticket is furnished with each batch of concrete before unloading at the placement site. The delivery ticket may be proprietary software or in the form of an electronic spreadsheet, but shall be printed. Ensure that the materials and quantities incorporated into the batch of concrete are printed on the delivery ticket. Include the following information on the Delivery Ticket:

1. Arrival time at jobsite,
2. Time that concrete mix has been completely discharged,
3. Number of revolutions upon arrival at the jobsite,
4. Total gallons of water added at the jobsite,
5. Additional mixing revolutions when water is added,
6. Total number of revolutions.

Items 3 through 6 do not apply to non-agitating concrete transporting vehicles.

Ensure the batcher responsible for production of the batch of concrete signs the delivery ticket, certifying the batch of concrete was produced in accordance with the Contract Documents.

Sign the delivery ticket certifying that the design mix maximum specified water to cementitious materials ratio was not exceeded due to any jobsite adjustments to the batch of concrete, and that the batch of concrete was delivered and placed in accordance with the Contract Documents.

346-6.4 Plastic Property Tolerances: Do not place concrete with a slump more than plus or minus 1 inch from the target slump value specified in Table 2.

Reject concrete with slump or air content that does not fall within the specified tolerances and immediately notify the concrete production facility that an adjustment of the concrete mixture is required. If a load does not fall within the tolerances, test each subsequent load and the first adjusted load. If failing concrete is not rejected or adjustments are not implemented, the Engineer may reject the concrete and terminate further production until the
corrections are implemented.

Do not allow concrete to remain in a transporting vehicle to reduce slump. Water may be added only upon arrival of the concrete to the jobsite and not thereafter.

346-7 Mixing and Delivering Concrete.

346-7.1 General Requirements: Operate all concrete mixers at speeds and volumes per the manufacturer’s design or recommendation as stipulated on the mixer rating plate.

346-7.2 Transit Truck Mixing: When water is added at the jobsite, mix the concrete 30 additional drum mixing revolutions. Do not add water after the total number of drum mixing revolutions exceeds 130, do not make additional mix adjustments. Discharge all concrete from truck mixers before total drum revolutions exceed 300. Seek approval from the Engineer prior to using a central mixer and depositing the batch into a truck mixer.

346-7.2.1 Transit Time: Ensure compliance with Table 6 between the initial introduction of water into the mix and completely discharging all of the concrete from the truck. Reject concrete exceeding the maximum transit time. For critical placements, the Engineer may authorize the placement of the concrete.

<table>
<thead>
<tr>
<th>TABLE 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Allowable Time</td>
</tr>
<tr>
<td>Non-Agitator Trucks</td>
</tr>
<tr>
<td>45 minutes</td>
</tr>
<tr>
<td>75 minutes*</td>
</tr>
</tbody>
</table>

*When a water-reducing and retarding admixture (Type D, Type G or Type II) is used.

346-7.2.2 Placement Time: All the concrete in a load must be in its final placement position a maximum of 15 minutes after the transit time has expired unless a time extension is approved in advance by the Engineer.

346-7.3 On-site Batching and Mixing: Use a mixer of sufficient capacity to prevent delays that may be detrimental to the quality of the work. Ensure that the accuracy of batching equipment is in accordance with requirements of this Section.

346-7.4 Concreting in Cold Weather: Do not mix or place concrete when the air temperature is below 40ºF. Protect the fresh concrete from freezing in accordance with Section 400. The requirements of concreting in cold weather are not applicable to precast concrete mixing and placement operations occurring in a temperature controlled environment.

346-7.5 Concreting in Hot Weather: Hot weather concreting is defined as the production, placing and curing of concrete when the concrete temperature at placing exceeds 85ºF but is less than 100ºF.

Unless the specified hot weather concreting measures are in effect, reject concrete exceeding 85ºF at the time of placement. Regardless of special measures taken, reject concrete exceeding 100ºF. Predict the concrete temperatures at placement time and implement hot weather measures to avoid production shutdown.

346-7.6 Adding Water to Concrete at the Placement Site: If the slump, as delivered, is outside the tolerance range, reject the load. If the slump is within the tolerance range, that load may be adjusted by adding water provided the addition of water does not exceed the water to cementitious materials ratio as defined by the mix design. After adding water, perform a slump test to confirm the concrete is within the slump tolerance range. If an adjustment is made at the concrete production facility, perform a slump test on the next load to ensure the concrete is within the slump tolerance range. Do not place concrete represented by slump test results outside of the tolerance range. Include water missing from the water storage tanks upon arrival at the project.
346-7.7 Sample Location: Obtain acceptance samples from the point of final placement.

Where concrete buckets are used to discharge concrete directly to the point of final placement or into the hopper of a tremie pipe, samples will be obtained from the discharge of the bucket. When the concrete is discharged directly from the mixer into the bucket and the bucket is discharged within 20 minutes, samples may be obtained from the discharge of the mixer.

Where conveyor belts, troughs, pumps, or chutes are used to transport concrete directly to the point of final placement or into the hopper of a tremie pipe, samples will be obtained from the discharge end of the entire conveyor belt, trough, pump, or chute system.

Where concrete is placed in a drilled shaft or other element using a tremie pipe and a concrete pump, samples will be obtained from the discharge of the pump line at the location of the tremie hopper.

For all other placement methods, prior to each placement, obtain Engineer Department approval for sampling at the discharge of the mixer in lieu of sampling at the point of final placement. Submit the sampling correlation procedure to the Engineer for approval prior to the placement of the concrete. Once the comparative sampling correlation is approved by the Engineer, apply this correlation to the plastic properties tolerances for samples obtained from the discharge of mixer.

Where a concrete pump is used to deposit concrete directly into a drilled shaft which is a wet excavation without the use of a tremie, or other applications as approved by the Engineer, ensure the discharge end of the pump line remains immersed in the concrete at all times after starting concrete placement.

346-8 Plastic Concrete Sampling and Testing.

QC tests include air content, temperature, slump, and preparing compressive strength cylinders for testing at later dates. In addition, calculate the water to cementitious materials ratio in accordance with FM 5-501 for compliance to the approved mix design.

Ensure that each truck has a rating plate and a valid mixer identification card issued by the Department. Ensure that the revolution counter on the mixer is working properly, and calibration of the water dispenser has been performed within the last twelve months. Reject any concrete batches that are delivered in trucks that do not have mixer identification cards. Remove the mixer identification card when a truck mixer is discovered to be in noncompliance and the mixer deficiencies cannot be repaired immediately. When the mixer identification card is removed for noncompliance, make note of the deficiency or deficiencies found, and forward the card to the District Materials and Research Engineer who has Producer QC Plan acceptance authority.

Perform plastic concrete tests on the initial delivery of each concrete design mix each day. Ensure QC technicians meeting the requirements of Section 014500 405 are present and performing tests throughout the placement operation. Ensure one technician is present and performing tests throughout the placement operation at each placement site. If a project has multiple concrete placements at the same time, identify the technicians in the QC Plan to ensure minimum sampling and testing frequencies are met. Ensure that the equipment used for delivery, placement and finishing meets the requirements of this Specification.

When a truck designated for QC testing arrives at the discharge site, a subsequent truck may also discharge once a representative sample has been collected from the QC truck and while awaiting the results of QC testing. Reject non-complying loads at the jobsite. Ensure that corrections are made on subsequent loads. Immediately cease concrete discharge of all trucks if the QC truck has failing test. Perform plastic properties tests on all trucks prior to the first corrected truck and the corrected truck. When more than one truck is discharging into a pump simultaneously, only the truck designated for QC testing may discharge into the pump to obtain a representative sample of concrete from the QC truck only.

Furnish sufficient concrete of each design mix as required by the Engineer for verification.
testing. When the Engineer’s verification test results do not compare with the QC plastic properties test results, within the limits defined by the Independent Assurance (IA) checklist comparison criteria, located in Materials Manual Chapter 5, disposition of the concrete will be at the option of the Contractor.

On concrete placements consisting of only one load of concrete, perform initial sampling and testing in accordance with this Section. The acceptance sample and plastic properties tests may be taken from the initial portion of the load.

If any of the QC plastic properties tests fail, reject the remainder of that load, and any other loads that have begun discharging, terminate the LOT and notify the Engineer. Make cylinders representing that LOT from the same sample of concrete.

Following termination of a LOT, obtain samples from a new load, and perform plastic properties tests until such time as the water to cementitious materials ratio, air content, temperature and slump comply with the Specification requirements. Initiate a new LOT once the testing indicates compliance with Specification requirements.

Suspend production when any five loads in two days of production of the same design mix are outside the specified tolerances. Increase the frequency of QC testing to one per load to bring the concrete within allowable tolerances. After production resumes, obtain the Engineer’s approval before returning to the normal frequency of QC testing.

If concrete placement stops for more than 90 minutes, perform initial plastic properties testing on the next batch and continue the LOT. Cylinders cast for that LOT will represent the entire LOT.

When the Department performs Independent Verification, the Contractor may perform the same tests on the concrete at the same time. The Department will compare results based on the Independent Assurance Checklist tolerances.

346-9 Acceptance Sampling and Testing.

346-9.1 General: All QC testing described herein will determine acceptability. Perform plastic properties tests in accordance with 346-8 and cast a set of three QC cylinders, for all structural concrete incorporated into the project. Take these acceptance samples randomly as determined by a random number generator (acceptable to the Engineer Department). The Department will independently perform verification plastic properties tests and cast a set of verification cylinders. The verification cylinders will be the same size cylinder selected by the Contractor, from a separate sample from the same load of concrete as the Contractor’s QC sample.

For each set of QC cylinders verified by the Department, cast one additional cylinder from the same sample, and identify it as the QC “hold” cylinder. The Department will also cast one additional “hold” cylinder from each Verification sample. All cylinders will be clearly identified as outlined in the Sample/Lot Numbering System instructions located on the State Materials Office website. Deliver the QC samples, including the QC “hold” cylinder to the final curing facility in accordance with ASTM C 31. At this same time, the Department will deliver the Verification samples, including the Verification “hold” cylinder, to their final curing facility.

Test the QC laboratory cured samples for compressive or flexural strength at the age of 28 days, or any other specified age, in a laboratory meeting and maintaining at all times the qualification requirements listed in Section 014500 105.

The QC testing laboratory will input the compressive strength test results into the Department’s sample tracking database within 24 hours. When the QC testing laboratory cannot input the compressive strength test results into the Department’s sample tracking database within 24 hours, the QA testing laboratory will notify the Verification testing laboratory within 24 hours of testing the cylinder and provide the Verification testing laboratory the compressive strength test results. Ensure the compressive strength results are input into the Department’s sample tracking database within 72 hours of determining the compressive strength of the cylinders.
The Department will compare the Verification sample results with the corresponding QC sample results. In the event that one set of compressive strength data for a set of cylinders falls outside the range of the other set of cylinders, use the lower Range of Average Compressive Strength to determine the comparison criteria. Based on this comparison, the Department will determine if the Comparison Criteria as shown in Table 7 has been met. When the difference between QC and Verification is less than or equal to the Comparison Criteria, the QC data is verified. When the difference between QC and Verification data exceeds the Comparison Criteria, the data is not verified and the Engineer will initiate the resolution procedure.

<table>
<thead>
<tr>
<th>Range of Average Compressive Strength</th>
<th>Comparison Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3500 psi</td>
<td>420 psi</td>
</tr>
<tr>
<td>3,501 – 4,500 psi</td>
<td>590 psi</td>
</tr>
<tr>
<td>4,501 – 6,500 psi</td>
<td>910 psi</td>
</tr>
<tr>
<td>6,501 – 8,500 psi</td>
<td>1,275 psi</td>
</tr>
<tr>
<td>Greater than 8,500 psi</td>
<td>1,360 psi</td>
</tr>
</tbody>
</table>

**346-9.2 Sampling Frequency:** As a minimum, sample and test concrete of each design mix for water to cementitious materials ratio, air content, temperature, slump and compressive strength once per LOT as defined by Table 8. When a mix design is used for a different application, the LOT is defined by the application. The Engineer will randomly verify one of every four consecutive LOTs of each design mix based on a random number generator. The Department may perform Independent Verification testing to verify compliance with specification requirements. All QC activities, calculations, and inspections will be randomly confirmed by the Department.

**TABLE 8**

<table>
<thead>
<tr>
<th>Class Concrete*</th>
<th>LOT Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>one day’s production</td>
</tr>
<tr>
<td>I (Pavement)</td>
<td>2,000 square yards, or one day’s production, whichever is less</td>
</tr>
<tr>
<td>II, III, IV, V (Special), V</td>
<td>50 cubic yards, or one day’s production, whichever is less</td>
</tr>
<tr>
<td>IV (Drilled Shaft)</td>
<td>50 cubic yards, or two hours between the end of one placement and the start of the next placement, whichever is less</td>
</tr>
<tr>
<td>III (Seal)</td>
<td>Each Seal placement</td>
</tr>
</tbody>
</table>

*For any class of concrete used for roadway barrier wall, the lot size is defined as 100 cubic yards, or one day’s production, whichever is less.

**346-9.2.1 Reduced Frequency for Acceptance Tests:** The LOT size may represent 100 cubic yards when produced at the same mix design at the same concrete production facility for the same prime contractor and subcontractor on a given Contract. Submit test results indicating the average compressive strength is greater than two standard deviations above the specified minimum strength for that class of concrete. Base calculations on a minimum of ten consecutive strength test results for a Class IV or higher; or a minimum of five consecutive strength results for a Class III or lower.
The average of the consecutive compressive strength test results, based on the class of concrete, can be established using historical data from a previous Department project. The tests from the previous Department project must be within the last 60 calendar days or may also be established by a succession of samples on the current project. Only one sample can be taken from each LOT. Test data must be from a laboratory meeting the requirements of Section 105. Obtain Department approval before beginning reduced frequency LOT’s.

If at any time a strength test is not verified or the average strength of the previous ten or five consecutive samples based on the class of concrete from the same mix design and the same production facility is less than the specified minimum plus two standard deviations, return to the maximum production quantity represented by the LOT as defined in Table 8. Notify the Engineer that the maximum production rate is reinstated. In order to reinitiate reduced frequency, submit a new set of strength test results.

346-9.3 Strength Test Definition: The strength test of a LOT is defined as the average of the compressive strengths tests of three cylinders cast from the same sample of concrete from the LOT.

346-9.4 Acceptance of Concrete:
Acceptance of concrete pavement shall be as described in Section 350-16. Ensure that the hardened concrete strength test results are obtained in accordance with 346-9.3. Do not discard a cylinder strength test result based on low strength (strength below the specified minimum strength as per the provisions of this Section).

When one of the three QC cylinders from a LOT is lost, missing, damaged or destroyed, determination of compressive strength will be made by averaging the remaining two cylinders. If more than one QC cylinder from a LOT is lost, missing, damaged or destroyed, the Contractor will core the structure at no additional expense to the Owner Department to determine the compressive strength. Acceptance of LOT may be based on verification data at the discretion of the Engineer. Obtain the approval of the Engineer to core, and of the core location prior to coring.

For each QC cylinder that is lost, missing, damaged or destroyed, payment for that LOT will be reduced by $750.00 per 1,000 psi of the specified design strength. For example, loss of two Class IV (Drill Shaft) QC cylinders that has no verification data will require the element to be recoresed and a pay reduction will be assessed (4,000 psi / 1,000 psi) x $750 x 2 = $6,000. This reduction will be in addition to any pay adjustment for low strength.

When QC compressive strength test results are not verified, the resolution procedure will be used to accept or reject the concrete. Maintain the “hold” cylinders until the verification of the compressive strength test results.

When QC test results are verified, the Engineer will accept the concrete based on QC test results. The Engineer will accept at full pay only LOTs of concrete represented by plastic property results which meet the requirements of the approved mix design and strength test results which equal or exceed the respective specified minimum strength.

346-9.5 Resolution Procedure: The Department may initiate an IA review of sampling and testing methods. The resolution procedure may consist of, but need not be limited to, a review of sampling and testing of fresh concrete, calculation of water to cementitious materials ratio, handling of cylinders, curing procedures and compressive strength testing. Compare the Verification sample results with the verification hold cylinders results. Compare the QC sample results with the QC hold cylinders results. Comparison results must not be greater than the comparison requirements in Table 7. Core samples of the hardened concrete may be required.

The Engineer will determine through the resolution procedure whether the QC strength test results or the verification strength test are deemed to be the most accurate. LOTs will then be considered to be verified. When the Engineer cannot determine which strength test results are the most accurate, the concrete represented by the four consecutive LOTs will be evaluated based on the QC data. The Engineer will inform the QC and the Verification lab within
three calendar days of the acceptance compressive strength test to transport their “hold” cylinders to the resolution lab. The QC and Verification laboratories will transport their own hold cylinder to the resolution testing laboratory within 72 hours after the Engineer notifies the Contractor that a resolution is required. In addition, the Engineer will ensure that the QC and verification “hold” cylinders are tested within seven calendar days of the acceptance strength tests.

The resolution investigation will determine the strength test results for each of the four or less LOTs. When the QC strength test results are deemed to be the most accurate, the QC strength test results will represent the four or less consecutive LOTs and the Department will pay for the resolution testing and investigation. When the verification strength test results are deemed to be the most accurate, the Department will assess a $1,000 pay reduction for the cost of the Resolution Investigation.

The results of the resolution procedure will be forwarded to the Contractor within five working days after completion of the investigation.

346-9.6 Small Quantities of Concrete: When a project has a total plan quantity of less than 50 cubic yards, that concrete will be accepted based on the satisfactory compressive strength of the QC cylinders. Provide certification to the Engineer that the concrete was batched and placed in accordance with the Contract Documents. Submit a QC Plan for the concrete placement operation in accordance with Section 105. In addition, the Engineer may conduct Independent Verification (IV) testing as identified in 346-9. Evaluate the concrete in accordance with 346-10 at the discretion of the Engineer.

346-10 Investigation of Low Strength Concrete for Structural Adequacy.

346-10.1 General: When a concrete acceptance strength test result falls more than 500 psi below the specified minimum strength and the Engineer Department determines that an investigation is necessary, make an investigation into the structural adequacy of the LOT of concrete represented by that acceptance strength test result at no additional expense to the Owner Department. The Engineer may also require the Contractor to perform additional strength testing as necessary to determine structural adequacy of the concrete.

Furnish either a structural analysis performed by the Specialty Engineer to establish strength adequacy or drilled core samples as specified in 346-10.3 to determine the in-place strength of the LOT of concrete in question at no additional expense to the Owner Department. Obtain the Engineer's approval before taking any core samples. When the concrete is deemed to have low strength, obtain and test the cores and report the data to the Engineer within 14 calendar days of the 28 day compressive strength tests. Core strength test results obtained from the structure pavement will be accepted by both the Contractor and the Owner Department as the in-place strength of the LOT of concrete in question. The core strength test results will be final and used in lieu of the cylinder strength test results for determination of structural adequacy and any pay adjustment. The Engineer Department will calculate the strength value to be the average of the compressive strengths of the three individual cores. This will be accepted as the actual measured value.

346-10.2 Determination of Structural Adequacy: If core strength test results are less than 500 psi below the specified minimum strength, consider the concrete represented by the cores structurally inadequate. If the core strength test results are more than 500 psi below the specified minimum strength, the Department will consider the concrete represented by the cores structurally questionable. Submit a structural analysis performed by the Specialty Engineer. If the results of the structural analysis indicate adequate strength to serve its intended purpose with adequate durability, and is approved by the Department, the Contractor may leave the concrete in-place subject to the requirements of 346-11, otherwise, remove and replace the LOT of concrete in question at no additional expense to the Owner Department.

346-10.3 Coring for Determination of Structural Adequacy: Notify the Engineer 48 hours prior to taking core samples. The Engineer will select the size and location of the drilled
cores so that the structure is not impaired and does not sustain permanent damage after repairing  
the core holes. Sample three undamaged cores taken from the same approximate location where  
the questionable concrete is represented by the low strength concrete test cylinders. Repair core  
holes after samples are taken.

346-10.4 Core Conditioning and Testing: Test the cores in accordance with ASTM C  
42. Test the cores after obtaining the samples within seven calendar days.

346-11 Pay Adjustments for Low Strength Concrete.

346-11.1 General: Any LOT of concrete failing to meet the specified minimum strength  
as defined in 346-3, 346-9, 346-10 and satisfactorily meeting all other requirements of the  
Contract Documents, including structural adequacy, the Engineer will individually reduce the price  
of each low strength LOT in accordance with this Section. Contractor shall remove and replace  
the failing concrete at no additional cost to the Owner.

346-11.2 Basis for Pay Adjustments: When an acceptance strength test result falls more  
than 500 psi below the specified minimum strength, core samples may be obtained in accordance  
with ASTM C 42 from the respective LOT of concrete represented by the low acceptance strength  
test result for determining pay adjustments. A price adjustment will be applied to the certified  
invoice price the Contractor paid for the concrete or the precast product.  
Do not core hardened concrete for determining pay adjustments when the 28 day  
acceptance cylinder strength test results are less than 500 psi below the specified minimum  
strength.

The results of strength tests of the drilled cores, subject to 346-11.5 and 346-11.6,  
will be used as the acceptance results and will be used in lieu of the cylinder strength test results  
for determining pay adjustments.

In precast operations, excluding prestressed, ensure that the producer submits  
acceptable core sample test results to the Engineer. The producer may elect to use the products  
in accordance with 346-11. Otherwise, replace the concrete in question at no additional cost to  
the Department. For prestressed concrete, core sample testing is not allowed for pay adjustment.  
The results of the cylinder strength tests will be used to determine material acceptance and pay  
adjustment.

346-11.3 Coring for Determination of Pay Adjustments: Obtain the cores in  
accordance with 346-10.3.

346-11.4 Core Conditioning and Testing: Test the cores in accordance with 346-10.4.

346-11.5 Core Strength Representing Equivalent 28 Day Strength: For cores tested  
no later than 42 calendar days after the concrete was cast, the Engineer will accept the core  
strengths obtained as representing the equivalent 28 day strength of the LOT of concrete in  
question. The Engineer will calculate the strength value to be the average of the compressive  
strengths of the three individual cores. The Engineer will accept this strength at its actual  
measured value.

346-11.6 Core Strength Adjustments: For cores tested later than 42 calendar days after  
the concrete was cast, the Engineer will establish the equivalency between 28 day strength and  
strength at ages after 42 calendar days. The Engineer will relate the strength at the actual test  
age to 28 day strength for the design mix represented by the cores using the following  
relationship:

346-11.6.1 Portland Cement Concrete without Pozzolan or Slag:
Equivalent 28 Day Strength, f'c (28) = 1/F (Average Core Strength) x 100 where:

\[ F = 4.4 + 39.1 \ln(x) - 3.1 (\ln(x))^2 \]  (Type I Cement)

\[ F = -17.8 + 46.3 \ln(x) - 3.3 (\ln(x))^2 \]  (Type II Cement)
F = 48.5 + 19.4 (ln x) -1.4 (ln x)^2 (Type III Cement)

x = number of days since the concrete was placed
ln = natural log

346-11.6.2 Pozzolanic-Cement Concrete:
Equivalent 28 day compressive strength = \( f'_{c(28)} \), where:

\[
f'_{c(28)} = 0.490 \cdot f_c(t) e^{(8.31 - 0.276 \ln t)} \quad \text{(Type I Cement)}
\]

\[
f'_{c(28)} = 0.730 \cdot f_c(t) e^{(7.89 - 0.514 \ln t)} \quad \text{(Type II Cement)}
\]

\[
f'_{c(28)} = 0.483 \cdot f_c(t) e^{(5.38 - 0.191 \ln t)} \quad \text{(Type III Cement)}
\]

\( f_c(t) \) = Average Core Strength at time t (psi)
\( t \) = time compressive strength was measured (days)

346-11.6.3 Slag-Cement Concrete:
Equivalent 28 day compressive strength = \( f'_c(28) \), where:

\[
f'_c(t) = \text{Average Core Strength at time } t \text{ (psi)}
\]

\( t \) = time compressive strength was measured (days)

346-11.7 Calculating Pay Adjustments: **There will be no pay adjustments for concrete pavement on the Project. It will either be accepted or rejected.** The Engineer will determine payment reductions for low strength concrete accepted by the Department and represented by either cylinder or core strength test results below the specified minimum strength, in accordance with the following:

Reduction in Pay is equal to the reduction in percentage of concrete cylinder strength (specified minimum strength minus actual strength divided by specified minimum strength).

For the elements that payments are based on the per foot basis, the Engineer will adjust the price reduction from cubic yards basis to per foot basis, determine the total linear feet of the elements that are affected by low strength concrete samples and apply the adjusted price reduction accordingly.

346-12 Pay-Reduction Rejection for Plastic Properties
A rejected load in accordance with 346-6.4 is defined as the entire quantity of concrete contained within a single ready mix truck or other single delivery vehicle regardless of what percentage of the load was placed. If concrete fails a plastic properties test and is thereby a rejected load but its placement continues after completion of a plastic properties test having a failing result, the concrete shall be removed and replaced at no additional cost. Payment for the concrete will be reduced.

The pay reduction for cast-in-place concrete will be twice the certified invoice price per cubic yard of the quantity of concrete in the rejected load.

The pay reduction for placing a rejected load of concrete into a precast product will be applied to that percentage of the precast product that is composed of the concrete in the rejected load. The percentage will be converted to a reduction factor which is a numerical value greater than zero but not greater than one. The precast product payment reduction will be twice the Contractor’s billed price from the Producer for the precast product multiplied by the reduction factor.
If the Engineer authorizes placement of the concrete, even though plastic properties require rejection, there will be no pay reduction based on plastic properties failures; however, any other pay reductions will apply.

END OF SECTION 346
SECTION 350
CEMENT CONCRETE PAVEMENT

350-1 Description.
Construct Portland cement concrete pavement in one course, on a prepared base/subgrade as indicated in the plans. Use either the fixed-form or the slip-form method of construction. When reinforced cement concrete pavement is specified or required, use concrete reinforced with steel bars or welded wire reinforcement, in accordance with details shown in the Plans. The Engineer may require a demonstration of equipment and paving operations.

If any uncontrolled cracks appear during the life of the Contract, remove and replace the cracked concrete at no expense to the Owner Department. Investigate and implement immediate effective solutions to eliminate further cracks, in consultation with, and subject to the approval of the Engineer.

350-2 Materials.
Meet the following requirements:
- Concrete, Class I or Class I (Pavement)................. Section 346
- Grinding Concrete Pavement.................................. Section 352
- Curing Materials.................................................. Section 925
- Embedded Items................................................. Section 931
- Joint Seal............................................................ Section 932

For concrete pavement placed using the slip-form or side-form methods of construction or placed by hand, utilize 650 psi flexural strength Concrete Class I (Pavement). For concrete pavement placed by hand in constructed forms, utilize Concrete Class I or Concrete Class I (Pavement). LOT size for the use of either material shall be as stated in Section 346 for Concrete Class I (Pavement).

Only cold-applied self-leveling silicone joint sealant (Dow Corning 890-SL or approved equal) will be permitted for concrete pavement joints.

350-3 Equipment.
350-3.1 General: Ensure the equipment and tools that are to be used meet the following:
The capability of handling materials and performing all parts of the work.
To be of such capacity that the paver operates continuously and at a constant rate of production, with starting and stopping held to a minimum.
When equipment operates on the side forms, use scraping devices to clean accumulations from the top of the forms and wheels.
The forms will be a rigid material and mortar tight. Ensure that the alignment and grade of all forms are in accordance with the contract documents, prior to the placing of concrete.

350-3.2 Slip-Form Paver: Provide a slip-form paver that is self-propelled and equipped to spread, strike-off, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the equipment, in such a manner that a minimum amount of hand-finishing will be necessary to provide a dense and homogeneous pavement. Ensure that the equipment is of such dimensions and arrangement as to cover the full width of the pavement strip being placed. Use equipment that is adjustable as to crown and superelevation and that can shape and compact the concrete into a dense and stable mass, to the required cross-section. Ensure that the crown adjustment is readily controllable for accuracy in crown transitions.
Operate the paver on tracks having sufficient contact area to prevent track slippage under load. Ensure that the length of ground contact per track and the arrangement of tracks are adequate to meet the straightedge and other riding-quality requirements specified.
Accomplish screeding by either: (1) oscillating screeds, (2) an extrusion device, or (3) a combination of both.
If necessary, in order to produce a pavement of the required cross-section and
meeting the surface requirements, equip the slip-form paver with traveling side forms of sufficient dimension and strength and of proper shape to support the concrete laterally for a sufficient length of time during placing and finishing.

If using trailing forms, provide forms that are rigidly supported laterally.

If using trailing forms, provide forms that are rigidly supported laterally.

Equip the slip-form paver with automatic guidance and grade controls which operate by sensing from a taut line set true to line and grade. Erect and maintain the taut line. Automatic grade controls are not required on the paver when the tracks of the slip-form paver are operating on a subgrade base which has been consistently trimmed to a tolerance of 1/8 inch above or below true grade as established by the taut line set for that purpose.

350-3.3 Vibratory Units: Consolidate the concrete for the full width of the strip being placed with either surface pan type or internal type vibrators. Use a vibration method with sufficient intensity and duration to ensure complete consolidation of the concrete without causing segregation of the materials.

For the surface vibrators, use a frequency of not less than 3,500 impulses per minute. For internal type vibrators, use a frequency of not less than 5,000 impulses per minute for tube vibrators and not less than 7,000 impulses per minute for spud vibrators. When using spud-type internal vibrators adjacent to forms, either hand-operated or attached to spreaders or finishing machines, use a frequency of not less than 3,500 impulses per minute. Measure and record the frequency of internal vibrators in plastic concrete and submit data to the Engineer. Mount spud vibrators such that the free tip trails, and space spud vibrators at a maximum interval of 30 inches.

Provide an amplitude of vibration with spud vibrators that is sufficient for the vibration to be perceptible on the surface of the concrete along the entire width of the strip being placed. Measure and record the actual frequency of vibrations and submit data to the Engineer. Control all vibration by the forward movement of the spreader or finishing machine so that vibration automatically ceases when stopping the forward movement of the spreader.

350-3.4 Device for Application of Membrane Curing Compound: Provide equipment for applying membrane curing compound that is self-propelled and capable of uniformly applying the curing compound at the specified rate. Use equipment that continuously stirs the curing compound, by effective mechanical means, and that thoroughly atomizes the curing compound during the spraying operation so that the finished surface of the fresh concrete will not be marred. Cover the entire surface of the pavement and, with slip-form type paving, the vertical faces by a single pass of the machine. Only use spray nozzles that are equipped with appropriate wind guards to ensure uniform application.

Power-spray equipment may be used to apply curing compound to areas where it is impracticable to operate the self-propelled equipment.

350-3.5 Equipment for Paving Small or Narrow Areas: For variable width areas, other than mainline, ramps, and shoulders, the Engineer will not require the full paving train as specified for the standard run of paving. Use such equipment that is approved by the Engineer.

350-3.6 Hand Finishing Tools: Provide straightedges that have a blade length of 10 feet. Use long-handled floats that have flat blades, approximately 4 feet long by 5 to 8 inches wide, and that are designed so as to remain straight and true. Use a handle for both types of tool with a length that exceeds 1/2 the width of the strip being placed by 3 feet.

350-4 Subgrade Base Preparation.

Keep construction of the subgrade base completed for a distance of at least 500 feet ahead of the paving operation. Maintain the finished subgrade base in a smooth, compact condition, and restore any areas which are disturbed prior to placing the concrete. Do not place concrete on a frozen subgrade base.
Ensure that the subgrade base is within two percent of the optimum moisture content while placing the concrete. Uniformly apply water ahead of the paving operations, as directed by the Engineer.

Do not allow vehicles to travel on the prepared subgrade base between the subgrade base trimming machine and the paving operations unless specifically authorized.

Accurately trim the subgrade base to the required elevation. Trim high areas to proper elevation. Fill low areas with suitable material, compacted to the specified density, or with concrete placed integrally with the pavement. When slip-form paving, include in the width to be trimmed the areas on which the tracks of the paver will operate.

Remove material planed from the subgrade base before placing any concrete. The Engineer may waive the use of the planer for small or isolated areas or any areas where its use would be impracticable.

350-5 Setting Forms.

350-5.1 General: Accurately set the forms to line and grade and such that they rest firmly, throughout their entire length, upon the subgrade base surface. Join forms neatly and tightly, and brace them to resist the pressure of the equipment operating on the forms. Obtain the Engineer’s approval of the alignment and grade of all forms before and immediately prior to the placing of concrete.

Fill any subgrade base that is below the established grade at the form line to grade with granular material, in lifts of 1/2 inch or less, for a distance of 18 inches on each side of the pavement edge, and thoroughly compact the material. As an exception, when placing forms on a cement-treated subgrade base, the Contractor may use wedging, provided that the wedging system used adequately supports the forms without causing detrimental deflection under the weight of the paving equipment.

350-5.2 Tamping: When placing forms on other than a cement-treated subgrade base, adequately tamp the materials below and adjacent to the forms with form-tamping machines.

350-5.3 Advance Preparation of Forms: Keep sufficient forms on hand at all times, and set forms so that at least 500 feet of forms on each side of the roadway will be accurately set, and maintained true to line and grade, in advance of the point where concrete is being placed. Provide sufficient forms so that it is not necessary to remove them in less than 12 hours after placing the concrete.

350-5.4 Cleaning Forms: Thoroughly clean the forms after each use and before placing concrete against them. Apply a release agent in accordance with the manufacturer’s recommendations.

350-6 Protection from Weather.

Meet the requirements of 400-7.1 when placing concrete. When rain appears imminent, stop all paving operations, and cover the surface of the unhardened concrete with the protective covering.

Concrete for pavement shall not be placed when the air temperature is less than 40 degrees F or greater than 90 degrees F. The concrete temperature shall be kept above 50 degrees F for a minimum period of 24 hours and shall never exceed 90 degrees F unless approved by Engineer.

350-7 Placement of Reinforcement.

350-7.1 General: Where the Plans call for reinforced concrete pavement, place the steel reinforcement in the pavement slab in accordance with the details shown in the Plans. At the time of the concrete placement, ensure that the reinforcing steel is free from any of the following which could impair bonding of the steel with the concrete: dirt, oil, paint, grease, mill scale, and any loose or thick rust. Place the reinforcement as provided below.
350-7.2 Welded Wire Reinforcement: Place welded wire reinforcement at right angles to the centerline of the pavement and accurately to the position and location shown in the Plans. Lap adjacent sheets of welded wire reinforcement not less than 6 inches. Make the laps only in the longitudinal members.

350-7.3 Bars: Place bar reinforcement as shown in the Plans. Securely wire together transverse and longitudinal bars at their intersections. Lap splices not less than 20 times the nominal diameter of the bar, and only in the longitudinal members.

350-8 Placing Concrete.

350-8.1 Distribution: Distribute the concrete on the subgrade base to such depth that, when it is consolidated and finished, the slab thickness required by the Plans will be obtained at all points. The surface will at no point be below the grade specified for the finished surface. Place the concrete on the subgrade base in a manner which will require as little rehandling as possible. Place concrete as near to expansion and contraction joint assemblies as possible without disturbing them. Ensure that workers do not walk in the freshly placed concrete with their boots or shoes coated with earth or other deleterious substances.

350-8.2 Use of Spreader: Place concrete on the subgrade base by an approved spreading device. Do not place concrete from the discharge bucket or hopper onto an assembly without centering the bucket or hopper directly over the assembly. A spreader is not required in areas where the width of slab varies, intersections, and small or isolated areas where it would be impractical to use a spreader. Perform the necessary hand spreading with shovels (not with rakes or hoes).

350-8.3 Placement Widths: The Contractor shall may construct the pavement either in lanes as determined by the longitudinal joints shown in the Plans, or for the full width in one operation. Construct the pavement to the full width of the lane or slab in a single construction operation. When constructing pavement in separate lanes, do not deviate the junction line from the true line shown in the Plans by more than 1/2 inch at any point. Tool the edges of the junction to the radius shown in the Plans.

When constructing pavement in separate lanes, place the lanes adjacent to the low edge of the pavement, as shown on the typical section, first.

350-8.4 Consolidation Along Forms and Joints: Thoroughly consolidate concrete against and along the faces of all forms, and along the full length on both sides of all joint assemblies, by means of hand-operated, spud-type vibrators. Do not allow vibrators to come in contact with a joint assembly, reinforcement, the subgrade base or a side form.

350-8.5 Slip-Form Paver: When placing concrete with a slip-form paver, operate the paver with a continuous forward movement. If for any reason it is necessary to stop the forward movement of the paver, immediately stop operation of the vibrating or tamping elements. Do not apply tractive force to the paving machine except that which is controlled from the machine.

In case of an emergency, have available for use at the project site at least 100 feet of forms. Do not insert steel tie-bars into the unsupported side of the freshly formed slab. The Contractor may place tie-bars into position prior to extrusion from the paver by insertion through the forms, by insertion through a temporary support form placed against the form slab, or by other means approved by the Engineer. Use a method that results in placement of the tie-bars at the specified locations with no damage or disruption of the concrete.

350-9 Striking-off, Consolidating, and Finishing Concrete.

350-9.1 General Requirements: Immediately after placing the concrete, strike-off, consolidate, and finish it to produce a finished pavement in accordance with the cross-section, width, and surface finish required by the Contract Documents. Perform the sequence of operations as follows: strike-off; vibratory consolidation; screeding; floating; removal of laitance;
straightedging; and final surface finish. Except as specified, perform strike-off, consolidation, screeding, and floating by the machine method.

Use equipment that is fully and accurately adjustable to produce a pavement meeting project requirements. Use equipment that is capable of operating in a consistent and smooth manner under all conditions of use.

As soon as possible after screeding while the concrete is plastic, correct all flaws such as cavities, blemishes, marks, or scratches that will not be removed by planing.

Provide a concrete surface true to grade, cross slope and superelevation, and free of irregularities. If the Engineer permits adding water to assist the finishing operations, apply water as a fog spray by means of approved spray equipment.

350-9.2 Machine Method: Operate the machine over each area of pavement as few times and at such intervals as is necessary to give proper consolidation and to leave a surface of uniform texture. Avoid excessive operation over a particular area.

Perform strike-off, consolidation, and finishing in a manner such as to avoid damage to, or misalignment of, joint assemblies, reinforcing steel, dowels, and other embedded items. Smooth the surface of the concrete and remove the excess mortar from the surface. Carry a small amount of mortar ahead of the float device as it moves on the surface of the concrete. Operate the machine over the surface of the concrete as many times as required to obtain an acceptable surface, meeting the requirements specified herein. Discard excess mortar beyond the edge of the slab.

350-9.3 Hand Methods:
350-9.3.1 Conditions under which Allowed: Use hand methods in areas of narrow width or irregular dimensions, where operation of mechanical equipment is impracticable.

350-9.3.2 Strike-off and Screeding: Use a portable screed of an approved design, constructed either of metal or of other suitable material shod with metal, to strike-off and screed the concrete. Use a screed that is sufficiently rigid to retain its shape and is at least 2 feet longer than the maximum width of the strip to be screeded.

350-9.3.3 Consolidation: Use hand-operated spud-type vibrators to consolidate.

350-9.3.4 Floating: Use long-handled floats to float the concrete. Take the necessary care to avoid creating depressions or ridges during this operation.

350-9.4 Work Bridges: Provide work bridges or other devices necessary for access to the pavement surface for the purpose of inspection, finishing, straightedging, and performing corrective work.

350-10 Final Finish.
350-10.1 Finishing: As the water sheen disappears from the surface of the pavement and just before the concrete achieves its initial set, drag a seamless length of damp burlap that extends the full width of the strip of the constructed pavement, longitudinally along the surface to produce a uniform gritty texture.

Use a burlap drag that consists of two layers of medium weight burlap with the trailing edge of the lower layer extending approximately 2 inches behind the upper layer. Support the burlap drag in a manner so that a length of at least 3 feet of burlap is in contact with the pavement.

Except in areas where using hand methods to construct the pavement, support the lead end of the burlap drag by a traveling bridge. Maintain the drag clean and free from encrusted mortar. Replace the burlap with new material as necessary.

350-10.2 Edging: After applying the final finish, but before the concrete has become nonplastic, carefully round the edges to a 1/4 inch radius on each side of transverse expansion joints and construction joints and along any structure extending into the pavement. Produce a well-defined and continuous radius, and obtain a smooth, dense mortar finish. Completely remove all concrete from the top of the joint filler.
Check all joints with a straightedge before the concrete has become nonplastic, and, if one side of the joint is higher than the other or the entire joint is higher or lower than the adjacent slabs, make corrections as necessary.

350-11 Curing.

350-11.1 General: After completing the finishing operations and as soon as the concrete has hardened sufficiently to not mar the surface, cover and cure the entire surface and, when the slip-form method is used, cover and cure the edges of the newly placed concrete in accordance with one or more of the methods described below. In cases where curing requires the use of water, ensure that curing has prior right to use all water supplies. If the Contractor fails to provide sufficient curing materials to adequately cure the concrete in place in a timely manner, that portion of the concrete pavement section addressed in the QCP will be suspended. Do not leave the concrete exposed for a period in excess of 30 minutes between stages of curing or during the curing period.

Continuously cure the freshly placed concrete for a period of 72 hours, exclusive of any periods when the temperature of the surface of the concrete falls below 50ºF.

350-11.2 White-Pigmented Curing Compound: Under this method, uniformly apply white-pigmented curing compound to the surfaces to be cured, in a single coat, continuous film, at the minimum rate of 1 gallon to every 200 ft², by a mechanical sprayer.

At the time of use, thoroughly mix the compound in accordance with the manufacturer’s recommendation.

Do not apply curing compound during periods of rainfall. Do not apply curing compound to the inside faces of joints to be sealed. Should the film become damaged from any cause within the required curing period, repair the damaged portions immediately with additional compound. If using side forms, upon their removal, immediately coat the sides of the slabs exposed to provide a curing treatment equal to that provided for the surface.

350-11.3 Burlap Mats: Thoroughly saturate the mats with water before placing them. Use mats of such dimensions that as laid they extend to at least 2 feet beyond the edges of the strip of concrete placed. Place and weigh down the mats throughout the curing period to ensure contact with the surface being cured. Maintain the mats fully moist and in position for the entire portion of the required curing period.

350-11.4 Removal of Forms: Do not remove forms from freshly placed concrete for at least 12 hours after placement. Remove forms carefully so as to avoid damage to the pavement. After removing the forms, immediately cure the sides of the slab in the same manner as the surface of the pavement.

350-12 Joints.

350-12.1 General: Construct joints at the locations and in accordance with the details shown in the Design Standards, Index Nos. 305 and 306 and the Contract Documents.

350-12.2 Longitudinal Joints:

350-12.2.1 Longitudinal Construction Joints: Where the pavement is poured in strips less than the full width of the pavement, construct longitudinal construction joints in accordance with the details shown in the Plans.

350-12.2.2 Longitudinal Lane-tie Joints: Construct longitudinal lane-tie joints within the limits of a strip of pavement, in accordance with the details shown in the Plans. Construct the plane of weakness by sawing a groove in the hardened concrete. Complete sawing as soon as possible but in no case longer than 72 hours after placing the concrete.

350-12.2.3 Tie Bars and Bolt Assemblies: Place deformed steel tie bars or tie bolt assemblies at the required depth, parallel to the finished surface, at right angles to the joint and at the uniform spacing specified or required in the Plans. Place them in the plastic concrete using approved equipment, or rigidly support them on the subgrade by approved devices.
capable of preventing displacement prior to placing of the concrete. Do not paint or coat the bars with any material before placing them in the concrete.

If placing tie bars along a longitudinal construction joint using the method of inserting bars with a 90 degree bend in the edge of the plastic concrete and after the concrete hardens straightening these bars, use Grade 40 reinforcing steel for such tie bars. Replace any bar broken while being straightened in an approved manner.

350-12.3 Transverse Joints:

350-12.3.1 Transverse Construction Joints: Construct transverse construction joints at the end of all pours and at other locations where the paving operations are stopped for as long as 30 minutes. Do not place construction joints, however, within 10 feet of any other transverse joint or within 10 feet of either end of a section of pavement. If sufficient concrete has not been placed to form a slab at least 10 feet long, remove the excess concrete, back to the last preceding joint. Form the joints by placing a wood or metal bulkhead accurately and securely in place, in a plane perpendicular to the profile and centerline of the pavement. Install dowel bars at the construction joints. Saw or form construction joints, in a manner similar to contraction joints, so that a groove will be formed for holding the joint sealing compound.

350-12.3.2 Transverse Contraction Joints: Construct transverse contraction joints at the interval indicated in the Plans consisting of planes of weakness created by sawing a groove in the surface of the hardened concrete. Place the groove perpendicular to the surface of the pavement. Install load transfer devices in transverse contraction joints.

Ensure that the sawing equipment does not damage the pavement, and saw the transverse contraction joints as soon as the pavement has hardened to the degree that tearing and raveling are not excessive and before uncontrolled shrinkage cracking begins.

Accomplish the joint sawing in two steps. Make the initial cut 1/8 inch wide by a depth at least 1/3 of the pavement thickness and as soon as possible but in no case longer than 12 hours after placing the concrete. Make a second saw cut, to provide the joint dimensions indicated in the Plans, just prior to sealing the load transfer device.

In cases where a strip of pavement is being placed immediately adjacent to a previously constructed strip of pavement, construct transverse contraction joints using extreme care to time sawing so as to prevent uncontrolled cracks.

Repair any uncontrolled cracks at no expense to the Department-Owner by removing and replacing the pavement across the full width of all affected lanes or shoulders and to the nearest transverse joint in each direction.

After the final sawing, clean the joint, install the bond breaker, and seal the joint.

350-12.3.3 Transverse Expansion Joints: Form transverse expansion joints using preformed joint filler, and provide them with dowel load transfer, in accordance with the details shown on the Design Standards, or in the Plans.

Form the joints during the placing of the concrete, by securely staking a metal bulkhead accurately in place at the joint location or by other methods which will securely brace and support the joint filler. Where using approved devices to keep the expansion joint filler and dowels securely in place, the Engineer will not require a bulkhead. Protect all transverse expansion joints at the bottom and side edges by a sheet metal strip as specified in 931-2.1 and as shown in the Contract Documents.

Cut the filler to the crown and shape of the slab cross-section and extended it to the subgrade base. After installation, ensure that the top is not less than 1 inch, and not more than 1.25 inches, below the finished surface. Furnish the joint filler in lengths not less than the lane widths being poured, except that the Engineer will not require lengths greater than 12 feet. Where more than one section is allowed and used in a joint, securely lace or clip the sections together.
Place the filler normal to the pavement surface. Stake the assembly into position in such a way as to hold the assembly securely in position throughout construction. Ensure that the assembly is true to the line prescribed, subject to a tolerance of 1/4 inch in the width of the slab. Obtain the Engineer’s approval of the assembly and its installation before placing any concrete against it. Obtain the Engineer’s approval of the cross-section and length of the stakes.

When laying the pavement in partial width slabs, place transverse joints in the succeeding slab in line with the like joints in the first slab. In the case of widening existing pavement, place transverse joints in line with like joints in the existing pavement or as otherwise shown in the Plans.

350-12.4 Load-Transfer Devices: Provide dowel load-transfer devices as shown on the plans in all transverse joints. Firmly hold dowel bars in a position parallel to the surface and the centerline of the slab, by approved steel supports and spacers of a type shown in the Plans. The Engineer may approve the use of dowel bar supports or assemblies other than those specifically detailed in the Plans. Allow the dowels to be free to move in one slab as the concrete contracts and expands. Paint each dowel with one coat of zinc rich primer or red oxide alkyd based primer meeting the requirements of SSPC Paint 25 Type I or Type II. Wait a minimum of 7 days before coating one-half of the dowel with a petroleum based lubricant grease to inhibit bonding to the concrete. Provide a cap for the free end of expansion joint dowels.

Position each dowel such that its final deviation from parallel to the surface of the pavement and parallel to the longitudinal centerline of the pavement does not exceed 1/2 inch. Position each dowel such that its final deviation from being centered on the joint does not exceed 2 inches. Position each dowel such that at no point in its length does it deviate from the surface of the pavement as shown in the Plans in excess of 1 inch. Confirm the position of dowel bars by suitable means acceptable to the Engineer, which may include non-destructive testing methods.

All dowel bars used at construction joints shall be drilled and epoxied as shown on the plans after the concrete has sufficiently cured (at least 72 hours). Dowel bars may be cast in the concrete using holes in side forms.

350-12.5 Expansion Joints Around Structures:

350-12.5.1 Expansion Joints at Manholes, Meter Boxes and other Projections: Form expansion joints by placing premolded expansion joint material about all structures and features projecting through, into or against the pavement. Ensure that such joints are 1/2 inch in width.

350-12.5.2 Bridge Approach Expansion Joints: Construct in accordance with Design Standards, Index No. 306.

350-12.6 Cleaning Joints and Cracks:

350-12.6.1 Sawed Joints: Immediately after sawing the joints which require sealing, completely remove the resulting slurry from the joint and the immediate area by flushing with a jet of water under pressure and by using other tools as necessary.

After flushing, blow out the joints with compressed air. After the flushed joints have dried, sandblast the joint faces to thoroughly remove all foreign material. Perform sandblasting in two passes, once for each face.

Patch all spalled edges with an epoxy compound.

Immediately prior to joint seal installation, clean the joints using compressed air to remove all traces of debris and dust within and on the joint surfaces.

350-12.6.1.2 Non-Sawed Joints: Thoroughly clean joints which require sealing of all foreign material for the full depth of the seal installation.

With the exception of slurry removal due to sawing, meet the cleaning requirements as specified for sawed joints.

350-12.6.2 Cleaning Joints in Existing Pavement: Remove all existing joint-
sealing material and foreign material for the full depth of the new joint seal by sawing, wire brushing, sandblasting, or other methods approved by the Engineer.

Remove any existing sealant or parting strip material below the tape or backer rod bond breaker and replace it with additional bond breaker. When conditions require removal and replacement with additional bond breaker below the new joint seal, obtain the Engineer’s approval of the type of bond breaker and its installation procedure. Perform cleaning by any method or combination of methods, as detailed in the Plans.

Flush the joint with a pressurized jet of water, and use other tools as necessary, to remove loose remnants and debris.

After flushing, blow out the joints with compressed air. After the flushed joints have dried, sandblast the joint faces to thoroughly remove all foreign material. Perform sandblasting in two passes, once for each face.

Patch all spalled edges with an epoxy compound.

Immediately prior to joint seal installation, clean the joints using compressed air to remove all traces of debris and dust within and on the joint surfaces.

350-12.6.3 Cleaning Random Cracks in Existing Pavement: Do not begin cleaning random cracks in existing pavement until all other concrete pavement repairs have progressed to the point where those operations will not adversely affect the installation of the new seal.

Cut the random cracks to be repaired and sealed into grooved joints to the depth and width detailed in the Plans. Clean the joints as specified in 350-12.6.2.

350-12.7 Sealing Joints and Cracks: Seal joints in new pavement before allowing any traffic or construction equipment on the pavement. Complete sealing within 72 hours (weather permitting) of sawing. If traffic is going to be on the pavement prior to any grinding, then seal the joints with a temporary material acceptable to the Engineer.

When using silicone and non-silicone sealants in the transverse and longitudinal joints, respectively, always use the silicone sealants first to prevent contamination at the intersection of the joint faces. Remove non-silicone sealant 1 foot in each direction from the transverse joints, and replace it with silicone sealant.

Use equipment equipped with nozzles that discharge the sealant at the bottom of the groove. Ensure that the apparatus develops sufficient pressure to extrude the joint sealer from the nozzles satisfactorily and to control the rate of application so as to completely fill the joint to within 1/4 inch of the surface of the pavement without spillage. Use an apparatus so constructed that it maintains the proper temperature of the sealing material within the manufacturer’s recommendation.

350-12.7.1 Hot-Poured Type Sealant: When the Plans require hot poured sealant for specific joints, fill the joint thoroughly, without trapping air, ensuring the sealant is recessed below the pavement surface as required, and control the pouring rate to avoid spilling of sealant onto the adjacent pavement surface. If any spilling of sealant occurs, immediately remove and clean the entire surplus amount from the pavement surface. Place poured material when the ambient air temperature is 50°F or greater.

Use an indirect heating or double boiler type heating kettle that uses oil as a heat transfer medium, for hot poured sealer. Use a heating kettle that has a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath.

350-12.7.2 Low Modulus Silicone Sealant: Use low modulus silicone sealant of either Type A (non-self-leveling silicone sealant), or Type B and/or Type C (self-leveling silicone sealant). Because Type A will not flow into the proper shape under its own weight, install and tool it so that the sealant is in firm contact with the joint faces and is formed into the appropriate shape as specified. Types B and C will normally flow into the proper shape without tooling. Exercise care to provide the required depth of recess above the sealant surface and below the pavement.
surface. Install the silicone sealant at temperatures above 40ºF.

350-13 Surface Requirements.
Produce, by grinding in accordance with Section 352, a pavement surface that is true to grade and uniform in appearance with a longitudinal line type texture.

350-14 Thickness Determinations.
350-14.1 General: After completing the concrete pavement, including any corrective work to meet ride requirement, determine the thickness by one of following methods. The Engineer will select the locations for testing and make the determination of thickness. Sample locations will be taken at various points on the cross-section so that each test represents an area not exceeding 2,500 yd². Provide traffic control, non-destructive equipment, coring equipment, and operator to obtain the samples.

350-14.1.1 Core Borings: To determine the actual thickness, drill cores from the pavement and measure thickness in accordance with ASTM C174. Replace the portions of the pavement removed by the borings at no expense to the Owner Department.

350-14.1.2 Non-destructive Testing: For a determination using the impact-echo method, measure the thickness of the pavement in accordance with ASTM C1383. The initial thickness measurement will be validated by having a core boring taken at that location in compliance with 350-14.1.1. If the results from the impact-echo test vary by plus or minus 0.15 inches from the core boring, then the non-destructive test method cannot be used on the pavement. In such case, the core boring will be used for acceptance of that LOT of concrete. The Engineer has the option to verify the accuracy of the results at any time.

350-14.1.3 Topographic Survey: If approved in advance by the Engineer, thickness may be determined using topographic survey data. If this alternative is selected, 100% of the pavement area shall be surveyed to make a determination of thickness.

After the base has been accepted in accordance with Section 200 (just prior to placement of any pavement), the surface of the base shall be surveyed on a grid corresponding to the pavement joint intersections, plus a shot in the middle of each slab and at grade breaks.

After concrete has been placed, Contractor shall survey the finished pavement surface at each joint intersection and the center of slabs. Elevations shall be measured to the nearest .001 foot. The surveyed areas will be separated into the thickness LOTS as described herein. The pavement thickness (pavement finish elevation minus the base elevation) will be averaged to determine an average surveyed thickness for the respective LOT.

The average thicknesses determined from cores and survey measurements will be evaluated separately.

Thickened edge transition slabs and PCC penetration areas will be evaluated individually and separately from other pavement areas.

Contractor shall submit all survey data to the Engineer for review in an ascii text file or 3D AutoCAD file as outlined in Section 017123.

350-14.2 Method of Calculating Average Thickness: The Department will determine the average thickness of the pavement by using the following method of calculation:
(a) The Department will not take into account in the calculation, any areas of pavement which are left in place, but for which no payment will be made.

(b) When the thickness of the pavement is more than 1/2 inch greater than the specified thickness, the Department will consider it in the calculation as the specified thickness plus 1/2 inch.

(c) The Department will calculate the average thickness for the entire job as a unit.

350-15 Deficient Thickness.
350-15.1 General: The Owner Department will not pay for any pavement which is more...
than 1/2 inch less than the specified thickness. When the pavement contains no longitudinal construction joint, the Owner Department will not pay for the area of such pavement that is the product of the full width of the strip placed as a unit times the sum of the distances each way from the short core or cores to the cores on each side which show measurements within the tolerance limits. When the pavement contains longitudinal construction joints, for the width, the Owner Department will use the width between longitudinal construction joint and the edge of pavement.

350-15.2 Deficient Pavement Requiring Removal: The Engineer will evaluate areas of pavement found deficient in thickness by more than 1/2 inch and if, in his judgment, the deficiency is enough to seriously impair the anticipated service life of the pavement, remove such areas and replace them with concrete of the thickness shown in the Plans. The Owner Department will not pay for the area of pavement removed or for the materials or labor involved in its removal. When removing a section of pavement, remove the full length between transverse joints.

350-15.3 Deficient Pavement Left in Place: If the Engineer determines that the deficiency will not seriously impair the anticipated service life of the pavement, the pavement may be left in place, at no compensation.

350-15.4 Additional Borings: If the number of cores taken is not sufficient to indicate the thickness of the pavement, additional boring locations may be requested, with prior approval from the Engineer at no additional cost to the Department Owner.

350-16 Opening Pavement to Traffic.

Construct an earth berm along each edge of the pavement within 36 hours of finishing any newly placed concrete pavement. Build the berm to the full height of the pavement and at least 18 inches wide, and sufficiently compacted to prevent underwash of the pavement. Maintain the berm until the final shoulders or adjacent construction is complete.

Except as provided below, keep the pavement closed to traffic for a minimum period of 14 calendar days after placement of the concrete. The Engineer may permit opening of a section of pavement to traffic at an earlier time provided that representative test cylinders, made in accordance with ASTM C31 and tested in accordance with ASTM C39, indicate a compressive strength of at least 2200 psi or a flexural strength of at least 550 psi. Cure these test cylinders in a manner identical to the corresponding section of pavement.

Protect the pavement from all traffic, including construction operations, until the specified period of time has elapsed. Protect the pavement from ambient temperatures below 50°F for the calendar days or until the required compressive strength has been attained.

350-17 Method of Measurement.

350-17.1 Concrete Pavement: The quantities to be paid for will be the plan quantity, in square yards, of plain cement concrete pavement and of reinforced cement concrete pavement, omitting any areas not allowed for payment under the provisions of 350-15.3 and adjusted for average thickness as provided herein.

For purposes of payment, the average thickness of pavement will determine the final pay quantities for this pavement as follows:

The area of pavement represented by the difference between the calculated average thickness and the specified thickness will be converted into equivalent square yards of specified thickness pavement, and the quantity thereby obtained will be added to, or deducted from, the quantity of pavement to be paid for, subject to the limitation that the maximum average of over-thickness permitted in the adjustment of the quantity of pavement to be paid for will be 1/4 inch.

Where the Plans call for cement concrete pavement that is to be covered with asphalt concrete surface course, payment will be made for the total thickness of the combination as plain cement concrete pavement. In such cases, price and payment will also include all costs.
of the asphalt concrete surface course constructed in accordance with Section 334.

Reinforcing steel, placed and accepted, will be measured and paid for as provided in Section 415.

350-17.2 Joints and Cracks: For cleaning and sealing joints in new or existing concrete pavement, the quantity to be paid will be the length in feet, as determined by field measurement along the joints.

For cleaning and sealing random cracks in existing concrete pavement, the quantity to be paid will be the length in feet, as determined by field measurement along the cracks.

350-17.3 Bridge Approach Expansion Joint: The quantity to be paid for will be the plan quantity, in feet of bridge approach expansion joint installed in accordance with Design Standards, Index No. 306, calculated across the pavement at right angles to the centerline of the roadway.

350-18 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including any preparation of the subgrade not included in the work to be paid for under another Contract item; all transverse and longitudinal joint construction, including tie-bars and dowel bars; the furnishing of test specimens; repair of core holes; and all incidentals necessary to complete the work.

Payment will be made under:

Item No. 350-3 Plain Portland Cement Concrete (PCC) Pavement, 9-Inch Depth - per square yard.

Item No. 350-4 Reinforced Cement Concrete Pavement - per square yard.

Item No. 350-5 Cleaning and Sealing Joints - per foot.

Item No. 350-6 Cleaning and Sealing Random Cracks - per foot.

END OF SECTION 350
SECTION 425
INLETS, MANHOLES, AND JUNCTION BOXES

425-1 Description.
Construct inlets, manholes, and junction boxes from reinforced concrete as shown in the Design Standards and the plans. Furnish and install the necessary metal frames and gratings. Construct yard drains from concrete meeting the requirements of Section 347. Adjust structures shown in the plans to be adjusted or requiring adjustment for the satisfactory completion of the work. This specification does not apply to structures related to City of Naples Water or Wastewater facilities.

425-2 Composition and Proportioning.
425-2.1 Concrete: For inlets, manholes, and junction boxes, use Class II or IV concrete, as designated in the plans and Design Standards and as specified in Section 346. For yard drains use concrete as specified in Section 347.

425-2.2 Mortar: For brick masonry, make the mortar by mixing one part Portland cement to three parts sand. Miami Oolitic rock screenings may be substituted for the sand, provided the screenings meet the requirements of 902-5.2.3 except for gradation requirements. Use materials passing the No. 8 sieve that are uniformly graded from coarse to fine. Masonry cement may be used in lieu of the above-specified mortar provided it is delivered in packages properly identified by brand name of manufacturer, net weight of package, and whether it is Type 1 or Type 2, and further provided that it has not been in storage for a period greater than six months.

425-3 Materials.
425-3.1 General: Meet the following requirements:
- Sand (for mortar) ...................................................... 902-3.2
- Portland Cement ....................................................... Section 921
- Water ........................................................................ Section 923
- Reinforcing Steel ..................................................... 931-1.1 and 415-3
- Brick and Concrete Masonry Units ......................... Section 949
- Castings for Frames and Gratings .......................... 962

425-3.2 Gratings, Covers, and Frames: Use gratings and frames fabricated from structural steel or cast iron as designated in the appropriate Design Standard. When “Alt. G” graters are specified in the plans, provide structural steel graters that are galvanized in accordance with the requirements of ASTM A123.
Use rigid frames and covers either 24 inches or 36 inches or optional three-piece adjustable frames and covers as indicated in Design Standards, Index No. 201.
For three-piece adjustable frames, the inner frame may include replaceable resilient seats to support the cover. In addition, the inner frame shall indicate it is adjustable, by clearly having the word “adjustable” imprinted into the exposed portion of the inner frame so “adjustable” is visible from the roadway after installation.

425-4 Forms.
Design and construct wood or metal forms so that they may be removed without damaging the concrete. Build forms true to line and grade and brace them in a substantial and unyielding manner. Obtain the Engineer’s approval before filling them with concrete.

425-5 Precast Inlets, Manholes, and Junction Boxes.
Only Precast inlets, manholes and junction boxes, designed and fabricated in accordance with the plans, the Design Standards and FDOT Section 449 shall be used. may be substituted for cast-in-place units.

425-6 Construction Methods.

425-6.1 Excavation: Excavate as specified in Section 125. Where unsuitable material for foundations is encountered, excavate the unsuitable material and backfill with suitable material prior to constructing or setting inlets, manholes and junction boxes. As an option to the above and with the Engineer’s approval, the Contractor may carry the walls down to a depth required for a satisfactory foundation, backfill to 8 inches below the flowline with clean sand and cast a non-reinforced 8 inch floor.

425-6.2 Placing and Curing Concrete: Place the concrete in the forms, to the depth shown in the plans, and thoroughly vibrate it. After the concrete has hardened sufficiently, cover it with suitable material and keep it moist for a period of three days. Finish the traffic surface in accordance with 522-7.2, or with a simulated broom finish approved by the Engineer.

425-6.3 Setting Manhole Castings: After curing the concrete as specified above, set the frame of the casting in a full mortar bed composed of one part portland cement to two parts of fine aggregate.

425-6.3.1 Standard Castings: Set manhole frames in a mortar bed and adjust to grade using brick or concrete grade rings, with a maximum 12 inch adjustment.

425-6.3.2 Optional Adjustable Castings: When using a three-piece adjustable frame and cover, install the frame and cover with brick or concrete grade rings to the base course height. Make adjustments using the inner frame in accordance with the manufacturer’s installation recommendations so the inner frame and cover meet the grade and slope of the pavement surface opened to traffic.

425-6.4 Reinforcing Steel: Follow the construction methods for the steel reinforcement as specified in Section 415.

425-6.5 Laying Brick: Brick masonry may be used if the structure is circular and constructed in place, or for adjustments of rectangular risers up to a maximum 12 inches in height. Saturate all brick with water before laying. Bond the brick thoroughly into the mortar using the shovejoint method to lay the brick. Arrange headers and stretchers so as to bond the mass thoroughly. Finish the joints properly as the work progresses and ensure that they are not less than 1/4 inch or more than 3/4 inch in thickness. Do not use spalls or bats except for shaping around irregular openings or when unavoidable at corners.

425-6.6 Backfilling: Backfill as specified in Section 125, meeting the specific requirements for backfilling and compaction around inlets, manholes, and junction boxes detailed in 125-8.1 and 125-8.2. However, for outfall lines beyond the sidewalk or future sidewalk area, where no vehicular traffic will pass over the pipe, inlets, manholes, and junction boxes, compact backfill as required in 125-9.2.2.

425-6.7 Adjusting Structures: Cut down or extend existing manholes, catch basins, inlets, valve boxes, etc., within the limits of the proposed work, to meet the finished grade of the proposed pavement, or if outside of the proposed pavement area, to the finished grade designated on the plans for such structures. Use materials and construction methods which meet the requirements specified above to cut down or extend the existing structures. The Contractor may extend manholes needing to be raised using adjustable extension rings of the type which do not require the removal of the existing manhole frame. Use an extension device that provides positive locking action and permits adjustment in height as well as diameter and meets the approval of the Engineer. When adjusting structures in flexible pavement, restore final road surface in accordance with the Design Standards, Index No. 307.

425-7 Method of Measurement.
The quantities to be paid for will be (1) the number of inlets, manholes, junction boxes, and yard drains, completed and accepted; and (2) the number of structures of these types (including also valve boxes) satisfactorily adjusted.

425-8 Basis of Payment.

425-8.1 New Structures: New drainage structures as shown on the plans shall be paid for under the Drainage Lump Sum Item. Additional authorized drainage structures shall be paid at a negotiated unit price per each additional structure authorized. Price and payment will be full compensation for furnishing all materials and completing all work described herein or shown in the plans, including all clearing and grubbing outside the limits of clearing and grubbing as shown in the plans, all excavation except the volume included in the measurement designated to be paid for under the items for the grading work on the project, all backfilling around the structures, the disposal of surplus material, and the furnishing and placing of all gratings, frames, covers, and any other necessary fittings.

425-8.2 Adjusted Structures: When an item of payment for adjusting manholes, valve boxes, or inlets is provided in the proposal, price and payment will be full compensation for the number of such structures designated to be paid for under such separate items, and which are satisfactorily adjusted, at the Contract unit prices each for adjusting inlets, adjusting manholes, and adjusting valve boxes.

For any of such types of these structures required to be adjusted but for which no separate item of payment is shown in the proposal for the specific type, payment will be made under the item of adjusting miscellaneous structures.

425-8.3 Payment Items: Payment will be made under:

- Item No. 425-1: FDOT Type F Ditch Bottom Inlet - each.
- Item No. 425-2: FDOT Type P-8 Manhole - each.
- Item No. 425-3: Junction Boxes - each.
- Item No. 425-4: Adjusting Inlets - each.
- Item No. 425-5: Adjusting Manholes - each.
- Item No. 425-6: Adjusting Valve Boxes - each.
- Item No. 425-8: Adjusting Miscellaneous Structures - each.
- Item No. 425-10: Yard Drains - each.

END OF SECTION 425
SECTION 430
PIPE CULVERTS

430-1 Description.
Furnish and install drainage pipe and end sections at the locations called for in the Plans. Furnish and construct joints and connections to existing pipes, catch basins, inlets, manholes, walls, etc., as may be required to complete the work.
Construct structural plate pipe culverts or underdrains in accordance with Sections 435 and 440.
For pipe culverts installed by jack & bore, install in accordance with Section 556.
Obtain pipe culverts from a Producer currently on the Department’s list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3.
When the producer’s Quality Control Program is suspended, accept responsibility of either obtaining drainage products from another producer with an accepted Quality Control Program or await re-approval of the producer’s Quality Control Program. The Engineer will not allow changes in Contract Time or completion dates as a result of the producer’s Quality Control Program suspension. Accept responsibility for all delay costs or other costs associated with the producer’s Quality Control Program suspension. This specification does not apply to City of Naples sanitary sewer or water supply pipes. Refer to City specifications for water supply and sanitary sewer specifications.

430-2 Materials.
430-2.1 Pipe: Meet the following requirements:
- Concrete Pipe ............................................................... Section 449
- Round Rubber Gaskets ................................................. Section 942
- Corrugated Steel Pipe and Pipe Arch ............................ Section 943
- Corrugated Aluminum Pipe and Pipe Arch ...................... Section 945
- Corrugated Polyethylene Pipe ....................................... Section 948
- Polyvinyl Chloride (PVC) Pipe ..................................... Section 948
- Fiberglass Reinforced Polymer Pipe ............................. Section 948
- Polypropylene Pipe ...................................................... Section 948

430-2.2 Joint Materials: Use joint materials specified in 430-7 through 430-9 according to type of pipe and conditions of usage.

430-2.3 Mortar: Use mortar composed of one part Portland cement and two parts of clean, sharp sand, to which mixture the Contractor may add hydrated lime in an amount not to exceed 15% of the cement content. Use mortar within 30 minutes after its preparation.

430-3 Type of Pipe to Be Used.
430-3.1 General: When the Plans designate a type (or types) of pipe, use only the type (or choose from the types) designated. As an exception, when the Plans designate reinforced concrete pipe as Class S, Class I, Class II, Class III and Class IV, the Contractor may use nonreinforced concrete pipe up to and including 36 inch in diameter.
430-3.2 Side Drain: If the Plans do not designate a type (or types) of pipe, the Contractor may use either a minimum Class I concrete pipe, corrugated steel pipe, corrugated aluminum pipe, corrugated polyethylene pipe, polypropylene pipe, or PVC pipe. If one of the metal types is chosen, use the minimum gage specified in Section 943 for steel pipe or Section 945 for aluminum pipe. When extending existing pipes, construct the pipe extensions of the same size and kind as the existing pipe. Extensions of existing pipes, whose materials are no longer produced, shall be
extended with the most similar pipe material available. Non-reinforced concrete pipe may also be substituted for concrete pipe in side drains, subject to the provisions of 430-3.1.

430-4 Laying Pipe.

**430-4.1 General:** Lay all pipe, true to the lines and grades given, with hubs upgrade and tongue end fully entered into the hub. When pipe with quadrant reinforcement or circular pipe with elliptical reinforcement is used, install the pipe in a position such that the manufacturer’s marks designating “top” and “bottom” of the pipe are not more than five degrees from the vertical plane through the longitudinal axis of the pipe. Do not allow departure from and return to plan alignment and grade to exceed 1/16 inch per foot of nominal pipe length, with a total of not more than 1 inch departure from theoretical line and grade. Take up and relay any pipe that is not in true alignment or which shows any settlement after laying at no additional expense to the Owner Department.

Do not use concrete pipe with lift holes except (1) round pipe which has an inside diameter in excess of 54 inches or (2) any elliptical pipe.

Repair lift holes, if present, with hand-placed, stiff, non-shrink, 1-to-1 mortar of cement and fine sand, after first washing out the hole with water. Completely fill the void created by the lift hole with mortar. Cover the repaired area with a 24 by 24 inch piece of filter fabric secured to the pipe. Use a Type D-3 filter fabric meeting the requirements shown on Design Standards, Index No. 199.

Secure the filter fabric to the pipe using a method that holds the fabric in place until the backfill is placed and compacted. Use grout mixtures, mastics, or strapping devices to secure the fabric to the pipe.

When installing pipes in structures, construct inlet and outlet pipes of the same size and kind as the connecting pipe shown in the Plans. Use the same pipe material within each continuous run of pipe. Extend the pipes through the walls for a distance beyond the outside surface sufficient for the intended connections, and construct the concrete around them neatly to prevent leakage along their outer surface as shown on Design Standards, Index No. 201. Keep the inlet and outlet pipes flush with the inside of the wall. Resilient connectors as specified in 942-3 may be used in lieu of a masonry seal.

Furnish and install a filter fabric jacket around all pipe joints and the joint between the pipe and the structure in accordance with Design Standards, Index Nos. 201 and 280. Use fabric meeting the physical requirements of Type D-3 specified on Design Standards, Index No. 199. Extend the fabric a minimum of 12 inches beyond each side of the joint or both edges of the coupling band, if a coupling band is used. The fabric must have a minimum width of 24 inches, and a length sufficient to provide a minimum overlap of 24 inches. Secure the filter fabric jacket against the outside of the pipe by metal or plastic strapping or by other methods approved by the Engineer.

Meet the following minimum joint standards:

<table>
<thead>
<tr>
<th>Pipe Application</th>
<th>Minimum Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm and Cross Drains</td>
<td>Water-tight</td>
</tr>
<tr>
<td>Gutter Drain</td>
<td>Water-tight</td>
</tr>
<tr>
<td>Side Drains</td>
<td>Soil-tight</td>
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</tbody>
</table>

When rubber gaskets are to be installed in the pipe joint, the gasket must be the sole element relied on to maintain a tight joint. Soil tight joints must be watertight to 2 psi. Water-tight joints must be water-tight to 5 psi unless a higher pressure rating is required in the Plans.

**430-4.2 Trench Excavation:** Excavate the trench for storm and cross drains, and side drains as specified in Section 125.
430-4.3 Foundation: Provide a suitable foundation, where the foundation material is of inadequate supporting value, as determined by the Engineer. Remove the unsuitable material and replace it with suitable material, as specified in 125-8. Where in the Engineer’s opinion, the removal and replacement of unsuitable material is not practicable, he may direct alternates in the design of the pipe line, as required to provide adequate support. Minor changes in the grade or alignment will not be considered as an adequate basis for extra compensation.

Do not lay pipe on blocks or timbers, or on other unyielding material, except where the use of such devices is called for in the Plans.

430-4.4 Backfilling: Backfill around the pipe as specified in 125-8 unless specific backfilling procedures are described in the Contract Documents.

430-4.5 Plugging Pipe: When existing pipe culverts are to be permanently placed out of service, fill them with flowable fill that is non-excavatable, contains a minimum 350 lbs/cy of cementious material and meets the requirements of Section 121 and/or plug them with masonry plugs as shown in the Plans. Install masonry plugs that are a minimum of 8 inches in thickness, in accordance with Design Standards, Index 280.

When proposed or existing pipe culverts are to be temporarily placed out of service, plug them with prefabricated plugs as shown in the Plans. Install prefabricated plugs in accordance with the manufacturer’s recommendations. Do not fill or construct masonry plugs in any pipe culvert intended for current or future service.

430-4.6 End Treatment: Place an end treatment at each storm and cross drain, and side drain as shown in the Plans. Refer to the Design Standards for types of end treatment details.

As an exception to the above, when concrete mitered end sections are permitted, the Contractor may use reinforced concrete U-endwalls, if shop drawings are submitted to the Engineer for approval prior to use.

Provide end treatments for corrugated polyethylene pipe, polypropylene pipe, and PVC pipe as specified in Section 948, or as detailed in the Plans.

430-4.7 Metal Pipe Protection: Apply a bituminous coating to the surface area of the pipe within and 12 inches beyond the concrete or mortar seal prior to sealing, to protect corrugated steel or aluminum pipe embedded in a concrete structure, such as an inlet, manhole, junction box, endwall, or concrete jacket.

Ensure that the surface preparation, application methods (dry film thickness and conditions during application), and equipment used are in accordance with the coating manufacturers’ published specifications.

Obtain the Engineer’s approval of the coating products used.

430-4.8 Pipe Inspection: For pipes installed under the roadway, inspection is to be conducted when backfill reaches 3 feet above the pipe crown or upon completion of placement of the stabilized subgrade. For pipe installed within fills, including embankments confined by walls, inspection is to be conducted when compacted embankment reaches 3 feet above the pipe crown or the finished earthwork grade as specified in the Plans. Prior to conducting the inspection, provide the Engineer with a video recording schedule for videoing, dewater installed pipe, and remove all silt, debris and obstructions. Submit pipe videoing and reports to the Engineer Department for review prior to the continuation of paving.

For pipe 48 inches or less in diameter, provide the Engineer a video DVD and report using low barrel distortion video equipment with laser profile technology, non-contact video micrometer and associated software that provides:

1. Actual recorded length and width measurements of all cracks within the pipe.
2. Actual recorded separation measurement of all pipe joints.
3. Pipe ovality report.
4. Deflection measurements and graphical diameter analysis report in terms of x and y axis.
5. Flat analysis report.
6. Representative diameter of pipe.
7. Pipe deformation measurements, leaks, debris, or other damage or defects.
8. Deviation in pipe line and grade, joint gaps, and joint misalignment.
9. A video record of the actual speed at which the camera is traveling through the pipe, ensuring that the rate of travel does not exceed the limit defined in 430-4.8.1 below.

Laser profiling and measurement technology must be certified by the company performing the work to be in compliance with the calibration criteria posted at: http://www.dot.state.fl.us/construction/contractorissues/laser.shtm. Reports submitted in electronic media are preferred.

The Engineer may waive this requirement for side drains and cross drains which are short enough to inspect from each end of the pipe.

430-4.8.1 Video Report: Provide a high quality DVD in a MPEG2 format video with a standard resolution of 720 x 480. Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe. Center the camera in the pipe both vertically and horizontally and be able to pan and tilt to a 90 degree angle with the axis of the pipe and rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera’s view or interfere with proper documentation of the pipe’s condition.

The video image shall be clear, focused, and relatively free from roll, static, or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe. The video will include identification before each section of pipe filmed. The identification will include the project number, the structure number corresponding to the structure number on the set of plans for the project, size of pipe, the date and time, and indicate which pipe is being filmed if multiple pipes are connected to the structure. Notes should be taken during the video recording process. Provide the Engineer with copies of these notes along with the video.

Move the camera through the pipe at a speed not greater than 30 feet per minute. Mark the video with the distance down the pipe. The distance shall have an accuracy of one foot per 100 feet. Film the entire circumference at each joint. Stop the camera and pan when necessary to document and measure defects. Position the camera head perpendicular to all defects requiring measurement by the video micrometer.

430-4.8.2 Reinspection: At any time after reviewing the submitted pipe inspection reports, the Engineer may direct additional inspections. If no defects are observed during the reinspection, the Owner Department will pay for the cost of the reinspections in accordance with 4-3. If defects are observed, the reinspection and all work performed to correct the defects will be done at no cost to the Owner Department. Acceptance of all replacements or repairs will be based on video documentation of the completed work prior to Final Acceptance.

430-5 Removing Existing Pipe.

If the plans indicate that existing pipe is to remain the property of the Owner, collect and relocate to a location on airport property approved by the Owner. Stack along the right-of-way all existing pipe or pipe arch so indicated in the plans to be removed, or Any pipe that does not conform to the lines and grades of the proposed work and that is not to be re-laid, shall be removed from the site or moved to an approved location on airport property as directed by the Engineer. Take care to prevent damage to salvageable pipe during removal and stacking operations. Any pipe not designated to remain property of the Owner shall become property of the contractor and removed from the site.

430-6 Placing Pipe Under Railroad.

430-6.1 General: Construct pipe culverts under railroad tracks in accordance with the requirements of the railroad company.
Perform all the shoring under the tracks, and sheeting and bracing of the trench, required by the railroad company or deemed necessary by the Engineer in order to ensure safe and uninterrupted movement of the railroad equipment, at no expense to the Department.

**430-6.2 Requirements of the Railroad Company:** Install pipe using methods required by the railroad company and shown in the Contract Documents. When the general method of installation required by the railroad company is indicated in the Plans, do not alter such method, or any other specific details of the installation which might be indicated in the Plans, without receiving approval or direction from the railroad, followed by written approval from the Engineer.

**430-6.3 Notification to Railroad Company:** Notify the railroad company and the Engineer at least ten days prior to the date on which pipe is to be placed under the railroad tracks.

**430-6.4 Placing Pipe by Jacking:** Obtain the Engineer’s and the railroad company’s approval of the details of the jacking method to be used, when placing pipe through the railroad embankment, before the work is started.

**430-6.5 Use of Tunnel Liner:** When the railroad company requires that a tunnel liner be used for placing the pipe in lieu of the jacking method, the Department will pay for the tunnel liner material separately in cases where the Contract Documents do not require the use of a tunnel liner. For these cases the Department will reimburse the Contractor for the actual cost of the liner, delivered at the site. The Department will base such cost on a liner having the minimum gage acceptable to the railroad.

**430-7 Specific Requirements for Concrete Pipe.**

**430-7.1 Sealing Joints:** Seal the pipe joints with round rubber or profile gaskets meeting the requirements of Section 449. Ensure that the gasket and the surface of the pipe joint, including the gasket recess, are clean and free from grit, dirt and other foreign matter, at the time the joints are made. In order to facilitate closure of the joint, application of a vegetable soap lubricant immediately before closing of the joint will be permitted. Prelubricated gaskets may be used in lieu of a vegetable soap lubricant when the lubricating material is certified to be inert with respect to the rubber material.

**430-7.2 Laying Requirements for Concrete Pipe with Rubber Gasket Joints:** Do not allow the gap between sections of pipe to exceed 5/8 inch for pipe diameters of 12 inches through 18 inches, 7/8 inch for pipe diameters of 24 through 66 inches, and 1 inch for pipe diameters 72 inches and larger. Where minor imperfections in the manufacture of the pipe create an apparent gap in excess of the tabulated gap, the Engineer will accept the joint provided that the imperfection does not exceed 1/3 the circumference of the pipe, and the rubber gasket is 1/4 inch or more past the pipe joint entrance taper. Where concrete pipes are outside of these tolerances, replace them at no expense to the Owner Department. Do not apply mortar, joint compound, or other filler to the gap which would restrict the flexibility of the joint.

**430-7.3 Field Joints for Elliptical Concrete Pipe:** Use either a preformed plastic gasket material or an approved rubber gasket to make a field joint.

**430-7.3.1 Plastic Gasket:** Meet the following requirements when field joints are made from preformed plastic gasket material:

**430-7.3.1.1 General:** Install field joints in accordance with the manufacturer’s instructions and the following:

**430-7.3.1.2 Material:** Meet the requirements of 942-2.

**430-7.3.1.3 Joint Design:** Ensure that the pipe manufacturer furnishes the Engineer with details regarding configuration of the joint and the amount of gasket material required to affect a satisfactory seal. Do not brush or wipe joint surfaces which are to be in contact with the gasket material with a cement slurry. Fill minor voids with cement slurry.
430-7.3.1.4 Primer: Apply a primer of the type recommended by the manufacturer of the gasket material to all joint surfaces which are to be in contact with the gasket material, prior to application of the gasket material. Thoroughly clean and dry the surface to be primed.

430-7.3.1.5 Application of Gasket: Apply gasket material to form a continuous gasket around the entire circumference of the leading edge of the tongue and the groove joint, in accordance with the detail shown on the Design Standards, Index No. 280. Do not remove the paper wrapper on the exterior surface of the gasket material until immediately prior to joining of sections. Apply plastic gasket material only to surfaces which are dry. When the atmospheric temperature is below 60°F, either store plastic joint seal gaskets in an area above 70°F, or artificially warm the gaskets to 70°F in a manner satisfactory to the Engineer.

430-7.3.1.6 Installation of Pipe: Remove and reposition or replace any displaced or contaminated gasket as directed by the Engineer. Install the pipe in a dry trench.

Carefully shape the bottom of the trench to minimize the need for realignment of sections of pipe after they are placed in the trench. Hold to a minimum any realignment of a joint after the gaskets come into contact. Prior to joining the pipes, fill the entire joint with gasket material and ensure that when the pipes are joined there is evidence of squeeze-out of gasket material for the entire internal and external circumference of the joint. Trim excess material on the interior of the pipe to provide a smooth interior surface. If a joint is defective, remove the leading section of pipe and reseal the joint.

430-7.3.2 Rubber Gasket: Meet the following requirements when field joints are made with profile rubber gaskets:

430-7.3.2.1 General: Install field joints in accordance with the manufacturer’s instructions and the following:

430-7.3.2.2 Material: Meet the requirements of 942-4.

430-7.3.2.3 Joint Design: Ensure that the pipe manufacturer furnishes the Engineer with details regarding configuration of the joint and gasket required to effect a satisfactory seal. Do not apply mortar, joint compound, or other filler which would restrict the flexibility of the gasket joint.

430-7.4 Requirements for Concrete Radius Pipe:

430-7.4.1 Design: Construct concrete radius pipe in segments not longer than 4 feet (along the pipe centerline), except where another length is called for in the Contract Documents. Join each segment using round rubber gaskets. Ensure that the pipe manufacturer submits details of the proposed joint, segment length and shape for approval by the Engineer, prior to manufacture.

430-7.4.2 Pre-Assembly: Ensure that the manufacturer pre-assembles the entire radius section in his yard, in the presence of the Engineer, to ensure a proper fit for all parts. At the option of the manufacturer, the Contractor may assemble the pipe without gaskets.

Consecutively number the joints on both the interior and exterior surfaces of each joint, and make match marks showing proper position of joints. Install the pipe at the project site in the same order as pre-assembly.

430-8 Specific Requirements for Corrugated Metal Pipe.

430-8.1 Field Joints:
430-8.1.1 General: Make a field joint with locking bands, as specified in Article 9 of AASHTO M 36 and AASHTO M 196M for aluminum pipe. For aluminum pipe, fabricate bands from the same alloy as the culvert sheeting.

When existing pipe to be extended is helically fabricated, make a field joint between the existing pipe and the new pipe using one of the following methods:

(1) Cut the new pipe to remove one of the re-rolled annular end sections required in Sections 943 or 945, or fabricate the pipe so that the re-rolled annular section is fabricated only on one end. Use either a spiral (helical) band with a gasket or a flat band with gaskets as required by 430-8.1.2 (2) to join the pipe sections.

(2) The Contractor may construct a concrete jacket as shown on the Design Standards, Index No. 280.

430-8.1.2 Side Drain, Storm and Cross Drain, and Gutter Drains: Where corrugated metal pipe is used as side drain, storm and cross drain, or gutter drain, use a rubber or neoprene gasket of a design shown to provide a joint as specified in 430-4.

Use a gasket of one of the following dimensions:

(1) For annular joints with 1/2 inch depth corrugation: either a single gasket a minimum of 7 inches by 3/8 inch or two gaskets a minimum of 3 1/2 inches by 3/8 inch; and for annular joints with 1 inch depth corrugations: either a single gasket a minimum of 7 inches by 7/8 inch or two gaskets a minimum of 3 1/2 inches by 7/8 inch.

(2) For helical joints with 1/2 inch depth corrugation: either a single gasket a minimum of 5 inches by 1 inch or two gaskets a minimum of 3 1/2 inches by 1 inch; and for helical joints with 1 inch depth corrugations: either a single gasket a minimum of 5 inches by 1 1/2 inches or two gaskets a minimum of 3 1/2 inches by 1 1/2 inches.

(3) Such other gasket designs as may be approved by the Engineer.

If, in lieu of a single gasket spanning the joint, two gaskets are used, place these individual gaskets approximately 2 inches from each pipe end at the joint. When two gaskets are used, seal the overlapping area on the coupling band between the gaskets consistent with the joint performance specified. The Contractor may tuck a strip of preformed gasket material over the bottom lip of the band for this purpose. Use coupling bands that provide a minimum circumferential overlap of 3 inches. As the end connections on the coupling band are tightened, ensure that there is no local bending of the band or the connection. Use precured coupling bands on pipe diameters of 24 inches or less.

Use flat gaskets meeting the requirements of ASTM D-1056, designation 2C2 or 2B3. In placing flat gaskets on pipe prior to placing the coupling band, do not stretch the gasket more than 15% of its original circumference. Use circular gaskets meeting the requirements of ASTM C-361. Do not stretch the circular gasket more than 20% of its original circumference in placing the gasket on pipe. Use preformed plastic gasket material meeting the composition requirements of 942-2.2.

Apply an approved vegetable soap lubricant, as specified for concrete pipe in 430-7.1.1.

430-8.1.3 Alternate Joint: In lieu of the above specified combination of locking bands and flat gaskets, the Contractor may make field joints for these pipe installations by the following combinations:

(a) Use the metal bands as specified in Article 9 of AASHTO M-36M that are at least 10 1/2 inches wide and consist of a flat central section with a corrugated section near each end, designed to match the annular corrugation in the pipe with which they are to be used.
Connect the bands in a manner approved by the Engineer, with a suitable fastening device such as the use of two galvanized 1/2 inch diameter bolts through a galvanized bar and galvanized strap, suitably welded to the band. Use a strap that is the same gage as the band.

Where helically corrugated pipe is to be jointed by this alternate combination, ensure that at least the last two corrugations of each pipe section are annular, and designed such that the band will engage each pipe end with the next-to-outside annular corrugation.

(b) For these bands, use a rubber gasket with a circular cross-section of the “O-ring” type conforming to ASTM C-361. Use gaskets having the following cross-sectional diameter for the given size of pipe:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Gasket Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 inches through 36 inches (with 1/2 inch depth corrugations)</td>
<td>13/16 inch</td>
</tr>
<tr>
<td>42 inches through 96 inches (with 1/2 inch depth corrugations)</td>
<td>7/8 inch</td>
</tr>
<tr>
<td>36 inches through 120 inches (with 1 inch depth corrugations)</td>
<td>1 3/8 inches</td>
</tr>
</tbody>
</table>

Use preformed gasket material to seal the overlapping area on the coupling band between gaskets.

(c) Use channel band couplers in helical pipe with ends which have been reformed and flanged specifically to receive these bands. Use channel band couplers that are of a two piece design, are fabricated from galvanized steel stock conforming to AASHTO M-36, have 2-by-2-by 3/16 inch angles fastened to the band ends to allow for proper tightening, and meet the following:

<table>
<thead>
<tr>
<th>Band Thickness</th>
<th>Pipe Wall Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.079 inch</td>
<td>0.109 inch or lighter</td>
</tr>
<tr>
<td>0.109 inch</td>
<td>0.138 inch or heavier</td>
</tr>
<tr>
<td>3/4 inch wide</td>
<td>0.109 inch or lighter</td>
</tr>
<tr>
<td>1 inch wide</td>
<td>0.138 inch or heavier</td>
</tr>
</tbody>
</table>

Furnish two 1/2 inch diameter connection bolts with each band, that conform to ASTM A-307, Grade A and are electroplated in accordance with ASTM B-633. Use a gasket with the joint that is a hydrocarbon blend of butyl rubber meeting the chemical composition and physical properties of 942-2.2. Use a 3/8 by 3/4 inch gasket for pipe fabricated from 0.109 inch or lighter material and a 3/8 by 1 inch gasket for pipe fabricated from 0.138 inch and heavier material.

The Contractor may use a flange band coupler without the gasket for all applications other than side drain, storm and cross drain, and gutter drain.

Do not use the flange band coupler to join dissimilar types of pipe.

The Contractor may join reformed flanged helical pipe to existing annular or reformed pipe having annular ends. On non-gasketed installations, use either an annular band or an alternate joint described in 430-8.1.3. On gasketed installations, use an annular band, minimum of five corrugations in width, in conjunction with two O-ring gaskets as specified in 430-8.1.3. Use mastic material to seal the area of band overlap.
The minimum joint performance standards specified in 430-4.1 apply.

430-8.2 Laying and Shape Requirements for Corrugated Metal Pipe: Install pipe using either a trench or open ditch procedure. Check pipe shape regularly during backfilling to verify acceptability of the construction method used. Pipe deflected 5% or more of the certified actual mean diameter of the pipe at final inspection shall be replaced at no cost to the Department. Deflection measurements are taken at the point of smallest diameter on the corrugations.

430-9 Specific Requirements for Corrugated Polyethylene Pipe, Polypropylene Pipe, and Polyvinyl Chloride (PVC) Pipe:

430-9.1 Field Joints: Use gasketed joints to seal side drain, and storm and cross drain. Use gaskets meeting the requirements of Section 449. Ensure that the pipe manufacturer provides a joint design approved by the Engineer before use.

430-9.2 Installation Requirements Including Trenching, Foundation and Backfilling Operations: Check structure shape regularly during backfilling to verify acceptability of the construction method used. Replace pipe deflected 5% or more of the certified actual mean diameter of the pipe at final inspection at no cost to the Owner Department.

430-10 Desilting Pipe or Concrete Box Culvert.
Desilt pipe culvert and concrete box culvert as designated in the Plans.

430-11 Method of Measurement.

430-11.1 New Pipe Installed by Excavation or Trenching: The quantities of storm and cross drain pipe, storm drain trench, side drain pipe and gutter drain pipe to be paid for will be the plan quantity, in place and accepted. The plan quantity will be determined from the inside wall of the structure as shown on the plans, along the centerline of the pipe.

430-11.2 New Pipe Installed by Jack & Bore: The quantity of storm and cross drain pipe, storm drain trench, side drain and gutter drain pipe, installed by pipe culvert optional material - jack & bore, to be paid for will be the plan quantity, in place and accepted. The measurement and payment will be the plan quantity length of the casing or carrier pipe installed by jack & bore. Carrier pipe installed through/inside the casing is paid for as pipe culvert optional material – excavation or trenching.

430-11.3 Mitered End Section: The quantity to be paid for will be the number completed and accepted.

430-12 Basis of Payment.

430-12.1 General: Prices and payments will be full compensation for all work specified in this Section, including all excavation except the volume included in the items for the grading work on the project, and except for other items specified for separate payment in Section 125; all backfilling material and compaction; disposal of surplus material; and all clearing and grubbing outside of the required limits of clearing and grubbing as shown in the Plans. No payment will be made for failed bore paths, injection of excavatable flowable fill, products taken out of service, or incomplete installations. Payment will include all work and materials necessary for jack & bore, including boring, backfilling, flowable fill, and restoration materials necessary for a complete and accepted installation. No payment will be made for jack & bore until a Bore Path Report has been delivered to the Engineer.

430-12.2 Removing Existing Pipe: When existing pipe is removed and replaced with new pipe approximately at the same location the cost of excavating and removing the old pipe and of its disposal will be included in the Contract unit price for clearing and grubbing.
430-12.3 Site Restoration: The cost of restoring the site, as specified in 125-11, that is disturbed, solely for the purpose of constructing pipe culvert, will be included in the Contract unit price for the pipe culvert, unless designated specifically to be paid for under other items.

430-12.4 Plugging Pipes: The cost of temporarily plugging a pipe culvert, either proposed or existing, will be incidental to the contract unit price for new pipe culvert. The cost of filling and/or plugging an existing pipe culvert that is to be permanently placed out of service will be paid for at the contract unit price for filling and plugging pipe, per cubic yard. Price and payment will be full compensation for flowable fill, masonry, concrete, mortar, and all labor and materials necessary to complete the work.

When the project includes no quantities for new pipe culverts, and temporary plugs are required for existing pipe culverts, the cost will be considered as extra work, in accordance with 4-3.5.

430-12.5 Desilting Pipe: Desilting Pipe will be paid for at the contract unit price per foot for each pipe desilted. Price and payment will be full compensation for furnishing all equipment, tools and labor, disposal of silt and debris, and all incidentals necessary for satisfactorily performing the work.

430-12.6 Desilting Concrete Box Culverts: Price and payment will be full compensation for all work required.

430-12.7 Flared End Sections: Price and payment will be full compensation for all work and materials required.

430-12.8 Mitered End Sections: Price and payment will be full compensation for all pipe, grates when required, fasteners, reinforcing, connectors, anchors, concrete, sealants, jackets and coupling bands, and all work required.

430-12.9 Railroad Requirements: Where pipe culvert is constructed under railroad tracks, the Contract unit price for the pipe culvert will include the costs of any jacking operations and the operation of placing the pipe by use of a tunnel liner, (except as specified for unanticipated tunnel liner, in 430-6.5, where reimbursement is to be made for such unanticipated liner), and all other work necessary to meet the requirements of the railroad company, excluding the costs of watchman or flagman services provided by the railroad company, except as provided below.

The Department will reimburse the Contractor for the actual costs of any trestle bridge work which is performed by the railroad’s forces, as billed to him by the railroad, less the value of any salvage materials derived there from, whether such salvage materials are retained by the railroad company or by the Contractor. When the work of shoring and bracing is to be performed by the railroad, such fact will be stipulated in the Contract Documents and the Contractor will be required to pay to the railroad the amount of such costs, which amount will be reimbursed to him by the Department. The Contract unit price for the pipe culvert shall include the costs of all other work of shoring and bracing.

430-12.10 Payment Items: Payment will be made under:

- Item No. 430-1 18-Inch RCP, Class III – per Linear Foot
- Item No. 430-2 24-Inch RCP, Class III – per Linear Foot
- Item No. 430-3 24-Inch Mitered End Section – per Each

END OF SECTION 430
SECTION 520
CONCRETE GUTTER, CURB ELEMENTS, AND TRAFFIC SEPARATORS

520-1 Description.
Construct portland cement concrete curb. Curb will include concrete curb and gutter, concrete traffic separator, valley gutter, special concrete gutter, curb for sidewalk curb ramps and driveways, and any other types of concrete curb not specified in other Sections.

520-2 Materials.
520-2.1 Concrete: Use concrete meeting the requirements of FDOT Section 347.
520-2.2 Reinforcement: For all steel reinforcement required by the Plans, meet the requirements of Section 415.
520-2.3 Joint Materials: Meet the requirements of FDOT Section 932.

520-3 Forms.
520-3.1 Form Materials: Construct forms for this work of either wood or metal. Provide forms that are straight, free from warp or bends, and of sufficient strength, when staked, to resist the pressure of the concrete without deviation from line and grade. For all items constructed on a radius, use flexible forms.
520-3.2 Depth of Forms: Ensure that forms have a depth equal to the plan dimensions for the depth of concrete being deposited against them.
520-3.3 Machine Placement: The Contractor may place these items by machine methods with the approval of the Engineer provided that the Contractor consistently produces an acceptable finished product, true to line, grade, and cross section.

520-4 Excavation.
Excavate to the required depth, and compact the foundation material upon which these items are to be placed as specified in FDOT Section 120-9.

520-5 Placing Concrete.
Place the concrete in the forms, and tamp and spade it to prevent honeycombing, and until the top of the structure can be floated smooth and the edges rounded to the radius shown in the Plans.

520-6 Joints.
520-6.1 Contraction Joints: Except for machine placed items, the Contractor may form joints by using dummy joints (either formed or sawed) or by using sheet metal templates. If using sheet metal templates, ensure that they are of the dimensions, and are set to the lines, shown in the Plans. Hold templates firmly while placing the concrete. Leave templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place.

Saw contraction joints, for machine placed items, unless the Engineer approves an alternate method. Saw the joints as soon as the concrete has hardened to the degree that excessive raveling will not occur and before uncontrolled shrinkage cracking begins.

Space contraction joints at intervals of 10 feet except where closure requires a lesser interval, but do not allow any section to be less than 4 feet in length.
520-6.2 Expansion Joints: Construct expansion joints at all inlets, at all radius points, and at other locations indicated in the Plans. Locate them at intervals of 500 feet between other expansion joints or ends of a run. Ensure that the joint is 1/2 inch in width.
520-7 Finishing.

520-7.1 Repair of Minor Defects: Remove the forms within 24 hours after placing the concrete, and then fill minor defects with mortar composed of one part portland cement and two parts fine aggregate. The Engineer will not allow plastering on the face of the curb. Remove and replace any rejected curb, curb and gutter, or valley gutter without additional compensation.

520-7.2 Final Finish: Finish all exposed surfaces while the concrete is still green. In general, the Engineer will only require a brush finish. For any surface areas, however, which are too rough or where other surface defects make additional finishing necessary, the Engineer may require the Contractor to rub the curb to a smooth surface with a soft brick or wood block, using water liberally. Also, if necessary to provide a suitable surface, the Engineer may require the Contractor to rub further, using thin grout or mortar.

520-7.3 Imprinted Concrete: Install imprinted concrete as shown in the Plans.

520-8 Curing.

520-8.1 General: Continuously cure the concrete for a period of at least 72 hours. Commence curing after completely finishing and as soon as the concrete has hardened sufficiently to permit application of the curing material without marring the surface. Immediately replace any curing material removed or damaged during the 72 hour period.

After removing the forms, cure the surfaces exposed by placing a berm of moist earth against them or by any of the methods described below, for the remainder of the 72 hour curing period.

520-8.2 Wet Burlap Method: Place burlap, as specified in FDOT Specification 925-1, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 6 inches. Hold the burlap securely in place such that it will be in continuous contact with the concrete at all times, and do not allow any earth between the burlap surfaces at laps or between the burlap and the concrete. Saturate the burlap with water before placing it, and keep it thoroughly wet throughout the curing period.

520-8.3 Membrane Curing Compound Method: Apply clear membrane curing compound or white pigmented curing compound, as specified in 925-2, by a hand sprayer meeting the requirements of 350-3.10, in a single coat continuous film at a uniform coverage of at least one gallon per 200 square feet. Immediately recoat any cracks, checks, or other defects appearing in the coating. Thoroughly agitate the curing compound in the drum prior to application, and during application as necessary to prevent settlement of the pigment.

520-8.4 Polyethylene Sheeting Method: Place polyethylene sheeting, as specified in 925-3, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 6 inches. Hold the sheeting securely in place and in continuous contact with the concrete at all times.

520-9 Backfilling and Compaction.

After the concrete has set sufficiently, but not later than three days after pouring, refill the spaces in front and back of the curb to the required elevation with suitable material. Place and thoroughly compact the material in layers not thicker than 6 inches.

520-10 Surface Requirements.

Test the gutter section of curb and gutter with a 10 foot straightedge laid parallel to the centerline of the roadway and while the concrete is still plastic. Perform straightedging along the edge of the gutter adjacent to the pavement or along other lines on the gutter cross-section, as directed by the Engineer. Immediately correct irregularities in excess of 1/4 inch.
520-11 Method of Measurement.

For curb or curb and gutter, the quantity to be paid will be plan quantity, in feet, measured along the face of the completed and accepted curb or curb and gutter. Curb for sidewalk curb ramps or driveways will be paid at the contract unit price for the adjacent curb type.

For valley gutter or shoulder gutter, the quantity to be paid will be plan quantity, in feet, measured along the gutter line of the completed and accepted valley gutter or shoulder gutter.

For concrete traffic separator of constant width, the quantity to be paid will be plan quantity, in feet, measured along the center of its width, completed and accepted, including the length of the nose.

For concrete traffic separator of varying width, the quantity to be paid will be plan quantity, in square yards, completed and accepted.

520-12 Basis of Payment.

520-12.1 Concrete Gutter, Curb Elements, and Traffic Separator: Price and payment will be full compensation for all work specified in this Section, including removal of existing curb (repair and replacement/relocation operations), reinforcement steel, joint materials and asphalt curb pad.

520-12.2 Excavation: No separate payment will be made for excavation. The cost of the work described in this item shall be considered incidental to the item in which it is being used for. Excavation for new installations will be paid for as roadway excavation in accordance with 120-13.2.

520-12.3 Payment Items:

Payment will be made under:

- Item No. 520-1- Type F Concrete Curb and Gutter - per foot.
- Item No. 520-2- Concrete Curb - per foot.
- Item No. 520-3- Concrete Valley Gutter - per foot.
- Item No. 520-5- Concrete Traffic Separator - per foot.
- Item No. 520-6- Concrete Shoulder Gutter - per foot.
- Item No. 520-70- Concrete Traffic Separator - per square yard.

END OF SECTION 520
SECTION 522
CONCRETE SIDEWALKS AND DRIVEWAYS

522-1 Description.
Construct concrete sidewalks and driveways. Sidewalk will include sidewalk curb ramps.

522-2 Materials.
Meet the requirements specified in 520-2.

522-3 Forms.
Provide forms as specified in 520-3.

522-4 Foundation.
Compact fill areas, including cut areas under the sidewalk that have been excavated more than 6 inches below the bottom of sidewalk, to a minimum of 95% of AASHTO T99 density. The area to be compacted is defined as that area directly under the sidewalk and 1 foot beyond each side of the sidewalk when right-of-way allows.

522-5 Joints.
522-5.1 Expansion Joints: Form 1/2 inch expansion joints between the sidewalk and the curb or driveway or at fixed objects and sidewalk intersections with a preformed joint filler meeting the requirements specified in FDOT Specification 932-1.1.
522-5.2 Contraction Joints:
522-5.2.1 Types: The Contractor may use open type or sawed contraction joints.
522-5.2.2 Open-Type Joints: Form open type contraction joints by staking a metal bulkhead in place and depositing the concrete on both sides. After the concrete has set sufficiently to preserve the width and shape of the joint, remove the bulkhead. After finishing the sidewalk over the joint, edge the slot with a tool having a 1/2 inch radius.
522-5.2.3 Sawed Joints: If electing to saw the contraction joints, cut a slot approximately 3/16 inch wide and not less than 1-1/2 inches deep with a concrete saw after the concrete has set, and within the following periods of time:
   Joints at not more than 30 feet intervals…..within 12 hours after finishing.
   Remaining joints…..within 96 hours after finishing.

522-6 Placing Concrete.
Place the concrete as specified in 520-5.

522-7 Finishing.
522-7.1 Screeding: Strike-off the concrete by means of a wood or metal screed, used perpendicular to the forms, to obtain the required grade and remove surplus water and laitance.
522-7.2 Surface Requirements: Imprint concrete as detailed in the Plans, otherwise provide a broom finish. Ensure that the surface variations are not more than 1/4 inch under a 10 foot straightedge or more than 1/8 inch on a 5 foot transverse section. Finish the edge of the sidewalk with an edging tool having a radius of 1/2 inch.

522-8 Curing.
Cure the concrete as specified in 520-8.
522-9 Method of Measurement.
The quantity to be paid will be plan quantity, in square yards, completed and accepted. Ramps, reconstructed sidewalks, walk around sidewalks, sidewalk landings, sidewalk curb, and driveways will be included in the area to be paid.

522-10 Basis of Payment.
Price and payment will be full compensation for all work specified in this Section. No separate payment will be made for excavation. The cost of excavation shall be considered incidental to the item in which it is being used for. Excavation for new installations will be paid for under the items for the grading work on the project. For repairs and replacements, removal of the existing sidewalk or driveway will be included in the cost of new sidewalks and driveways.

Payment will be made under:

Item No. 522-1 Concrete Sidewalk, 4-Inch Depth - per Square Yard

END OF SECTION 522
SECTION 530
REVETMENT SYSTEMS

530-1 Description.

530-1.1 Riprap: Construct riprap composed of sand-cement or rubble (consisting of broken stone or broken concrete) as shown in the Design Standards and in the Plans.

530-1.2 Articulating Concrete Block (ACB) Revetment Systems: Furnish and install an ACB revetment system in accordance with this Section and in conformance with the lines, grades, design, and dimensions shown in the Plans. Submit vendor drawings for review and approval by the Engineer. Submit signed and sealed calculations of the block and cable sizing design for approval. Comply with the National Concrete Masonry Association’s Design Manual for Articulating Concrete Block Revetment Systems, Second Edition, or the National Highway Institute, Hydraulic Engineering Circular (HEC) No. 23, Publication No. FHWA NHI 09-110. Use a minimum Factor of Safety of 1.5 and 0.5 inch for the block projection.

Blocks must be open cell and non-tapered unless otherwise stated in the Plans. Revetment cabling must be bi-directional or, for mono-directional cabling, the block installation must include a permanent mechanism within the block matrix to prevent lateral displacement of the installed blocks. Cabling must be polyester and free to move within the block.

Use only ACB revetment systems currently listed on the Department’s Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6, and include certified test reports from an independent test laboratory certifying the ACB revetment system meets the requirements of this Section.

If the ACB revetment system is intended for use as bridge abutment protection, include the following drawings with the APL submittal:

1. At the corner transition between the front and side slopes.
2. For anchorages, geosynthetic materials, treatment of voids between adjacent blocks, limits on void size between adjacent blocks and other special details required to successfully install the ACB.
3. For areas adjacent to bridge abutments, detail mat placement around curves, connections, protection of mat ends, and splicing of mat.

530-1.3 Gabions: Furnish and install gabions, including gabion, gabion basket, or gabion mattress, filled with rock in accordance with this Section and in conformance with the lines, grades, design, and dimensions shown in the Plans.

530-2 Materials.

530-2.1 Riprap:

530-2.1.1 General: Meet the following requirements:

Portland Cement ................................................Section 921
Fine Aggregate .................................................Section 902
Grout .................................................................Section 934
Type D-2 Geotextile Fabric*.............................Section 514

*Use products listed on the Department’s FDOT Approved Products List (APL).

530-2.1.2 Sacks: Provide sacks made of jute, cotton, or scrim reinforced paper capable of holding the sand-cement mixture without leakage. Ensure that sack material is permeable and absorptive enough to permit passage of water to provide for hydration of the cement. Ensure that paper used in sacks is non-asphalt laminated with a polyester fiber scrim reinforcement in a three-way directional pattern, has an embossed finish, and is perforated approximately 3/32 inch in approximate one inch centers. Extend perforations continuously through the entire wall.
Provide sacks of uniform size and dimensions, in order to provide uniformity of lines in the completed work. Use sacks that are free from holes and strong enough to withstand handling without ripping or splitting. Use only one type and size of sack at any one structure.

530-2.1.3 Rubble:

530-2.1.3.1 Rubble (Bank and Shore Protection): Provide sound, hard, durable rubble, free of open or incipient cracks, soft seams, or other structural defects, consisting of broken stone with a bulk specific gravity of at least 2.20. Ensure that stones are rough and angular.

For this application, use broken stone meeting the following gradation and thickness requirements:

<table>
<thead>
<tr>
<th>Weight Maximum Pounds</th>
<th>Weight 50% Pounds</th>
<th>Weight Minimum Pounds</th>
<th>Minimum Blanket Thickness in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>670</td>
<td>290</td>
<td>60</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Ensure that at least 97% of the material by weight is smaller than Weight Maximum pounds].
Ensure that at least 50% of the material by weight is greater than Weight 50% pounds].
Ensure that at least 85% of the material by weight is greater than Weight Minimum pounds.

530-2.1.3.2 Rubble (Ditch Lining): Use sound, hard, durable rubble, free of open or incipient cracks, soft seams, or other structural defects, consisting of broken stone or broken concrete with a bulk specific gravity of at least 1.90. Ensure that stones or broken concrete are rough and angular.

Use broken stone or broken concrete meeting the following gradation and thickness requirements:

<table>
<thead>
<tr>
<th>Weight Maximum Pounds</th>
<th>Weight 50% Pounds</th>
<th>Weight Minimum Pounds</th>
<th>Minimum Blanket Thickness in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>30</td>
<td>4</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Ensure that at least 97% of the material by weight is smaller than Weight Maximum pounds].
Ensure that at least 50% of the material by weight is greater than Weight 50% pounds].
Ensure that at least 90% of the material by weight is greater than Weight Minimum pounds.

530-2.1.3.3 Physical Requirements of Broken Stone and Broken Concrete: Use broken stone and broken concrete meeting the following physical requirements:

<table>
<thead>
<tr>
<th>Absorption (FM 1-T85)</th>
<th>Maximum 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Abrasion (FM 1-T096)</td>
<td>Maximum loss 45%*</td>
</tr>
<tr>
<td>Soundness (Sodium Sulphate) (AASHTO T104)</td>
<td>Maximum loss 12%** (after five cycles)</td>
</tr>
<tr>
<td>Flat and elongated pieces</td>
<td>Materials with least dimension less than one third of greatest dimension not exceeding 10% by weight.</td>
</tr>
</tbody>
</table>
Dirt and Fines | Materials less than 1/2 inch in maximum dimension accumulated from interledge layers, blasting or handling operations not exceeding 5% by weight.

Drop Test**(EM 1110-2-2302) | No new cracks developed, or no existing crack widened additional 0.1 inch, or final largest dimension greater than or equal to 90% original largest dimension of dropped piece.

* Ensure that granite does not have a loss greater than 55% and that broken concrete does not have a loss greater than 45%.
** The Engineer may accept rubble exceeding the soundness loss limitation if performance history shows that the material will be acceptable for the intended use. The Engineer will waive the soundness specification for rubble riprap (broken stone and broken concrete) when project documents indicate it will be placed in or adjacent to water or soil with a sulfate content less than 150 parts per million and a pH greater than 5.0.
*** The Engineer will waive the Drop Test unless required to ensure structural integrity. Provide all equipment, labor and testing at no expense to the Owner Department. EM refers to the US Army Corps of Engineer’s Specification Engineering Method.

530-2.1.3.4 Source Approval and Project Control: The Engineer will approve construction aggregate sources in accordance with 6-2.3 as amended by the following:

1. The Engineer may perform Independent Verification tests on all materials placed on the project.

2. The Engineer will check the gradation of the riprap by visual inspection at the project site. Resolve any difference of opinion with the Engineer in accordance with the method provided in FM 5-538. Provide all equipment, labor, and the sorting site at no expense to the Owner Department.

3. The Engineer may test components in a blend of rubble processed from different geologic formations, members, groups, units, layers or seams. The Engineer may select components based on like color, surface texture, porosity, or hardness. The Engineer will reject any blend if a component that makes up at least five percent by volume of the blend does not meet these specifications.

530-2.1.4 Bedding Stone: Use Bedding Stone of either a durable quality limestone or other quarry run stone, with a bulk specific gravity of not less than 1.90 and that is reasonably free from thin, flat and elongated pieces. Ensure that the bedding stone is also reasonably free from organic matter and soft, friable particles. Meet the following gradation limits:

<table>
<thead>
<tr>
<th>Standard Sieve Sizes - Inches</th>
<th>Individual Percentage by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 inches</td>
<td>100</td>
</tr>
<tr>
<td>10 inches</td>
<td>70 to 100</td>
</tr>
<tr>
<td>6 inches</td>
<td>60 to 80</td>
</tr>
<tr>
<td>3 inches</td>
<td>30 to 50</td>
</tr>
<tr>
<td>1 inch</td>
<td>0 to 15</td>
</tr>
</tbody>
</table>

The Engineer will conduct source approval and project control of bedding stone as specified in 530-2.1.3.4. In lieu of limestone or other quarry run stone, the Contractor may
substitute non-reinforced concrete from existing pavement that is to be removed and which meets the above requirements for commercial bedding stone.

**530-2.2 Articulating Concrete Block (ACB) Revetment Systems:** Obtain all precast block, cabling, anchors, and necessary incidental materials from the same manufacturer. ACB revetment systems must meet the requirements of ASTM D6684, ASTM D7276 and ASTM D7277. Submit to the Engineer certification from the manufacturer that the ACB revetment system meets the requirements of this Section.

ACB system components must meet the following requirements:

Concrete .....................................Section 347, ASTM D6684
Cables and Fittings ..........................................ASTM D6684
Type D-2 Geosynthetic Material ......................Section 514
Granular Underlay ..............................................Section 901

Cables must maintain at least 85% of original tensile strength (ASTM D638) after 1000 hours exposure to a saturated solution of calcium hydroxide (pH greater than or equal to 11) at 73°F, plus or minus three degrees. Cables must not exceed a maximum of 0.5% moisture absorption at seven days, per ASTM D570. Cable crimps must be aluminum or stainless steel Type 304 or 316.

**530-2.3 Gabions:**

**530-2.3.1 General:** Gabions, as defined in ASTM A974 and ASTM A975, and components must meet the following requirements:

Wire Mesh and Fabric* ...................... ASTM A974 and A975
Spiral Binders, Lacing Wire, Stiffeners and
Ring Wire Fasteners .................... ASTM A974 and A975
Type D-2 Geotextile Fabric** ..................Section 514
Granular Underlay ..............................................Section 901
Anchors .... Section 451 or manufacturer’s recommendations

*Wire mesh must be Style 1 or Style 3. Wire fabric must be Style 1 or Style 5.
** Use products listed on the Department’s APL.

In moderate to extremely aggressive environments, as defined in the Plans, wire used in the fabrication of gabions must be galvanized and PVC coated in accordance with ASTM A974 and ASTM A975.

**530-2.3.2 Gabion Rock:** Use rock meeting the requirements of ASTM D6711 to fill gabions. The rock must be reasonably free from thin, flat or elongated pieces. Rock size must be at least 1.25 times greater than the aperture size of the wire mesh or fabric. Each range of sizes may allow for a variation of 5% oversize rock by weight, 5% undersize rock by weight, or both.

<table>
<thead>
<tr>
<th>Physical Property Requirements</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA Abrasion, ASTM C131 and ASTM D535</td>
<td>Maximum loss 40%</td>
</tr>
<tr>
<td>Bulk Specific Gravity</td>
<td>Minimum 2.20</td>
</tr>
<tr>
<td>Absorption, ASTM C127 and ASTM C128</td>
<td>Maximum 3%</td>
</tr>
</tbody>
</table>

**530-3 Construction and Installation:**

**530-3.1 Sand-Cement:**

**530-3.1.1 Mixing Materials:** Proportion sand and cement in the ratio of 5 cubic feet of sand to 94 pounds (one bag) of cement. If proportioning the materials by mass, use a density of 85 pounds per cubic foot (loose volume) for sand. The Contractor may batch sand at the moisture content occurring in the stockpile.
Mix the sand and cement until the mixture is of uniform color.  

530-3.1.2 Filling Sacks: Accurately measure the mixed material into each sack, taking care to place the same amount of material in each sack; keep at least the top 6 inches of the sacks unfilled to allow for proper tying or folding and to ensure against breaking of the sack during placing.

530-3.1.3 Placing: Place the filled sacks with their tied or folded ends all in the same direction. Lay the sacks with broken joints, in a regular pattern. Ram or pack the sacks against each other so as to form a close and molded contact after the sand and cement mixture has set up. Remove and replace sacks ripped or torn in placing with sound, unbroken sacks. Then, thoroughly saturate all sacks with water.

530-3.1.4 Grouting: Immediately after watering, fill all openings between sacks with dry grout composed of one part Portland cement and five parts sand.

530-3.1.5 Toe Walls: The Contractor may construct toe walls of riprap for fill slopes of poured in place concrete in lieu of sand cement in sacks. Meet the concrete requirements as specified in Section 347. If using sand cement in sacks for the toe walls, fill the entire trench excavated for the toe walls with sand cement in sacks.

530-3.2 Rubble: Dump rubble in place forming a compact layer conforming to the neat lines and thickness specified in the Plans. Ensure that rubble does not segregate so that smaller pieces evenly fill the voids between the larger pieces.

530-3.3 Bedding Stone: Place a minimum one foot thick layer of bedding stone under all rubble riprap without puncturing or tearing the geosynthetic material. The Engineer will allow an in place thickness tolerance of plus or minus one inch.

Remove and replace geosynthetic material damaged as a result of operations at no expense to the Department.

530-3.4 Articulating Concrete Block (ACB) Revetment System: Install the ACB revetment system in accordance with ASTM D6884 and the manufacturer’s recommendations, unless directed otherwise by the Engineer.

Prior to installation, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades and cross sections shown in the Plans. Bring the subgrade surface to a plane approximately parallel to the plane of the proposed finished surface, such that, upon placement of the mat, no individual block within the ACB mat will protrude more than one-half inch from any adjacent block. Uniformly compact each subgrade layer to achieve the density required in the Plans. If the Plans do not provide for stabilizing, compact the subgrade in both cuts and fills, to the density specified in ASTM D6884.

Embed anchors at least six feet into the subgrade at a 45 degree angle into the bank with a minimum pullout resistance of 875 pounds. In the presence of the Engineer, perform on-site anchor strength testing to verify the required pull-out resistance is achieved. Anchor strength testing must be performed on the first two and final two installed anchors, and randomly throughout the installation operation such that 5% of all installed anchors are tested for pullout resistance. If any anchor fails to meet the pullout resistance requirement, test every subsequent installed anchor until a revised installation plan is proposed and approved by the Engineer. Anchor spacing cannot exceed four feet.

Immediately prior to placing the geosynthetic material and ACB system, inspect the prepared subgrade to ensure it is free of loose material and the surface is smoothly compacted. Place the geosynthetic material directly on the prepared area, in intimate contact with the subgrade and free of folds or wrinkles. Do not glue or physically bond the geosynthetic material to the ACB mat. Install a six inch thick layer of bedding stone under the geosynthetic material, when called for in the Plans.
When installing ACB systems around curves, the mats shall be matched up to the greatest extent possible. Gaps greater than one block size shall be filled with a block and grouted the depth of the block with non-structural grout.

Do not install blocks with chips that result in any block weighing less than 95% of the manufacture specified weight.

530-3.5 Gabions: Install double-twisted wire mesh gabions in accordance with ASTM D7014. Install welded wire fabric gabions in accordance with the manufacturer's recommendations.

Prior to installation, complete any required excavation and preparation of the foundation as shown in the Plans or as directed.

Install soil anchors as specified in the Plans.

All adjoining gabion units shall be connected along the perimeter of their contact surfaces to obtain a monolithic structure. If more than one tier, stagger the vertical joints of subsequent rows by one half cell length and adjoin the empty gabions to the top of the lower tier along the front and back edges of the contact surface.

Fill gabions in a manner that minimizes voids, protects against local deformation of the wire mesh and prevents damage to PVC coating. At no point in the filling process may rock be mechanically placed from a height of over 36 inches from machine to fill area. Uniformly overfill gabions by 1 to 2 inches to compensate for future rock settlements.

Any damage to the wire or coatings during assembly, placement, or filling shall be repaired promptly in accordance with the manufacturer's recommendations or replaced with undamaged gabion baskets.

530-4 Method of Measurement.

530-4.1 Sand-Cement: The quantity to be paid for will be the volume, in cubic yards, of sand actually used in the sand cement mixture and grout, satisfactorily placed and accepted.

If sand cement is proportioned by volume, the sand will be measured loose in an approved measure prior to mixing with cement. If sand cement is proportioned by weight, approved scales will be used for this purpose and the volume will be calculated using a standard conversion factor for sand of 85 pound per cubic foot. No adjustment of batch weights to allow for varying moisture content of the sand will be made.

For toe walls, the quantity to be paid for will include only the volume of sand cement in sacks or concrete placed within the neat lines shown in the Plans for the toe walls.

530-4.2 Rubble and Bedding Stone: The quantity of rubble riprap to be paid for will be the square yard area of rubble rip installed in accordance with the Plans and accepted in the field. The quantities to be paid for will be the weight, in tons, in surface dry natural state, by railroad scales, truck scales, or barge displacement. The Contractor shall determine the weights as follows:

1. Railroad Weights: The Contractor shall weigh railroad cars on railroad scales, before and after loading or before and after unloading. If weighed by other than the Engineer, a certified statement of weights will be required. Certificates of weight, furnished by the railroad company, will be acceptable without further certification.

2. Truck Weights: The Contractor shall weigh trucks on certified scales, loaded and empty, as prescribed above for railroad weights. The Contractor shall weigh trucks in the presence of the Engineer, or submit certificates of weights.

3. Barge Displacement: The Engineer will measure each barge. The Contractor shall fit each barge with gauges graduated in 0.10 foot increments. The Contractor shall locate a gauge at each corner of the barge near the lower end of the rake. The Contractor shall furnish additional gauges amidships if the Engineer deems necessary. The Engineer will compute all weights.
530-4.3 Articulating Concrete Block (ACB) Revetment System: The quantity to be paid for will be the plan quantity, in square yards, completed and accepted, subject to the provisions of 9-3.2. No allowance will be made for ACB placed outside the Plan dimensions, unless the additional placement is ordered by the Engineer.

530-4.4 Gabions: The quantity to be paid for will be the plan quantity, in square yards, placed in the final locations.

530-5 Basis of Payment.

530-5.1 Sand-Cement: Price and payment will be full compensation for all work specified in this Section, including all materials, labor, hauling, excavation, and backfill. Include the cost of dressing and shaping the existing fills (or subgrade) for placing riprap in the Contract unit price for riprap (sand-cement).

530-5.2 Rubble: Price and payment will be full compensation for all work specified in this Section, including all materials, hauling, excavation, and backfill. Include the cost of dressing and shaping the existing fills (or subgrade) for placing riprap in the Contract unit price for riprap (rubble).

As an exception to the above, concrete that is shown to be removed from an existing structure and subsequently disposed of by being used in the embankment as riprap will not be paid for under this Section. Include the cost of such work under removal of existing structures.

530-5.3 Bedding Stone: Price and payment will be full compensation for all work specified in this Section, including all materials and hauling. Include the cost of dressing and shaping the existing fills (or subgrade) for placing bedding stone in the Contract unit price for riprap (rubble).

530-5.4 Geosynthetic Material: Include the cost of materials and installation of the geosynthetic material in the contract unit price for riprap or ACB revetment system.

530-5.5 Articulating Concrete Block (ACB) Revetment System: Price and payment will be full compensation for all work specified in this Section, including all materials, labor, hauling, excavation and backfill.

530-5.6 Gabions: Price and payment will be full compensation for all work specified in this Section, including all materials, labor, hauling, excavation and backfill.

530-5.7 Payment Items. Payment will be made under:
- Item No. 530-1- Riprap (Sand-Cement) – per cubic yard.
- Item No. 530-3- Riprap (Rubble) – per ton.
- Item No. 530-4- Articulating Concrete Block Revetment System – per square yard.
- Item No. 530-5- Gabions – per square yard.
- Item No. 530-74- Bedding Stone – per ton.

END OF SECTION 530
SECTION 570
PERFORMANCE TURF

570-1 Description.
Establish a growing, healthy turf over all areas designated in the Plans. Use sod in areas designated in the Plans to be sodded. Use seed, hydrosod, bonded fiber matrix, or sod in all other areas. Maintain turf areas until final acceptance of all contract work in accordance with Section 5-11.

570-2 Materials.
Meet the following requirements:

- Turf Materials .................................................. Section 981
- Fertilizer .......................................................... Section 982
- Water .............................................................. Section 983

All sod shall be Argentine Bahia and shall not contain soda apple or millet.

570-3 Construction Methods.

570-3.1 General: Incorporate turf installation into the project at the earliest practical time. Shape the areas to be planted to the plan typical sections and lines and grade shown in the Contract Documents.

Except in areas where the Contract Documents requires specific types of grass to match adjoining private property, any species of grass designated in Section 981 may be used.

Use the methods and materials necessary to establish and maintain the initial grassing until acceptance of the Contract work in accordance with 5-11. All of the permanent grassing material shall be in place prior to final acceptance.

The Owner Department will only pay for replanting as necessary due to factors determined by the Engineer to be beyond control of the Contractor.

Complete all grassing on shoulder areas prior to the placement of the friction course on adjacent pavement.

570-3.2 Seeding: At the Contractor’s option, wildflower seed may be included in the turf seeding operation or performed separately from the turf seeding. Use of compost meeting the requirements of Section 987 as mulch is acceptable unless otherwise specified.

570-3.3 Sod: Place the sod on the prepared surface, with edges in close contact. Do not use sod which has been cut for more than 48 hours.

Place the sod to the edge of all landscape areas as shown in the Plans and as shown in the Design Standards.

Place rolled sod parallel with the roadway and cut any exposed netting even with the sod edge.

Monitor placed sod for growth of pest plants and noxious weeds. If pest plants and/or noxious weeds manifest themselves within 30 days of placement of the sod during the months April through October, within 60 days of placement of the sod during the months of November through March treat affected areas by means acceptable to the Owner Department at no expense to the Owner Department. If pest plants and/or noxious weeds manifest themselves after the time frames described above from date of placement of sod, the Engineer, at his sole option, will determine if treatment is required and whether or not the Contractor will be compensated for such treatment. If compensation is provided, payment will be made as Unforeseeable Work as described in 4-4.

Remove and replace any sod as directed by the Engineer.
570-3.4 Hydroseeding: Use equipment specifically designed for mixing the mulch, seed, fertilizer, tackifier and dye, and applying the slurry uniformly over the areas to be hydroseeded. Use mulch that does not contain reprocessed wood or paper fibers. Ensure that 50% of the fibers will be retained on a twenty-five mesh screen.

Mix fertilizer as required into the hydroseeding slurry.

Ensure that the dye does not contain growth or germination inhibiting chemicals.

When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture holding compounds.

570-3.5 Bonded Fiber Matrix (BFM): Meet the minimum physical and performance criteria of this Specification for use of BFM in hydroseeding operations or temporary nonvegetative erosion and sediment control methods.

Provide evidence of product performance testing, manufacturer’s certification of training and material samples to the Engineer at least 7 calendar days prior to installation.

Provide documentation to the Engineer of manufacturer’s testing at an independent laboratory, demonstrating superior performance of BFM as measured by reduced water runoff, reduced soil loss and faster seed germination in comparison to erosion control blankets.

Use only BFMs that contain all components pre-packaged by the manufacturer to assure material performance. Deliver materials in UV and weather resistant factory labeled packaging. Store and handle products in strict compliance with the manufacturer’s directions.

When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture holding compounds.

Meet the following requirements after application of the formed matrix:

Ensure that the tackifier does not dissolve or disperse upon re-wetting.

Ensure that the matrix has no gaps between the product and the soil and that it provides 100% coverage of all disturbed soil areas after application.

Ensure that the matrix has no germination or growth inhibiting properties and does not form a water repelling crust.

Ensure that the matrix is comprised of materials which are 100% biodegradable and 100% beneficial to plant growth.

Mix and apply the BFM in strict compliance with the manufacturer’s recommendations.

Apply the BFM to geotechnically stable slopes at the manufacturer’s recommended rates.

Degradation of BFM will occur naturally as a result of chemical and biological hydrolysis, UV exposure and temperature fluctuations. Re-application, as determined by the Engineer, will be required if BFM treated soils are disturbed or water quality or turbidity tests show the need for an additional application. The work and materials for re-application, will be paid for as Unforeseeable Work.

570-3.6 Watering: Water all turf areas as necessary to produce a healthy and vigorous stand of turf. Ensure that the water used for turf irrigation meets the requirements of Section 983.

570-3.7 Fertilizing: Fertilize as necessary based on soil testing performed in accordance with Section 162. Refer to Section 982 for fertilizer rates.

For bid purposes, base estimated quantities on an initial application of 265 lbs/acre and one subsequent application of 135 lbs/acre of 16-0-8.
570-4 Turf Establishment.

Perform all work necessary, including watering and fertilizing, to sustain an established turf until final acceptance, at no additional expense to the Owner Department. Provide the filling, leveling, and repairing of any washed or eroded areas, as may be necessary.

Established turf is defined as follows:

1. An established root system (leaf blades break before seedlings or sod can be pulled from the soil by hand).
2. No bare spots larger than one square foot.
3. No continuous streaks running perpendicular to the face of the slope.
4. No bare areas comprising more than 1% of any given 1,000 square foot area.
5. No deformation of the turf areas caused by mowing or other Contractor equipment.
6. No exposed sod netting.
7. No pests or noxious weeds.

Monitor turf areas and remove all competing vegetation, pest plants, and noxious weeds (as listed by the Florida Exotic Pest Plant Council, Category I “List of Invasive Species”, Current Edition, http://www.fleppc.org). Remove such vegetation regularly by manual, mechanical, or chemical control means, as necessary. When selecting herbicides, pay particular attention to ensure use of chemicals that will not harm desired turf or wildflower species. Use herbicides in accordance with 7-1.7.

If at the time that all other work on the project is completed, but all turf areas have not met the requirements for established turf set forth in 570-4, continuously maintain all turf areas until the requirements for established turf set forth in 570-4 have been met.

During the entire establishment period and until turf is established in accordance with this specification, continue inspection and maintenance of erosion and sedimentation control items in accordance with Section 104. Take responsibility for the proper removal and disposal of all erosion and sedimentation control items after turf has been established.

Notify the Engineer, with a minimum of seven calendar days advance notice, to conduct inspections of the turf at approximate 90-day intervals during the establishment period to determine establishment. Results of such inspections will be made available to the Contractor within seven calendar days of the date of inspection. Determination of an established turf will be based on the entire project and not in sections.

Upon the determination by the Engineer that the requirements of 570-4 have been met and an established turf has been achieved and all erosion and sedimentation control items have been removed, the Engineer will release the Contractor from any further responsibility provided for in this Specification.

The Contractor’s establishment obligations of this specification will not apply to deficiencies due to the following factors, if found by the Engineer to be beyond the control of the Contractor, his subcontractors, vendors or suppliers:

a. Determination that the deficiency was due to the failure of other features of the Contract.

b. Determination that the deficiency was the responsibility of a third party performing work not included in the Contract or its actions.

The Owner Department will only pay for replanting as necessary due to factors determined by the Owner Department to be beyond the control of the Contractor.

570-5 Responsible Party.

For the purposes of this Specification, the Contractor shall be the responsible party throughout construction and establishment periods.
Upon final acceptance of the Contract in accordance with 5-11, the Contractor's responsibility for maintenance of all the work or facilities within the project limits of the Contract will terminate in accordance with 5-11; with the sole exception that the facilities damaged due to lack of established turf and the obligations set forth in this Specification for performance turf shall continue thereafter to be responsibility of the contractor as otherwise provided in this Section.

570-6 Disputes Resolution.

The Contractor and the Department acknowledge that use of the Statewide Disputes Review Board is required and the determinations of the Statewide Disputes Review Board for disputes arising out of the performance turf specification will be binding on both the Contractor and the Department, with no right of appeal by either party, for the purposes of this Specification.

Any and all Statewide Disputes Review Board meetings after final acceptance of the Contract in accordance with 5-11 shall be requested and paid for by the Contractor. The Department will reimburse the Contractor for all fees associated with meetings.

570-7 Failure to Perform.

Should the Contractor fail to timely submit any dispute to the Owner Statewide Disputes Review Board, refuse to submit any dispute to the Owner Statewide Disputes Review Board, fail to provide an established turf in accordance with 570-4 within one year of final acceptance of the Contract in accordance with 5-11, or fail to compensate the Owner Department for any remedial work performed by the Owner Department in establishing a turf and other remedial work associated with lack of an established turf, including but not limited to, repair of shoulder or other areas due to erosion and removal of sediments deposited in roadside ditches and streams, as determined by the Statewide Disputes Review Board to be the Contractor's responsibility, the Owner Department shall suspend, revoke or deny the Contractor's certificate of qualification under the terms of Section 337.16(d)(2), Florida Statutes, until the Contractor provides an established turf or makes full and complete payment for the remedial work performed by the Owner Department. In no case shall the period of suspension, revocation, or denial of the Contractor's certificate of qualification be less than six months. Should the Contractor choose to challenge the Owner's Department's notification of intent for suspension, revocation or denial of qualification and the Department's action is upheld, the Contractor shall have its qualification suspended for a minimum of six months or until the remedial action is satisfactorily performed, whichever is longer.

570-8 Method of Measurement.

The quantities to be paid for will be plan quantity in square yards based on the area shown in the Plans, completed and accepted.

570-9 Basis of Payment.

Prices and payments will be full compensation for all work and materials specified in this Section.

Payment will be made under:

Item No. 570-1 Performance Turf - per square yard
Item No. 570-1 Sod (Argentine Bahia) – per square yard.

END OF SECTION 570
SECTION 700
HIGHWAY SIGNING

700-1 General Requirements.

700-1.1 Description: Furnish and erect roadway signs at the locations shown in the Plans and in accordance with the details shown in the Plans.

The FDOT Department designates ground traffic signs as signs erected on the shoulders, slopes, or medians, but not extending over the traveled roadway, and may further classify these signs as single post or multi-column.

The FDOT Department designates signs erected partially or completely over the traveled roadway or mounted on bridges as overhead traffic signs, and may further classify these signs as overhead cantilever or span traffic signs.

Meet the requirements of Section 603.

700-1.2 Materials:

700-1.2.1 General: Meet the materials requirements shown in the Specifications and Design Standards and any additional requirements identified in the Plans.

700-1.2.2 Concrete: Use concrete meeting the requirements of Section 346. Obtain concrete from a plant that is listed on the FDOT’s Department’s Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

700-1.2.3 Static Sign Assembly Requirements: All sign panels shall be aluminum unless otherwise shown in the Plans. Sheets and plates for sign panels shall meet the requirements of ASTM B209, Aluminum Association Alloy 6061-T6, 5154-H38 or 5052-H38. Sign panels for single column ground mounted signs shall utilize aluminum plate with a minimum thickness of 0.08 inches. All other sign panels shall utilize aluminum plate with a minimum thickness of 0.125 inches. All panels shall have rounded corners.

700-1.2.4 Retroreflective Sign Sheeting: Use signs that meet the material and process requirements of Section 994.

Use Type XI sheeting for all regulatory, warning and overhead signs. The R1-1, R1-2, R5-1 and R5-1a signs must use a sheeting system that includes a colorless film overlay.

Type XI sheeting shall also be used for all limited access advance exit and exit guide signs.

Use Type IV yellow-green fluorescent sheeting for school S1-1, S3-1, S4-3, S4-5 and supplemental panels used with S1-1 signs. Do not mix signs having fluorescent yellow-green sheeting with signs having yellow retroreflective sheeting.

Roll-up signs shall meet the requirements of Type VI sheeting.

Use Type IV sheeting for all other signs.

700-1.3 Sign Fabrication Requirements: Obtain multi-post and overhead sign structures from a facility that is listed on the FDOT’s Department’s Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

700-1.4 Storage, Handling and Labeling: If signs are stored prior to installation, store them in accordance with the manufacturer’s recommendations. Properly package signs to protect them during storage, shipment and handling to prevent damage to the sign face and panel.

In addition to the information required in Section 994, all permanent roadway signs must be labeled on the back bottom edge with the date of installation. Make the labels unobtrusive, but legible enough to be easily read by an observer on the ground when the sign is in its final position. Apply the label in a manner that is at least as durable as the sign face.

700-1.5 Acceptance of Signs:

700-1.5.1 Sign Inspection: Provide certification that the sign assembly meets the material and installation requirements of the Contract. The Engineer will inspect the signs upon delivery to the storage or project site and again at the final construction inspection. Repair and
replace signs deemed unacceptable by the Engineer at no expense to the Owner Department.

700-1.5.2 Imperfections and Repairs: Repair or replace signs containing imperfections or damage regardless of the kind, type, or cause of the imperfections or damage. For sign panels exceeding 30 square feet, the Contractor may make one patch, if necessary, to each sign panel not to exceed two square inches. Make repairs according to the manufacturer’s recommendations and to the satisfaction of the Engineer. Ensure that completed repairs provide a level of quality necessary to maintain the service life of the sign and are satisfactory in appearance to the Engineer.

700-2 Static Signs.

700-2.1 Ground Mounted Signs: Ground mounted signs consist of both single column and multi-column static signs.

700-2.1.1 Materials: Use aluminum tubing materials meeting the general provisions of Section 965 for all single column ground signs. Multi-column signs must be galvanized steel W or S beams steel columns meeting the general provisions of Section 962. All materials must meet the requirements of the appropriate Design Standard.

700-2.1.2 Fabrication of Panel Messages: Fabricate standard sign panel messages in accordance with details included in the Standard Highway Signs (SHS) manual published by the U.S. Department of Transportation. Submit shop drawings to the Engineer Department for approval as specified in Section 5.

700-2.1.3 Foundation: Construct foundations in accordance with the applicable Design Standards. The Contractor may use precast foundations in augured or excavated holes a minimum of 12 inches larger than each axis dimension of the precast foundation. Obtain precast foundations from a plant that is currently on the FDOT’s Department’s Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. The holes must be clean and without loose material. Temporary casing will be required if the soil is unstable. Fill the void around the precast foundation with flowable fill meeting the requirements of Section 121 or use clean sand placed using hydraulic methods.

700-2.1.4 Breakaway Support Mechanisms for Ground Traffic Signs:

700-2.1.4.1 Frangible Supports: Provide support posts for all frangible sign assemblies consisting of aluminum tubes up to 3 -1/2 inches outside diameter with 3/16 inch wall thickness in accordance with the requirements in the Design Standards.

700-2.1.4.2 Slip Bases: Slip base assemblies for single column signs will use aluminum sleeves and base plates. Slip base assemblies for multi-column signs will use galvanized steel bases. All slip bases must be fabricated in accordance with the requirements of the Design Standards.

700-2.1.5 Installation: Verify the length of the column supports in the field prior to fabrication to permit the appropriate sign mounting height. Fabricate the supports and wind beams in accordance with the Design Standards. Columns must be plumb and panels must be level with the proper orientation.

700-2.2 Overhead Signs:

700-2.2.1 Materials:

700-2.2.1.1 General: Obtain reinforcing steel, multi-post and overhead sign structures from a fabrication facility that is listed on the Department’s Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. Only use structural steel, including bolts, nuts, and washers, that have been hot-dip galvanized or metalized after fabrication. Perform hot-dip galvanizing in accordance with Section 962 and metalizing in accordance with Section 562. For galvanized steel members, meet the general requirements of Section 962. Obtain galvanized steel from a fabrication facility that is listed on the Department’s Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of
Section 105.

Use a galvanizing compound as specified in Section 975. Use a galvanizing repair compound listed on the APL for large areas as defined in Section 975.

**700-2.2.1.2 Reinforcing Steel:** Use reinforcing steel in footings meeting the requirements of Section 415.

**700-2.2.1.3 Specific Uses of Aluminum and Galvanized Steel:** Use aluminum bolts, nuts, and hardware to connect parts of the cast base. Use galvanized steel anchor bolts for anchoring base plates to concrete bases and for the nuts and washers.

For all other metal parts of the cast base, the Engineer will allow galvanized steel as an alternative to aluminum.

**700-2.2.2 Foundations:** Meet the requirements of Section 455.

**700-2.2.3 Installation:** Install nuts on anchor bolts in accordance with Section 649 with the following exception. For cantilever overhead sign structures, after placement of the upright and prior to installation of the truss, adjust the leveling nuts beneath the base plate to achieve the back rake shown on the Camber Diagram. If the top surface of the base plate has a slope that exceeds 1:40, use beveled washers under the top nuts. For span overhead sign structures, install a screen around the base plate in accordance with 649-6. For cantilever overhead sign structures, install a structural grout pad in accordance with 649-7.

Use ASTM A325 bolt, nut and washer assemblies for all installations other than anchor bolts as follows. Use bolt, nut and washer assemblies that are free of rust and corrosion and are lubricated properly as demonstrated by being able to easily hand turn the nut on the bolt thread for its entire length. Tighten nuts to a snug-tight condition to bring the faying surfaces of the assembly into full contact which is referred to as snug-tight. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12 inch long wrench or equivalent. After bringing the faying surfaces of the assembly into full contact and to a snug-tight condition, tighten nuts to achieve the minimum torque as specified in Table 700-1 unless the connection is an alternate splice connection of a span sign structure, in which case, tighten nuts in accordance with Table 460-7, Nut Rotation from the Snug Tight Condition. Maintain uniform contact pressure on the faying surfaces during snugging and the subsequent final tightening process by using a bolt tightening pattern that balances the clamping force of each bolt, as closely as possible, with the equal clamping force of a companion bolt. Within 24 hours after final tightening, the Engineer will witness a check of the minimum torque using a calibrated torque wrench for three bolts or a minimum of 10% of the bolts, whichever is greater, for each connection. However, do not perform this check on alternate splice connections of span sign structures.

<table>
<thead>
<tr>
<th>Bolt Diameter (inches)</th>
<th>Minimum Torque (ft-lbs.)</th>
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<tbody>
<tr>
<td>3/8</td>
<td>15</td>
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<tr>
<td>1/2</td>
<td>37</td>
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<tr>
<td>5/8</td>
<td>74</td>
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<td>3/4</td>
<td>120</td>
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<tr>
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<td>275</td>
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<tr>
<td>1-1/8</td>
<td>375</td>
</tr>
<tr>
<td>1-1/4</td>
<td>525</td>
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</tbody>
</table>

700-2.2.4 Erection of Signs and Sign Supports: Do not erect overhead sign supports until the concrete strength in the support footing is at least 2,500 psi. Determine concrete strength from tests on a minimum of two test cylinders sampled and tested in accordance with
ASTM C31 and ASTM C39 and verifying test results have been provided to the Engineer. Erect the signs and sign structures in accordance with the details shown in the Plans. The Contractor may fabricate the structural steel sign trusses in sections that will fit into available galvanizing vats. Prior to galvanizing, weld the joints as specified in Section 460 and in accordance with the details shown in the Plans. Re-galvanize damaged parts as specified in Section 562.

Weld aluminum structures in accordance with Section 965.
Attach electronic display signs to the supporting structure in accordance with the manufacturer’s recommendations using the mounting hardware provided by the manufacturer.

700-2.2.5 Shop Drawings: Submit shop drawings to the Department for approval as specified in Section 5. Prior to the submittal of the shop drawings, determine the actual in-place dimensions for all sign structures on the basis of existing field conditions and include these on the shop drawings.

700-2.3 Method of Measurement: For single post and multi post sign assemblies, an assembly consists of all the signs mounted on a single structure. The Contract unit price per assembly for ground mounted signs (single post and multi-post), furnished and installed, will include furnishing the sign panels, support structure, foundation, hardware, and labor necessary for a complete and accepted installation.

For overhead signs, sign panels will be paid separately from support structures. The Contract unit price for each for sign panel, furnished and installed, will include furnishing the sign panels, hardware, and labor necessary for a complete and accepted installation. The Contract unit price for each overhead static sign structure, furnished and installed, will include furnishing the support structure, foundation, hardware, and labor necessary for a complete and accepted installation.

Relocation of signs will consist of removing the existing sign assembly and installing the sign on a new foundation at the location shown in the Plans.

When the Plans call for existing ground-mounted signs to be relocated or removed, after removing the sign panel from the assembly, remove supports and footings. Restore the area of the sign removal or relocation to the condition of the adjacent area.

700-2.4 Basis of Payment: Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 700- 1- Single Post Sign, per Assembly.

Item No. 700- 2- Multi Post Sign, per Assembly.

Item No. 700- 3- Sign Panel, per Each.

Item No. 700- 4- Overhead Static Sign Structure, per

Item No. 700- 13 Retroreflective Sign Strip, per Each.

END OF SECTION 700
SECTION 710
PAINTED PAVEMENT MARKINGS

710-1 Description.
Apply Painted Traffic Stripes and Markings, in accordance with the Contract Documents.

710-2 Materials.
Use only materials listed on the Department’s FDOT Approved Product List (APL) meeting the following requirements:
- Raised Retroreflective Pavement Markers and Bituminous Adhesive .................................................. Section 970
- Standard Waterborne Fast Dry Traffic Paint ................... 971-1 and 971-3
- Fast Dry Solvent Paint ................................................... 971-1 and 971-4
- Glass Spheres ............................................................... 971-1 and 971-2

The Engineer will take random samples of all material in accordance with the Department’s FDOT Sampling, Testing and Reporting Guide schedule.

710-3 Equipment.
Use equipment that will produce continuous uniform dimensions of pavement markings of varying widths and meet the following requirements:
(a) Capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of paint and capable of following straight lines and making normal curves in a true arc.
(b) Capable of applying glass spheres to the surface of the completed stripe by an automatic sphere dispenser attached to the striping machine such that the glass spheres are dispensed closely behind the installed line. Use a glass spheres dispenser equipped with an automatic cut-off control that is synchronized with the cut-off of the traffic paint and applies the glass spheres in a manner such that the spheres appear uniform on the entire pavement markings surface with, 50 to 60% embedment.
(c) Capable of spraying the paint to the required thickness and width without thinning of the paint. Equip the paint tank with nozzles equipped with cut-off valves, which will apply broken or skip lines automatically.

710-4 Application:
710-4.1 General: Remove existing pavement markings, such that scars or traces of removed markings will not conflict with new pavement markings, by a method approved by the Engineer. Payment for marking removal will be in accordance with 102-5.8.
Before applying traffic stripes and markings, remove any material by a method approved by the Engineer that would adversely affect the bond of the traffic stripes.
Apply traffic stripes and markings only to dry surfaces, and when the ambient air and surface temperature is at least 40ºF and rising. Do not apply traffic stripes and markings when winds are sufficient to cause spray dust.
Apply traffic stripes and markings, having well defined edges, over existing pavement markings such that not more than 2 inches on either end and not more than 1 inch on either side is visible. When stencils are used to apply symbols and messages, the areas covered by the stencil reinforcing will not be required to be painted.
Mix the paint thoroughly prior to pouring into the painting machine. Apply paint to the pavement by spray or other means approved by the Engineer.
Conduct field testing in accordance with FM 5-541. Remove and replace traffic stripes and markings not meeting the requirements of this Section at no additional cost to the project Department.
710-1 Final Surface: When permanent pavement markings are placed on newly constructed asphalt, painted pavement markings (final surface) will include one application of standard painted pavement markings and one application of retroreflective pavement markers applied to the final surface; otherwise, painted pavement markings (final surface) will include two applications of standard painted pavement markings and one application of retroreflective pavement markers applied to the final surface. Wait at least 14 days after the first application to apply the second application of painted pavement markings (final surface). Second application must be applied prior to final acceptance of the project.

710-2 Thickness: Apply paint to attain a minimum wet film thickness in accordance with the manufacturer’s recommendations.

710-3 Retroreflectivity: Apply white and yellow standard pavement markings that will attain an initial retroreflectance of not less than 300 mcd/lx m$^2$ and not less than 250 mcd/lx m$^2$, respectively. Measure, record, and certify on a Department FDOT approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with FM 5-541.

The Department FDOT and/or the Engineer reserves the right to test the markings within 3 days of receipt of the Contractor’s certification. Failure to afford the Department FDOT and/or the Engineer opportunity to test the markings will result in rejection of the markings. The test readings should be representative of the Contractor’s striping performance. If the retroreflectivity values measure below values shown above, reapply the striping at no additional cost to the project Department.

For standard pavement markings, ensure that the minimum retroreflectance of white and yellow pavement markings are not less than 150 mcd/lx m$^2$. If the retroreflectivity values fall below the 150 mcd/lx m$^2$ value within six months of initial application, the striping will be reapplied at the Contractor’s expense.

710-4 Color: Use paint material that meets the requirements of 971-1.

710-5 Glass Spheres: Apply glass spheres on all pavement markings immediately and uniformly following the paint application. The rate of application shall be based on the manufacturer’s recommendation.

710-5 Tolerances in Dimensions and in Alignment.

Establish tack points at appropriate intervals for use in aligning stripes, and set a stringline from such points to achieve accuracy.

710-5.1 Dimensions:

710-5.1.1 Longitudinal Lines: Apply painted skip line segments with no more than plus or minus 12 inches variance, so that over-tolerance and under-tolerance lengths between skip line and the gap will approximately balance. Apply longitudinal lines at least 2 inches from construction joints of portland cement concrete pavement.

710-5.1.2 Transverse Markings, Gore Markings, Arrows, and Messages: Apply paint in multiple passes when the marking cannot be completed in one pass, with an overall line width allowable tolerance of plus or minus 1 inch.

710-5.1.3 Contrast Lines: Use black paint to provide contrast on concrete or light asphalt pavement, when specified by the Engineer. Apply black paint in 10 foot segments following each longitudinal skip line.

710-5.2 Alignment: Apply painted stripes that will not deviate more than 1 inch from the stringline on tangents and curves one degree or less. Apply painted stripes that will not deviate more than 2 inches from the stringline on curves greater than one degree. Apply painted edge stripes uniformly, not less than 2 inches or more than 4 inches from the edge of pavement, without noticeable breaks or deviations in alignment or width.
Remove and replace at no additional cost to the project Department, traffic stripes that deviate more than the above stated requirements.

710-5.3 Correction Rates: Make corrections of variations in width at a maximum rate of 10 feet for each 0.5 inches of correction. Make corrections of variations in alignment at a maximum rate of 25 feet for each 1 inch of correction, to return to the stringline.

710-6 Contractor’s Responsibility for Notification.
Notify the Engineer prior to the placement of the materials. Furnish the Engineer with the manufacturer’s name and batch numbers of the materials and glass spheres to be used. Ensure that the approved batch numbers appear on the materials and glass spheres packages.

710-7 Protection of Newly Painted Pavement Markings.
Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause, at no additional cost to the project Department.

710-8 Corrections for Deficiencies to Applied Painted Pavement Markings.
Reapply a 1.0 mile 100 foot section, or the complete marking if less than 100 feet long, centered around any deficiency, at no additional cost to the project Department.

710-9 Submittals.
710-9.1 Submittal Instructions: Prepare a certification of quantities, using the Department’s current approved form, for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

710-9.2 Contractor’s Certification of Quantities: Request payment by submitting a certification of quantities no later than Twelve O’clock noon Monday after the estimate cut-off date or as directed by the Engineer, based on the amount of work done or completed. Ensure the certification of quantities consists of the following:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

710-10 Method of Measurement.
The quantities to be paid for under this Section will be as follows:

(a) The area length, in net square feet miles, of 6-inch solid traffic stripe, authorized and acceptably applied.

(b) The total traversed distance in gross miles of 10-30 or 3-9 skip line. The actual applied line is 25% of the traverse distance for a 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.

(c) The net area length, in square feet, of each of all other types of lines and stripes, authorized and acceptably applied.

(d) The number of pavement messages, symbols and directional arrows, authorized and acceptably applied.

(e) Lump Sum, as specified in 710-4.1.1 when the item for painted pavement markings (final surface) is included in the proposal.

The net length, in feet of dotted and skip stripes other than 10-30 and 3-9 will be measured as the distance from the beginning of the first painted stripe to the end of the last
Painted stripe with proper deductions made for unpainted intervals as determined by plan dimensions or stations, subject to 9-1.3. Unpainted intervals will not be included in pay quantity.

The gross-mile measurement of 10-30 and 3-9 skip traffic stripes will be taken as the distance from the beginning of the first painted stripe to the end of the last painted stripe, and will include the unpainted intervals. It will not include any lengths of unpainted intervals which, by design or by other intent of the Department, are greater than 30 feet. Final measurement will be determined by plan dimensions or stations, subject to 9-1.3.1.

710-11 Basis of Payment.

710-11.1 General: Prices and payments will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

710-11.2 Lump-Sum Payment: When the item for painted pavement markings (final surface) is included in the proposal, prices and payments will be full compensation for two applications of all painted pavement markings applied to the final surface, and one application of retroreflective pavement markers applied to the final surface in accordance with Section 706.

Payment will be made under:

Item No. 710-1 Painted Pavement Markings, Landside – per Square Foot

END OF SECTION 710
ITEM 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 – DESCRIPTION

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Foundations.
2. Grade Beams and Pile Caps.
3. Slabs-on-Grade & Sidewalks.
4. Concrete Topping.
5. Suspended Slabs.
6. Suspended Framing Members.
7. Walls.
8. Tie columns and Tie Beams.
9. Slab-on-Deck.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.
3. Division 3 Section "Cast-in-Place Architectural Concrete" for general building applications of specially finished formed concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.
C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Re-shoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing re-shoring.

E. Welding certificates.

F. Qualification Data: For Installer, manufacturer, and testing agency.

G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

H. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Floor and slab treatments.
10. Vapor barriers.

I. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

J. Field quality-control test and inspection reports.

K. Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Mockups: Cast concrete panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

I. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.

2. Review testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and re-shoring procedures, steel reinforcement installation, floor and slab flatness and levelness measurement, and concrete protection.
1.6 **DELIVERY, STORAGE, AND HANDLING**

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

**PART 2 - PRODUCTS**

2.1 **MANUFACTURERS**

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 **FORM-FACING MATERIALS**

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
   a. High-density overlay, Class 1 or better.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.


D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.


F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.
C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
D. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.
E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I
   a. Fly Ash: ASTM C 618, Class F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
B. Silica Fume: ASTM C 1240, amorphous silica.
C. Normal-Weight Aggregates: ASTM C 33, Class 3S with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
D. Water: ASTM C 94/C 94M and potable

2.6 ADMIXTURES

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 FIBER REINFORCEMENT

A. Synthetic Fibers.

1. Synthetic fibrous reinforcing material shall be Fibermesh® 150 made with 100 percent virgin polypropylene fibers containing no reprocessed olefin materials and specifically manufactured to use as concrete secondary reinforcement. Fibers shall have a specific gravity of 0.91, graded per manufacturer, have UL or Omega Point classified fire ratings, and complies with local and national building code. Fibers shall be manufactured in an ISO 9002 certified facility for use as concrete secondary reinforcement at a minimum of 1.5 pounds per cubic yard. Fibers are for the control of cracking due to drying shrinkage and thermal expansion/contraction, lowered permeability, increased impact, abrasion and shatter resistance. Fiber manufacturer must document evidence of 5 year satisfactory performance history, compliance with applicable building codes and ASTM C-1116 Type III, 4.1.3.

2. Fibers shall be added at the concrete batch plant. Fiber supplier shall provide a representative to instruct the concrete supplier in proper batching and mixing of material for initial placement if requested.

3. A submittal package for fibers must be incorporated with concrete mix designs showing 1.5 pounds per yard for approval by engineer, before any concrete can be placed.

4. Fibrous concrete reinforcement shall be manufactured by Fibermesh, a division of SI Concrete Systems, 4019 Industry Drive, Chattanooga, Tennessee, USA, 37416. Phone: (423) 892-7243, Fax: (423) 892-0157. www.siconcretesystems.com. Local contact in Central / South Florida is Randy Shelby, 621 Sheridan Blvd., Orlando, Florida 32804. Phone: (407) 481-9503, Fax: (407) 481-8428, e-mail randy_shelby@sind.com
B. Equivalent Manufacturers/Suppliers:

1. Axim Concrete Technologies
2. Euclid Chemical Company
3. FORTA Corporation
5. Bekaert Corporation
6. Metalcrete Industries

2.8 GROUT

A. Nonmetallic, shrinkage-resistant grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

1. Available Products:
   a. Crystex - L&M Construction Chemicals, Inc.
   b. Euco Non-shrink Grout - Euclid Chemical Co.
   c. Vibropruf #41 - Lambert Corp.

2.9 VAPOR BARRIERS

A. Plastic Vapor Barriers: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Available Products:
   a. Fortifiber Corporation; Moistop Ultra A.
   b. Raven Industries Inc.; Vapor Block 10.
   c. Reef Industries, Inc.; Griffolyn Type-105.

2.10 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products:
   a. Burke by Edoco; Titan Hard.
   b. ChemMasters; Chemisil Plus.
   c. ChemTec International; ChemTec One.
   d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
   e. Curecrete Distribution Inc.; Ashford Formula.
   f. Dayton Superior Corporation; Day-Chem Sure Hard.
   g. Euclid Chemical Company (The); Euco Diamond Hard.
   h. Kaufman Products, Inc.; SureHard.
   i. L&M Construction Chemicals, Inc.; Seal Hard.
k. Metalcrete Industries; Floorsaver.
l. Nox-Crete Products Group, Kinsman Corporation; Duranox.
m. Symons Corporation, a Dayton Superior Company; Buff Hard.
o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS.

2.11 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products:
   a. Axim Concrete Technologies; Cimfilm.
   b. Burke by Edoco; BurkeFilm.
   c. ChemMasters; Spray-Film.
   d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
   e. Dayton Superior Corporation; Sure Film.
   f. Euclid Chemical Company (The); Eucobar.
   g. Kaufman Products, Inc.; Vapor Aid.
   h. Lambert Corporation; Lambco Skin.
   i. L&M Construction Chemicals, Inc.; E-Con.
   j. MBT Protection and Repair, Div. of ChemRex; Confilm.
   l. Metalcrete Industries; Waterhold.
   m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
   n. Sika Corporation, Inc.; SikaFilm.
   o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
   p. Unitex; Pro-Film.
   q. US Mix Products Company; US Spec Monofilm ER.
   r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
D. Water: Potable.
E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products:
   a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
   b. Burke by Edoco; Aqua Resin Cure.
   c. ChemMasters; Safe-Cure Clear.
   d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
   e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
   f. Euclid Chemical Company (The); Kurez DR VOX.
   g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
m. Tamms Industries, Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.

2.12 RELATED MATERIALS

B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.13 REPAIR MATERIALS

A. Repair Under-layment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of under-layment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by under-layment manufacturer.
4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Over-layment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.14 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.15 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Foundations: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Maximum Aggregate Size: 1 inch.
4. Slump Limit: 4 inches, plus or minus 1 inch for concrete with verified slump of less than 2 inches before adding high-range water-reducing admixture or plasticizing admixture.
5. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Slabs-on-Grade & Sidewalks: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
4. Slump Limit: 4 inches, plus or minus 1 inch for concrete with verified slump of less than 2 inches before adding high-range water-reducing admixture or plasticizing admixture.
5. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
7. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd.
8. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

C. Concrete Toppings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at 28 days.
4. Slump Limit: 5 inches, plus or minus 1 inch for concrete with verified slump of less than 3 inches before adding high-range water-reducing admixture or plasticizing admixture.
5. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
7. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd.
8. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

D. Cast-in-Place Tie Beams and Tie Columns: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.5.
4. Slump Limit: 6 inches, plus or minus 1 inch for concrete with verified slump of less than 2 inches before adding high-range water-reducing admixture or plasticizing admixture.
5. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

E. Tilt-up Panels: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
4. Slump Limit: 4 inches, plus or minus 1 inch for concrete with verified slump of less than 2 inches before adding high-range water-reducing admixture or plasticizing admixture.
5. Air Content: Do not allow air content of troweled finished panels to exceed 3 percent.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:


D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR BARRIERS

A. Plastic Vapor Barriers: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer’s recommended tape.
3.5  STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
   2. Reinforcement shall be bent cold to the shapes indicated in the plans. Bending and straightening shall be done in the shop before shipment and not in the field, unless otherwise directed by the engineer.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6  JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Contractor shall coordinate location of construction joints with contraction and isolation joints or sections for slab construction. After depositing is started, it shall be carried on as a continuous operation until placing of a section, as defined by pre-determined contraction and isolation joints, is completed except as permitted or prohibited by concrete placement specifications.
   2. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
   3. Form keyed joints using embed keys at least 1-1/2 inches into concrete.
   4. Locate joints for beams, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   6. Space vertical joints in walls as shown on plan. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screening, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish of Slab-on-grade to Receive Topping Concrete: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 30 with minimum local values of flatness, F(F) 24; and of levelness, F(L) 20 or slabs-on-grade.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 14 days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.
3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or concrete plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish blending with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.

2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. Yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days, one set of two specimens at 28 days, two sets of two specimens in reserves to be tested at the discretion of the Engineer.
   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03 30 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes marble window sills.

1.3 SUBMITTALS

A. Product data for each type of marble, marble accessory, and other manufactured products required.

B. Shop drawings detailing fabrication and installation of marble. Include relationship with, Attachment to, and reception of related work.

C. Samples: 12 inch section of actual sill showing the full range of variations in appearance characteristics to be expected in completed work.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for marble: Obtain stone from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project Site in undamaged condition.

B. Store and handle stone and related materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or other causes.

1. Do not use pinch or wrecking bars.
2. Store stone on wood skids or pallets covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones.
3. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.
4. Store cementitious materials off the ground, under cover, and in dry location.

PART 2 - PRODUCTS

2.1 MARBLE

A. “White Cherokee” as manufactured by the Georgia Marble Dimension Stone, Polycor, Inc., or equal.

B. Physical Properties: per ASTM C503, latest edition:
   1. Absorption by weight, %…………………0.09
   2. Density, lb/cu.ft…………………………169
   3. Compressive strength, PSI………………9333
   4. Modulus of rupture, PSI…………………1364
   5. Abrasion resistance, hardness……………16.6
   6. Flexural strength, PSI……………………1296

2.2 DIMENSION STONE FABRICATION

A. General: Fabricate dimension stonework in sizes and shapes required to comply with requirements indicated, including details on Drawings and final shop drawings.
   1. For marble comply with recommendations of Marble Institute of America, Inc. (MIA) as published in “Dimensional Stone - Design Manual III.”

B. Cut stones to produce pieces of thickness, size, and shape indicated to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.

C. Finish exposed faces and edges of stones to comply with requirements indicated for finish under each type and application of stone required and to match approved samples and field-constructed mock-ups.

D. Carefully inspect finished stones at fabrication plant for compliance with requirements relative to qualities of appearance, material, and fabrication; replace defective stones with ones that do comply.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine surfaces to receive marble, and conditions under which marble will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.
B. All materials used in installation of marble shall be installed in accordance with the manufacturer’s requirements.

C. Installation shall be in accordance with the Drawings, reviewed shop drawings, and manufacturers recommendations.

D. After completion of work, surfaces shall be cleaned to remove dirt, stains, or other defacements. Under no circumstances shall wire brushes, harsh abrasive cleansers or acid be used to clean marble.

3.2 PROTECTION

A. Protect and maintain conditions to ensure stonework is not damaged at time of Substantial Completion.

END OF SECTION 04 40 14
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ITEM 04 81 00
UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units (CMUs).
   2. Mortar and grout.
   3. Reinforcing steel.
   4. Masonry joint reinforcement.
   5. Ties and anchors.
   6. Embedded flashing.
   7. Miscellaneous masonry accessories.

B. Related Sections include the following:
   1. Division 7 Section "Bituminous Damp-proofing" for damp-proofing applied to cavity face of backup wythes of cavity walls.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
   3. Division 7 Section "Through-Penetration Fire-stop Systems" for fire-stopping at openings in masonry walls.
   4. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistive joint systems at heads of masonry walls.
   5. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products furnished, but not installed, under this Section include the following:
   1. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast-in-Place Concrete."
   2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."

D. Allowances: The following are included under the allowances indicated as specified in Division 1 Section "Allowances."
   1. [Pre-construction] [source quality-control] [and] [field quality-control] testing under Testing and Inspecting Allowance.
1.3  DEFINITIONS
A.  Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4  PERFORMANCE REQUIREMENTS
A.  Provide structural unit masonry that develops indicated net-area compressive strengths ($f_{m}^'$) at 28 days.
B.  Determine net-area compressive strength ($f_{m}^'$) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
C.  Determine net-area compressive strength ($f_{m}^'$) of masonry by testing masonry prisms according to ASTM C 1314.

1.5  SUBMITTALS
A.  Product Data: For each type of product indicated.
B.  Shop Drawings: For the following:
   1.  Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2.  Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
   3.  Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
   4.  Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
C.  Samples for Initial Selection: For the following:
   1.  Decorative concrete masonry units, in the form of small-scale units.
   2.  Face brick, in the form of straps of five or more bricks.
   3.  Colored mortar.
   4.  Weep holes/vents.
D.  List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1.  Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
E.  Qualification Data: For testing agency.
F.  Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
   1.  Masonry units.
a. Include material test reports substantiating compliance with requirements.
b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.

3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.

4. Grout mixes. Include description of type and proportions of ingredients.

5. Reinforcing bars.


7. Anchors, ties, and metal accessories.

G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.

2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Pre-construction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor’s expense.

1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67.

2. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.

3. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
4. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.
5. Prism Test: For each type of construction required, per ASTM C 1314.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.


PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 MASONRY UNITS, GENERAL
A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)
A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.

a. Products:
1) Addiment Incorporated; Block Plus W-10.
2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
3) Master Builders, Inc.; Rheopel.

C. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
2. Weight Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.4 MASONRY LINTELS

A. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
B. Hydrated Lime: ASTM C 207, Type S.
C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
D. Masonry Cement: ASTM C 91.

1. Products:
   b. Essroc, Italcementi Group; Brixment.
   c. Holcim (US) Inc.; Mortamix Masonry Cement.
   d. Lafarge North America Inc.; Lafarge Masonry Cement.
   e. Lehigh Cement Company; Lehigh Masonry Cement.

E. Mortar Cement: ASTM C 1329.

1. Products:
   a. Lafarge North America Inc.; Lafarge Mortar Cement

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Products:
   a. Addiment Incorporated; Mortar Tite.
   b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
   c. Master Builders, Inc.; Color Cure Mortar Admix

H. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

   1. Interior Walls: Hot-dip galvanized, carbon steel.
   2. Exterior Walls: Hot-dip galvanized, carbon steel.
   3. Wire Size for Side Rods: W1.7 or 0.148- diameter.
   4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
   5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
   6. Provide in lengths of not less than 10 feet with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA’s "Architectural Sheet Metal Manual and as follows:

   1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
   2. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, 10-oz./sq. ft. weight or 0.0135 inch thick for fully concealed flashing; 16-oz./sq. ft. weight or 0.0216 inch thick elsewhere.
   3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   4. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

      a. Products:
         1) Cheney Flashing Company; Cheney Flashing.
   5. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
6. Fabricate through-wall flashing with drip edge, unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.

7. Fabricate through-wall flashing with sealant stop, unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.

8. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.

9. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees.

10. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.

11. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

E. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:
   a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
   b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch thick coating of rubberized-asphalt adhesive.
   c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
   1) Color: See drawings.
   d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
   e. Products:
      1) Hyload, Inc.; Hyload Cloaked Flashing System.

2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.
   a. Products:
      1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

F. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.

1. Product: Subject to compliance with requirements, provide "Blok-Flash" by Advanced Building Products Inc.

G. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

H. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Products:
   a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
   c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
   d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
2.8 MASONRY-CELL INSULATION

A. Foamed-In-Place Masonry Insulation: Two component thermal insulation of noncombustible, Class A building material and "R" Value of 4.91/inch @ 32 degrees F mean (ASTM C-177), produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270 Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

D. Grout for Unit Masonry: Comply with ASTM C 476

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

2.10 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.
C. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, maximum.

2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet maximum.

3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

### 3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 MASONRY-CELL INSULATION

A. Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions. Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8” to 7/8” holes drilled into every vertical column of block cells every 8” on center, beginning at an approximate height of four feet from finished floor level. Repeat this procedure at an approximate height of ten feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 3/4 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS
A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
B. Form control joints in concrete masonry as follows:
   1. Install preformed control-joint gaskets designed to fit standard sash block.

3.9 LINTELS
A. Install steel lintels where indicated.
B. Provide concrete and masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY INSTALLATION
A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602
C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 96 inches.

3.11 FIELD QUALITY CONTROL
A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
   1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

E. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

F. Mortar Test (Property Specification): For each mix provided, per ASTM C 780 Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

H. Prism Test: For each type of construction provided, per ASTM C 1314 at 7 days and at 28 days.

3.12 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 81 00
ITEM 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Architecturally exposed structural steel.
3. Prefabricated building columns.

B. Related Sections include the following:

1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 5 Section "Steel Deck" for field installation of shear connectors.
3. Division 5 Section "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
4. Division 9 Section "High-Performance Coatings" for surface preparation and priming requirements.
5. Division 13 Section "Metal Building Systems" for structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple and double shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand LRFD loads indicated and comply with other information and restrictions indicated.

2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

B. Construction: Type 2, simple framing
1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.
   5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed and prepared by the qualified professional engineer responsible for their preparation.

C. Welding certificates.
D. Qualification Data: For Installer, fabricator, and testing agency.
E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   3. Shear stud connectors.
   4. Shop primers.
   5. Non-shrink grout.

F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CASE.
B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
E. Comply with applicable provisions of the following specifications and documents:
   1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
5. RCSC’s "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
   1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
   2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M or ASTM A 572/A 572M, Grade 50
B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M
C. Plate and Bar: ASTM A 36/A 36M
D. Corrosion-Resisting Structural Steel: ASTM A 588/A 588M, Grade 50
E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
   1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
C. Un-headed Anchor Rods: ASTM F 1554, Grade 55, weldable
4. Finish: Plain

D. Threaded Rods: ASTM A 193/A 193M

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer.
B. Galvanizing Repair Paint: SSPC-Paint 20

2.4 GROUT

A. Non-metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

   1. Camber structural-steel members where indicated.
   2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
   3. Mark and match-mark materials for field assembly.
   4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
   1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
   2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning"

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
   1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
   2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
   3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
      a. Grind butt welds flush.
      b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
   2. Surfaces to be field welded.
   3. Surfaces to receive sprayed fire-resistive materials.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.8 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
   1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges"
   1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of base plate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
E. Splice members only where indicated.
F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened.
B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.


2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.

   a. Grind butt welds flush.
   b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

   1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION 05 12 00
ITEM 05 44 00
COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Cold-formed steel trusses for roofs.

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings:
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
C. Delegated-Design Submittal: For cold-formed steel trusses.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For testing agency.
B. Welding certificates.
C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency or tests performed by a qualified testing agency.
   1. Steel sheet.
   2. Expansion anchors.
   4. Mechanical fasteners.
   5. Miscellaneous structural clips and accessories.
D. Field quality-control reports.
1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
B. Product Tests: Mill certificates or data from a qualified testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel trusses from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: Refer to Drawings.
2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

C. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: Design according to AISI S210.
2. Lateral Design: Design according to AISI S213.
3. Roof Trusses: Design according to AISI S214.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL’s "Fire Resistance Directory" or from the listings of another qualified testing agency.
2.2 COLD-FORMED STEEL TRUSS MATERIALS  

E. Steel Sheet: ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST50H  
2. Coating: G90 or equivalent

2.3 ROOF TRUSSES  

A. Roof Truss Members: Manufacturer's standard steel sections.

1. Connecting Flange Width: 1-5/8 inches minimum at top and bottom chords connecting to sheathing or other directly fastened construction.  
2. Minimum Base-Metal Thickness: 0.0329 inch  
3. Section Properties: Refer to drawings

2.4 ACCESSORIES  

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of same grade and coating weight used for truss members.  

B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.5 ANCHORS, CLIPS, AND FASTENERS  

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: Refer to drawings.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Fasteners: Fastener system of type suitable for application, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.
2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20

B. Shims: Load bearing, of high-density multi-monomer plastic, non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.7 FABRICATION

A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate trusses using jigs or templates.
2. Cut truss members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting cold-formed steel trusses for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.

1. Fasten cold-formed steel trusses by welding or mechanical fasteners.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.

C. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

D. Truss Spacing: 24 inches

E. Do not alter, cut, or remove framing members or connections of trusses.

F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

G. Erect trusses without damaging framing members or connections.

H. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

I. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Field and shop welds will be subject to testing and inspecting.

D. Prepare test and inspection reports.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 44 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rough hardware
2. Loose bearing and leveling plates
3. Shelf and relieving angles.
4. Steel tube reinforcement for low partitions.
5. Miscellaneous steel framing and supports.
6. Metal bollards.
7. Metal Ships Ladder.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous steel framing and supports.
2. Miscellaneous steel trim including steel angle corner guards.
3. Metal bollards.
4. Metal Ships Ladder.

C. Qualification Data: For professional engineer.
D. Welding certificates.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

F. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.


F. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 2.

D. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

E. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.


2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

2.6 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required
thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.7 SHELF AND RELIEVING ANGLES

A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o.c., unless otherwise indicated.

B. Galvanize shelf angles to be installed on exterior concrete framing.

C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 STEEL PIPE BOLLARD

A. Fabricate pipe bollards from Schedule 80 steel pipe. Fill bollards with concrete.

1. Cap bollards with 1/4-inch-thick, steel plate with domed top.

2. All shall be galvanized if exposed to weather.

2.9 CONCRETE FILL FOR BOLLARDS

A. Concrete Materials and Properties: Comply with requirements of Section 03 30 00, Cast-in-Place Concrete, for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.

2.10 METAL SHIPS' LADDERS

A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.

1. Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.

2. Fabricate ships' ladders, including railings from aluminum.

3. Fabricate treads from rolled-aluminum-alloy tread plate.

4. Comply with applicable railing requirements in Section 05 52 13 "Pipe and Tube Railings."

2.11 GROUT

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
B. Products: Subject to compliance with requirements, provide one of the following:

1. B-6 Construction Grout.
2. Sure-Grip High Performance Grout; Dayton Superior Corp.
3. Euco N-S Grout; Euclid Chemical Co.
4. Five Star Grout; Five Star Products, Inc.
5. Crystex; L & M Construction Chemicals, Inc.
6. Masterflow 928 and 713; Master Builders Technologies, Inc.
7. Sealight 588 Grout; W. R. Meadows, Inc.

2.12 FINISHES, GENERAL

A. Finish metal fabrications after assembly.
B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
C. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153, for galvanizing steel and iron hardware.
B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.14 SHOP PAINTING

A. Surface Preparation for Metal Fabrications (SSPC - SP 3): After inspection and before shipping, clean steel work to be painted.

1. Clean all steel installed in the interior of the building in accordance with SSPC - SP 3, Power Tool Cleaning.
2. Prior to power tool cleaning, remove visible oil, grease, soluble welding residue and salts in accordance with SSPC - SP 1, Solvent Cleaning.
3. After power tool cleaning and prior to shop painting, remove dirt, dust, and all similar contaminants from the surface.

B. Shop Prime Painting: Immediately after surface preparation, apply steel rust inhibited primer paint in accordance with manufacturer’s instructions and at rates as specified. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2. All exterior exposed steel shall be primed with the above specified primer in lieu of being galvanized.

C. Interior Galvanized Steel Galvanizing Repair Paint (if applicable): High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions operable partitions securely to, and rigidly brace from, building structure.

3.3 INSTALLING METAL BOLLARDS

A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Preassembled steel stairs with concrete-filled treads.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs.

1.4 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:
   1. Prefilled metal-pan-stair treads.
   2. Shop primer products.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
   3. Include plan at each level.

C. Delegated-Design Submittal: For stairs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer’s experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Welder’s Certificates: Signed by Contractor certifying that welders comply with requirements specified under the “Quality Assurance” Article.

E. Fabricator’s Qualifications: Demonstrate capability and experience. Include a list of completed projects with project name, addresses, names of architects and owners.


1. Letter to be signed and sealed by Registered Structural Engineer in the State of Florida.

1.6 QUALITY ASSURANCE

A. Fabricator’s Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel,"

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

C. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

1. See Concrete and Masonry Sections of these Specifications for installation of inserts and anchorage devices.

D. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.
1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
   a. Repair or replace damaged materials or structures as directed.

1.8 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal stairs must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating stairs without field measurements.

2. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabricate stair assembly to NAAMM - Metal Stairs Manual, Class Architectural.

B. Delegated Design: Engage a qualified professional engineer, to design stairs.

C. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
C. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

D. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

2.3 FASTENERS

A. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

B. Anchor Bolts: mechanically deposited or hot-dip, zinc-coated ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting."

C. Prefilled Concrete Treads:

1. Concrete Materials and Properties: Comply with requirements for Cast-in-Place Concrete for normal-weight, air-entrained, ready-mix concrete with minimum 28-day compressive strength of 3000 psi and maximum aggregate size of 1/2 inch unless otherwise indicated.

2. Galvanized Steel Welded-Wire Reinforcement: ASTM A 1064/A 10645M, steel, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated on Drawings.

3. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening welded-wire reinforcement in place.


2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs in shop to greatest extent possible.
   1. Disassemble units only as necessary for shipping and handling limitations.
   2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Weld exposed corners and seams continuously unless otherwise indicated.
   5. At exposed connections, finish exposed welds to comply with NOMMA’s “Voluntary Joint Finish Standards” for Finish #2 - Completely sanded joint with some undercutting and pinholes okay.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
   1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
   2. Locate joints where least conspicuous.
   3. Fabricate joints that will be exposed to weather in a manner to exclude water.
   4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Commercial Class, unless more stringent requirements are indicated.

B. Stair Framing:
   1. Fabricate stringers of steel plates or steel channels as indicated on Drawings.
      a. Stringer Size: As required to comply with "Performance Requirements" Article.
b. Provide closures for exposed ends of channel and rectangular tube stringers.
c. Finish: Shop primed.

2. Construct platforms of steel plate or channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
   a. Finish: Shop primed.

3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
   1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
   2. Galvanized Steel Sheet: Uncoated, cold-rolled steel sheet unless otherwise indicated.
   3. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
   4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
   5. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
   6. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.7 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.


   a. Clean bottom surface of plates.
   b. Set plates for structural members on wedges, shims, or setting nuts.
   c. Tighten anchor bolts after supported members have been positioned and plumbed.
   d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.

   1) Neatly finish exposed surfaces; protect grout and allow to cure.
   2) Comply with manufacturer’s written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

3. Comply with requirements for welding in "Fabrication, General" Article.
F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

3.3 REPAIR

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 05 51 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes the following:
   1. Aluminum pipe and tube railings.

1.3 SUBMITTALS
A. Product Data: For the following:
   1. Manufacturer's product lines railings.
   2. Grout, anchoring cement, and paint products.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
C. Samples: For each type of exposed finish required.
   1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
   2. Fittings and brackets.
   3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
      a. Show method of welding and finishing members at intersections.
D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.
1.4 QUALITY ASSURANCE

A. Contractor’s Qualifications: Employ only experienced Contractors (Installers) skilled in the successful installation of the specified materials and assemblies on similar projects for not less than five (5) years.

B. Manufacturer’s Qualifications: Employ only manufacturers with not less than five (5) years of successful experience making the specified materials as a current catalog and regular production item.

C. Welding Standards: Comply with applicable provisions of AWS D1.2 "Structural Welding Code--Aluminum".
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

D. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of stair work. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.
   1. See Concrete and Masonry Sections of these Specifications for installation of inserts and anchorage devices.

E. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for field welded re-assembly and coordinated installation. Bolted connections are no allowed, except to structure.

F. Single Source Responsibility: Unless otherwise indicated, provide handrails through a single source and from one manufacturer for each indicated type of unit Specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store and handle units in strict accordance with manufacturer’s written recommendations.

B. Shop Assembly: As much as possible, assemble handrail units in shop and ship to job site when construction schedule and conditions are ready for immediate installation.
   1. Handrails shall not be stored at the job site.

1.6 WARRANTY

A. Warranty: Material and workmanship including finish.
   1. One (1) year warranty.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, to design railings, including attachment to building construction.

B. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

1. Top Rail: Design to be capable of withstanding the following loads:
   a. Concentrated load of 300 pounds applied at any point nonconcurrently, vertically downward, or horizontally.
   b. Uniform load of 100 pounds per lineal feet applied nonconcurrently, vertically downward, or horizontally.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails: Design to be capable of withstanding the following loads:
   a. Concentrated load of 200 pounds applied at any point nonconcurrently, vertically downward, or horizontally.
   b. Uniform load of 50 pounds per lineal foot applied nonconcurrently, vertically downward, or horizontally.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Handrail System: Capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot at any point in the system including panels, intermediate rail balusters, or other elements composing the infill area.
   a. Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guardrails.

C. General: Handrails and railings shall conform with applicable requirements of the following:

1. Accessibility Requirements Manual from the Florida Department of Community Affairs, Florida Board of Building Codes and Standards.
2.2 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide brackets of type indicated; provide type with concealed fasteners.

2.3 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.


D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.


2.4 FASTENERS

A. Brackets shall have concealed fasteners.

B. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

C. Masonry Anchorage Devices: Expansion shields, FS FF--325.

D. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.

E. Concrete Anchor Bolts: Hexagon head "Kwik Bolt" by Hilti Fastening System.

F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. All connections in handrails shall be welded.

B. Assemble handrails in the shop and ship to the jobsite when construction conditions allow immediate installation. Do not store handrails at the jobsite.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
   5. Use of Bondo type fillers or putty is prohibited.

F. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

G. Form changes in direction by bending.

H. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
I. Close exposed ends of railing members with prefabricated end fittings.

J. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

L. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

2.7 ALUMINUM FINISHES


PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with predrilled hole for concealed bolt anchorage.
2. For concrete and solid masonry anchorage, use drilled-in expansion shield and concealed hanger bolt.

B. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

3.2 ANCHORING POSTS
   A. Use cast aluminum pipe sleeves preset and anchored into concrete for installing exterior railing. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
   B. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.3 ATTACHING RAILINGS
   A. Attach railings to wall with wall brackets and concealed fasteners. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
   B. Secure wall brackets and railing end flanges to building construction as indicated.

3.4 PROTECTION AND CLEANING
   A. Protect finishes of railings from damage during construction with manufacture's protective covering.
   B. Clean aluminum surfaces in accordance with manufacturer's instructions and recommendations. Remove dirt, grime, and other contaminates completely.

END OF SECTION 05 52 13
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work of this Section includes the following:

1. Wood grounds, nailers, and blocking.
2. Plywood backing panels.

1.3 REFERENCES

A. Lumber Standard: Comply with PS-20 and with applicable rules of the respective grading and inspecting agencies for species and products indicated.

B. Plywood Product Standards: Comply with PS 1 (ANSI A199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard PRP-108 for type of panel indicated.

1.4 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.5 SUBMITTALS

1.6 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Design Submittals:

1. Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.


3. Chain-of-Custody Qualification Data: For manufacturer and vendor.

4. Product Data: For installation adhesives, indicating VOC content.

5. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.7 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
4. Post-installed anchors.

1.8 QUALITY ASSURANCE

A. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to Architect’s satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the Work.

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
1.9 PROJECT CONDITIONS

A. Installer must examine the substrates and supporting structure and the conditions under which the Carpentry Work is to be installed; and notify the Architect in writing of conditions detrimental to the Work.

1. Do not proceed with the installation until unsatisfactory conditions have been corrected.

B. Coordination: Fit carpentry Work to other work; scribe and cope as required for accurate fit.

1. Correlate location of nailers, blocking, grounds, and similar supports to allow proper attachment of other work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
2. Keep treated wood waste separated from other wood to be recycled or reused as mulch. Discard in a legal manner.

1.11 LEED REQUIREMENTS

A. Work performed and materials provided under this Section shall comply with Division 01 Section 01 80 15 “Sustainable Design Requirements.”

1.12 WARRANTY

A. A two-year minimum warranty is required on all building components. Warranties shall begin at date of Substantial completion.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Regional Materials: Dimension lumber, except treated materials, shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

B. Certified Wood: Lumber and plywood shall be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004.
C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

D. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

E. All wood that is installed in contact with concrete shall be back painted prior to installation.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.4 WOOD GROUNDS, NAILERS, AND BLOCKING

A. Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

E. Unless otherwise indicated, wood grounds, nailers, and blocking shall be pressure treated except as work of roof construction.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. All fasteners for use with pressure treated and treated wood shall be AISI Type 304, stainless steel.


E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

1. Separate materials in accordance with Waste Management Plan as Specified in Section 01 74 19.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

E. Use screws, unless otherwise indicated. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

F. Use IPBC treated products at interior locations and ACO or CDDC treated products at exterior locations.

3.2 WOOD GROUNDS, NAILERS, AND BLOCKING

A. Install wood grounds, nailers, and blocking where shown and where required for screeding or attachment of other work.
1. Form to shapes as shown and cut as required for true line and level of work to be attached.
2. Coordinate locations of units with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.
   1. Build into masonry during installation of masonry work.
   2. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1 ½ inches wide and of thickness required to bring face of ground to exact thickness of finish material involved.
   1. Remove temporary grounds when no longer required.

END OF SECTION 06 10 53
PART 1 - GENERAL

1.1 SUMMARY
   A. Provide labor, materials and equipment necessary for the complete installation of standing and running trim and KV standards for adjustable shelving and the plastic laminate faced shelves as shown on Drawings.

1.2 SUBMITTALS
   A. Submit in accordance with Division 01 requirements.
   B. Product data for each type of factory-fabricated product and process specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
   C. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of material indicated.
   D. Samples for verification purposes of the following: 1. Lumber and panel products for non-factory-applied finish, 50 square inches for lumber and 8-1/2 inches by 11 inches for panels for each species and cut, finished on one side and one edge, with one-half of exposed surface finished. 2. Lumber and panel products with factory-applied finish, 50 square inches for lumber and 8-1/2 inches by 11 inches for panels for each finish system and color.

1.3 QUALITY ASSURANCE
   A. Installer Qualifications: Arrange for installation of finish carpentry by a firm that can demonstrate successful experience in installing finish carpentry items similar in type and quality to those required for this Project.
   B. Quality Standards: Except as otherwise shown or specified, comply with specified provisions of the Architectural Woodwork Institute (AWI) "Quality Standards."
   C. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain measurements and verify dimensions and any shop drawing details as required for accurate fit.
   D. Optimum Moisture Content: Kiln-dry woodwork to an average moisture content within the following ranges or as otherwise recommended by applicable Quality Standards for the regional climatic conditions involved.
1. Exterior woodwork - 9 to 12 percent
2. Interior woodwork - 6 to 11 percent.

E. Ensure all preservative is adequately fixed in wood. Reject lumber with surface residues of white salts. Provide wood that is kiln-dried after treatment or pre-finished with a sealer.

F. Dimensional Lumber: To be from a well-managed forest, certified by one or more of the following independent certification organizations accredited by the Forest Stewardship Council:

1. Scientific Certification Systems, Inc., Oakland, California
2. Smart Wood Certification Program, Rainforest Alliance, New York, New York

G. No products used within the interior of the building shall contain urea formaldehyde glue.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels. Provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

B. Do not deliver interior finish carpentry until environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified for installation areas.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Obtain and comply with finish carpentry manufacturer’s and installer’s coordinated advice for optimum temperature and humidity conditions for finish carpentry during its storage and installation.

B. Weather Conditions: Proceed with finish carpentry only when existing and forecasted weather conditions allow exterior finish carpentry to be installed in compliance with manufacturer’s recommendations and when substrate is completely dry.

C. Examination of Substrate and Conditions: The installer must examine the substrate and the conditions under which this Section is to be performed and notify the Contractor in writing of any unsatisfactory conditions. Do not proceed with Work under this Section until unsatisfactory conditions have been corrected.

D. Do not install woodwork until the required temperature and relative humidity have been stabilized in installation areas.
E. Maintain temperature and relative humidity as required for a tolerance of plus or minus one percent of the specified optimum moisture content until woodwork receives specified finishes. Maintain temperature and humidity conditions until acceptance of the Work by the Owner.

F. Protect installed woodwork from damage by other trades until Owner's acceptance of the Work. Advise Contractor of required protection procedures.

PART 2 - PRODUCTS

2.1 GRADING

A. Lumber Grades: Shall be as specified herein and shall conform to requirements of AWI Section 100 for species specified.

2.2 MATERIALS

A. Lumber Standards: Comply with PS 20 "American Softwood Lumber Standard" for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:

1. RIS - Redwood Inspection Service.
2. SPIB - Southern Pine Inspection Bureau.
3. WCLIB - West Coast Lumber Inspection Bureau.
4. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

2.3 INTERIOR STANDING AND RUNNING TRIM

A. Trim and Rails: For trim in form of boards and worked products, provide lumber complying with the following requirements.

1. Species: As indicated on the Drawings.
2. Finish Grade: Superior.
3. Texture: Surfaced (smooth).
2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
2. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153, latest edition.

B. Felt Underlayment: Asphalt-saturated organic felts, un-perforated, conforming to requirements of ASTM D 26, latest edition, Type 1, No. 15.

C. Adhesives: Comply with manufacturer's recommendations for adhesives.

D. Sealants: Comply with requirements of Division 07 Section "Joint Sealants" for materials required for sealing siding work.

2.5 FABRICATION

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry in relation to relative humidity conditions existing during time of fabrication and in installation areas. Provide finish carpentry with moisture content that is compatible with Project requirements.

B. Fabricate finish carpentry to dimensions, profiles and details indicated. Ease edges to radius indicated for the following:

1. Lumber less than 1 inch in nominal thickness: 1/16 inch.
2. Lumber 1 inch or more in nominal thickness: 1/8 inch.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
2. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153, latest edition.

B. Adhesives: Comply with manufacturer's recommendations for adhesives.

C. Sealants: Comply with requirements of Division 07 Section "Joint Sealants" for materials required for sealing siding work.

D. Shelf Brackets: Provide components as detailed on the Drawings and as follows:
1. Provide KV #185 double slot boltless brackets and #85 double slot standards.
2. Provide KV #106 shelf rests with #129 rubber cushions.

E. High Pressure Plastic Laminate:

1. Plastic laminate except backing or balancing sheets shall be high pressure laminate conforming to NEMA LD-1985.
2. Shall be Wilsonart "Design Group I" series or Architect approved equivalent; colors shall be selected by the Architect from the full line of standard colors.
3. Exposed Horizontal and Vertical Surfaces: Shall be nominal .050 inch thick minimum with textured finish and conforming to NEMA standards for GP50 horizontal grade.

F. Plastic Laminate Faced Shelving:

1. Plastic laminate as specified herein.
2. Plastic laminate for shelving shall be laminated to ¾” cabinet grade water resistant plywood. 3. All exposed surfaces shall be covered with high pressure plastic laminate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation for a minimum of 24 hours unless longer conditioning recommended by manufacturer.

3.3 INSTALLATION, GENERAL

A. Do not use finish carpentry materials that are unsound, warped, bowed, twisted, improperly treated or finished, not adequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 8 feet for plumb and level. Install adjoining finish carpentry with 1/16 inch maximum offset for flush installation and 1/8 inch maximum offset for reveal installation.
3. Coordinate finish carpentry with materials and systems that may be in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.

C. Finish in accordance with specified requirements.

D. Refer to Section 09 91 00 for final finishing of finish carpentry.

E. Install all items in strict accordance with the manufacturers written installation instructions.

3.4 STANDING AND RUNNING TRIM AND RAILS

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related standing and running trim and rails. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane back of casings to provide uniform thickness across joints if required.

1. Match color and grain pattern across joints.
2. Install trim after drywall joint finishing operations are completed.
3. Drill pilot holes in hardwood prior to nailing or fastening to prevent splitting. Fasten to prevent movement or warping. Countersink nail heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

A. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at time of Final Completion.

END OF SECTION 06 20 00
PART 1 - GENERAL

1.1 SUMMARY

A. Provide labor, materials and equipment necessary for the complete installation of millwork items as shown on Drawings. Delivery and installation shall be completed by the manufacturer or woodworking company. Items provided, but not limited to, are as follows:

1. Base and overhead cabinets.
2. Cabinetry hardware.

1.2 SUBMITTALS

A. Submit in accordance with Division 01 requirements.

B. The millwork and furniture manufacturer or woodworking company shall furnish shop drawings giving details, dimensions, and hardware, including methods of attachment and everything pertinent to the construction and installation of the millwork.

C. The manufacturer or woodworking company shall keep aware of the progress of the Project and shall make sure that shop drawings are furnished in adequate time so that the millwork and furniture covered thereby can be fabricated and delivered in accordance with the scheduled installation date.

D. The manufacturer or woodworking company shall be responsible for making field measurements and electrical receptacle and switch locations and computer hook-up to insure proper fit of millwork and furniture.

E. Submit certified letter verifying active member of AWI.

F. Submit warranty as specified herein.

1.3 JOB CONDITIONS

A. Manufacturer or woodworking company shall be responsible for quantities shown on equipment schedules and Drawings.

1.4 WARRANTY

A. The manufacturer or woodworking (millwork) company shall warrant the products from delamination, loose edges, defective or broken hardware, loose wood trim,
and horizontal or vertical members coming apart from each other for five (5) full years after date of substantial completion.

B. If problems occur, each affected item shall be repaired in field or replace the product at no cost to the Owner.

1.5 QUALITY ASSURANCE

A. Manufacturer or woodworking company shall be an active member of the Architectural Woodwork Institute and shall comply with the latest AWI Standards for millwork construction.

B. All millwork shall comply with the latest applicable AWI standards for types of commercial millwork construction.

PART 2 - PRODUCTS

2.1 CONSTRUCTION – GENERAL

A. Exposed exterior and interior surfaces shall be finished with high pressure plastic laminate, unless otherwise indicated on Drawings. Exterior surfaces shall be fused to core using a minimum average high pressure of 360 PSI and average 300 degrees F. temperature. Interior surfaces and edges receiving laminate shall be bonded to substrate using Lekweld Brand Contract Adhesive, or equal. Laminate must be bonded tight to substrate to ensure against delamination. The face and backing laminates and substrates should be conditioned in the same equipment for 48 hour before fabrication. Conditioning temperature should be 75 degrees F. at 45 percent relative humidity. There shall be no exposed seams in furniture or casework, except where end panels covered in laminate meet.

B. Machine parts for accurate fit and assemble with appropriate fastenings and adhesives to result in true, square, level and plumb units.

C. Verify dimensions of other trades which result in an interface with casework and furniture.

D. Provide removable, false backs or cut outs for access to heating, plumbing, or electrical items to be concealed by casework to furniture.

E. Scribe tops and back splashes to walls and other adjoining surfaces.

F. Provide fillers and trim strips where necessary.

G. There shall be a minimum scribe with cabinets at end walls unless shown otherwise.

H. Wood trim and in-lays shall be premium grade red oak.

I. 4 inch high bases on all millwork items shall be constructed of pressure treated wood and shall be separate from the base cabinet.
2.2 MATERIALS

A. High Pressure Plastic Laminate
   1. Exposed exterior vertical surfaces shall receive GP-28 grade high pressure plastic laminate.
   2. Vertical interior surfaces shall receive 80 gram minimum paper weight melamine

B. Basis of Design Product and Manufacturer; as indicated on the Finish Legend, subject to compliance with requirements other Manufactures offering products which may be incorporated into the work are but not limited to the following:
   1. Formica Corporation.
   3. Nevamar.

C. Edging Material:
   1. High impact PVC extrusion, with satin finish
   2. Door and Drawer Fronts: 3mm, machine profile to 1/8 inch radius
   3. Horizontal and Vertical Front Cabinet Members: 1mm thick
   4. Colors: Selected by Architect

D. Core Materials:
   1. Hardboard: ANSI A135.4, Class 1 tempered, smooth, 2 sides equal to "Duron" by U.S. Gypsum Company.
   2. Water and moisture resistant cabinet grade plywood shall be used in all millwork construction specified herein.
   3. Hardwood and Hardwood Plywood:
      a. Solid lumber or plywood concealed members; solid wood to be hardwood, kiln dried, select Poplar, Fir, or mill option lumber and plywood shall be Baltic Birch 7-ply, cabinet grade.

2.3 HARDWARE

A. Hinges
   1. Steel, institutional 5 knuckle with interlaying leaves, 270-degree swing, hospital tipped with non-removable pins fastened with 4 screws each leaf into faces. No edge fastening allowed.
   2. Thickness: 0.090 inch minimum
   3. Doors 48 inches and over shall have 3 hinges per leaf
   4. Finish: As selected by the Architect.

B. Pulls:
2. Style and Color: Transitional style in stainless steel
3. Size: 14-1/2" in. long with 1-15/16 in. projection by 1/2 in. wide
4. Accurately position on drawer and door fronts
5. Through fastened with machine screws

C. Drawer Glides: Accuride Box Drawer - Full extension, ball bearing, 100 pound load capacity. File Drawer - progressive action full extension, ball bearing with noise abatement feature, 150 pound load capacity equal to KV#8500.

D. Slides for Sliding Glass Doors: ANSI/BHMA A156.9, B07063; aluminum.

E.

F. Adjustable Shelf Clip: zinc flush mounted brackets made from cold rolled steel. Adjust labels at 1/2 inch spacing.

G. Door Cushions: Blum - door corners, opposite hinge side, to receive plastic round cushion.

H. Grommets: 2-1/2 inch diameter with removable cap. Color as selected by Architect.

I. Locks:
   1. Locks shall be provided on all drawers and doors where indicated on the Drawings.
   2. The locks shall be a diecast, surface mounted, disc tumbler with 2 keys per lock.
   3. Locks in each room or area shall be keyed alike unless indicated otherwise in itemized specification.
   4. Locks shall be masterkeyed alike.

J. Catches: Magnetic type, adjusted for maximum 5-pound pull. Attach with screws and slotted for adjustment.

K. Tempered Float Glass for Cabinet Doors: ASTM C1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick unless otherwise indicated.
   1. Unframed Glass Doors: Seam exposed edges seamed before tempering.

L. Tempered Float Glass for Cabinet Shelves: ASTM C1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.

M. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.

N. Hardware for the custom lockers shall utilize a battery powered integral key pad lock. All operation lockers shall be master keyed as a group. Hinges shall be 5 knuckle and all other hardware shall be as specified herein or as indicated on the Drawings.
2.4 CABINET CONSTRUCTION

A. Cabinet Base: 4-inch high, ¾ inch CDX pressure treated plywood. Provide additional center support for cabinets over 24 inches wide.

B. Base, Wall, and Tall Cabinet Boxes:
   1. Sides, bottom, and top: Constructed of glued and spline doweled 3/4 inch formaldehyde-free plywood providing balanced construction, surfaced with cabinet liner CL for semi-exposed and vertical grade laminate for exposed locations.
   2. Wall cabinet bottoms and tops: Constructed of glued and spline doweled one inch thick formaldehyde-free plywood, providing balanced construction surfaced with vertical grade laminate for exposed locations and cabinet liner CLS for semi-exposed locations.
   3. Back panel: Constructed of minimum 1/4 inch prefinished tempered hard board, surfaced with CLS for semi-exposed and vertical grade laminate for exposed locations, inset and glued into sides, bottom, and top.
   4. Exposed backs: Constructed of 3/4 inch formaldehyde-free plywood, surfaced with vertical grade laminate of balanced construction for semi-exposed locations, glued and spline doweled, and mechanically attached if required.
   5. Intermediate support rail: Minimum 3/4 inch formaldehyde-free plywood, surfaced with vertical grade laminate of balanced construction, glued and doweled into cabinet sides.
   6. Hanger rails: Two located at top and bottom of cabinet back, 3 on tall cabinets, locate at top, bottom, and center of 3/4 inch formaldehyde-free plywood.

C. Fixed and Adjustable Shelves and Dividers:
   1. One inch (formaldehyde-free plywood) shelves.
   2. Exposed Locations: Vertical grade plastic laminate both sides. Color to match cabinet exterior plastic laminate or as selected by Architect.
   3. Semi-exposed locations: VGS or CLS
   4. Front and back leading edges shall be edged with flat 1mm thick high impact PVC edging to match shelf color.
   5. Number of adjustable shelves provided, unless indicated otherwise on the Drawings or on the Schedule
      a. Low and tall cabinets
         1) 1 up to 24 inches
         2) 2 up to 36 inches
         3) 3 up to 60 inches
         4) 4 up to 72 inches
         5) 5 up to 84 inches
         6) 6 up to 96 inches
      b. Wall hung cabinets
         1) 0 up to 24 inches
         2) 1 up to 30 inches
3) 2 up to 36 inches
4) 3 up to 40 inches

6. Adjustable dividers: 1/4-inch minimum thickness, prefinished tempered hardboard or formaldehyde-free plywood, smooth both faces, retained by molded plastic support clip.

7. Fixed dividers: Constructed of 3/4 inch formaldehyde-free plywood, surfaced with vertical grade laminate, providing balanced construction; glued and spline doweled. PVC edged to match laminate or adjacent PVC edging.

8. Exposed open shelves will have 1” radius at all exposed corners.

D. Cabinet Doors

1. ¾ inch formaldehyde-free plywood.
2. High pressure plastic vertical grade laminate exterior and interior.
3. Doors 48 inches and less in length shall have 2 hinges per door; doors over 48 inches in length shall have 3 hinges per door.
4. Corners: Square with radiused edges, 3mm PVC edging.
5. Doors to be flush overlay design.

E. Drawers:

1. Manufacturers standard construction of minimum components listed below; or high density fiber board; glued and doweled or dovetail jointed; surfaced with vertical grade laminate of balanced construction. Bottoms constructed of minimum 1/4-inch tempered hardboard, surfaced to match drawer sides, inset and glued to four sides.
2. Drawer Bodies: 1/2-inch construction.
3. Drawer Face: Constructed of minimum 3/4-inch formaldehyde-free plywood, surfaced with VGS, screw attached to the drawer box.
   a. Corners: To match doors.
   b. Edging: To match doors.
   c. Plastic Laminate: To match doors.
4. File Drawers: File drawers shall be constructed in accordance with standard drawers specified above with the following: Include front-to-back and side-to-side hanger file capability with hanger channel for letter size files integral with file drawer sides and 3/16- inch by 1/2-inch removable steel channel to span side-to-side for legal size hanging files
5. Drawers and doors to be flush overlay design.

F. Sealants: Fully bed and seal splashes to tops and to other splashes with Dow Corning 786 Mildew Resistant Silicone Sealant.

G. Install glass to comply with applicable requirements in Section 08 80 00 "Glazing" and in GANA's "Glazing Manual."

1. For exposed glass edges, polish and grind smooth.
PART 3 - EXECUTION

3.1 DELIVERY

A. Items shall be shipped in trucks owned by manufacturer or woodworking company. Manufacturer will be responsible for loading and unloading truck.

B. Items shall be blanket wrapped. Manufacturer shall pack truck as to avoid shipping damage.

C. Items shall be inspected for shipping damage. Damage found should be immediately reported to the Architect and the manufacturer. If the damage cannot be repaired in field to meet the approval of the Architect, the item shall be returned to the manufacturer for immediate repair or replacement.

D. Remove packing materials from site.

3.2 INSTALLATION

A. Strictly follow shop drawings and installation instructions. Installation shall be by experienced carpenters, capable of the highest quality of workmanship.

B. Counter tops shall be installed flush against the wall. Provide clear sealant at the top and around ends of counter tops and back splashes where they meet wall surfaces.

C. Grommet holes not cut in the shop, or other openings for passage of wires or access of electrical, heating, plumbing devices, shall be neatly cut in the field. If exposed to sight, opening will require grommet or access plate as specified.

D. The installer of the millwork shall make use of filler sections, if required, and scribe panels to fit cabinet work to specific dimensions.

3.3 FIELD QUALITY CONTROL

A. Defective workmanship or damaged components shall be corrected, repaired, or replaced, as requested by Architect without further cost to the Owner.

3.4 ADJUSTMENT

A. Adjust door hinges and drawer slides after installation to provide proper operation and appearance.
3.5 CLEANING

A. Clean exterior and interior surfaces.

END OF SECTION 06 41 00
PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Cold-applied, emulsified-asphalt dampproofing.

1.2 SUBMITTALS
   A. Product Data: For each type of product.

1.3 FIELD CONDITIONS
   A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL
   A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING
   A. Basis-of-Design Product: Subject to compliance with requirements, provide W. R. Meadows, Inc; Sealmastic or a comparable product by one of the following:
      1. Euclid Chemical Company (The); an RPM company.
      2. Karnak Corporation.
   B. Trowel Coats: ASTM D 1227, Type II, Class 1.

2.3 AUXILIARY MATERIALS
   A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

1. Test for surface moisture according to ASTM D 4263.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
3.4 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 11 13
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bentonite waterproofing.

1.3 SUBMITTALS

A. Product Data: Include product specifications, installation instructions and recommendations of manufacturer, for each material and type of application required.

B. Shop Drawings: Show installation details for interface with other work.

C. Contractor Certificate: Submit written certification that installer has current Approved Applicator status with waterproofing material manufacturer.

D. Warranty: Submit a specimen of specified waterproofing warranty.

E. Test Report: Submit manufacturer’s test report on water samples taken at the site along with recommendations as a result of these tests.

F. Field quality-control reports.

G. Manufacturer Certificates: Signed by materials manufacturer certifying that waterproofing system complies with requirements specified.

H. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installing company shall have at least three years’ experience in work of the type indicated, who can comply with manufacturer's warranty requirements, and who is an Approved Applicator as determined by waterproofing system manufacturer.

B. Single-Source Responsibility: Obtain bentonite waterproofing system from one source of a single manufacturer. Obtain accessory products used in conjunction with bentonite waterproofing from sources acceptable to the bentonite waterproofing manufacturer.
C. Preinstallation Conference: Approximately 2 weeks prior to scheduled commencement of waterproofing installation, meet at Project site with Waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and around waterproofing that must precede, follow, or penetrate waterproofing (including Mechanical and Electrical Installers as applicable); Architect; Owner; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing bentonite waterproofing.

D. Water Samples: Obtain water samples from the site at approximate locations where waterproofing will be installed and have the waterproofing manufacturer test for acids, alkalis, brine, or other contaminants that may inhibit the performance of untreated bentonite. Comply with manufacturer's recommendations resulting from these tests.

E. Manufacturer Certificates: Signed by waterproofing system materials manufacturer certifying that the installation complies with requirements specified.
   1. Submit evidence of meeting performance requirements.
   2. Manufacturer shall attend pre-construction meetings, and shall conduct site visits during construction and after completion of construction (for that phase of work that directly applies to the specific product) before issuing a manufacturer warrantee certificate.

F. Bentonite installation is to be inspected and approved by the Owner's Authorized Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original unopened containers.

B. Store materials in a dry, well-ventilated space and in accordance with manufacturer's instructions and recommendations.

C. Remove and replace bentonite materials that have been prematurely exposed to moisture.

1.6 PROJECT CONDITIONS

A. General: Comply with manufacturer's recommendations regarding weather conditions before and during installation, condition of the substrate to receive waterproofing, and protection of the installed waterproofing system.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite waterproofing to be installed according to manufacturers' written instructions and warranty requirements.
   1. Do not apply waterproofing materials to surfaces where ice or frost is visible. Do not apply bentonite waterproofing materials in areas with standing water.
   2. Placing bentonite clay products in panel or composite form on damp surfaces is allowed if approved in writing by manufacturer.
1.7 WARRANTY

A. Manufacturer’s Warranty: Submit manufacturer’s Warranty in which manufacturer agrees to provide waterproofing system materials to repair or replace components of bentonite waterproofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Final Completion.

B. Installer’s Warranty: Submit installer’s Warranty in which installer agrees to provide all labor required to repair or replace components of bentonite waterproofing system that fail within specified warranty period.

1. Warranty Period: 5 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bentonite Waterproofing – Under Concrete Slabs and Foundations:

1. Product and Manufacturer – Basis of Design: Ultraseal SP; CETCO, Colloid Environmental Technologies Company.

B. Bentonite Waterproofing – Vertical Walls Below Grade:


2.2 ACCESSORIES

A. General: Provide accessories as recommended by manufacturer for a complete and waterproof system. Accessories include, but are not limited to, the following:

1. Bentonite Seal (Mastic): Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.


2. Termination Bar: Minimum 1-inch wide aluminum bar with pre-punched holes on 12-inch centering for fastening.

   a. Fasteners for Termination Bar: 300 Series stainless steel.

3. Seam Tape: Type recommended by the materials manufacturer for applications indicated.

4. Transition Tube: Granular bentonite clay (sodium bentonite), minimum 85 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a 20-mesh sieve.

   a. Product: Hydrobar Tubes; water-soluble plastic tubing filled with bentonite.
5. Mechanical Fasteners: Case hardened nails or hardened-steel powder-actuated fasteners. Provide 1/2-inch diameter or 1-inch diameter washers (dependant on manufacturer's requirements) under fastener heads.


7. Preformed Waterstop: Flexible strip of bentonite waterproofing compound in cartridge or coil form, designed specifically for vertical and horizontal joints in concrete construction.
   a. Product: Waterstop Rx.

8. Plastic Sheets: Polyethylene sheeting conforming to ASTM D 4397, thickness as recommended by waterproofing manufacturer to suit application, but not less than 15.0 mils.

9. Sealants: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer, manufacturer’s representative, and Owner’s Representative present, for compliance with requirements for substrate preparations affecting performance of bentonite waterproofing.

B. Verify that substrate is complete and that work that will penetrate waterproofing is complete and rigidly installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Provide photo documentation.

3.2 PREPARATION

A. General: Comply with manufacturer’s instructions and recommendations. Verify that substrate is complete and that all work that will penetrate waterproofing is complete and rigidly installed. Verify locations of waterproofing termination.

   1. Coordinate work in vicinity of waterproofing to assure proper conditions for installation of the waterproofing system and to prevent damage to the waterproofing after installation.

3.3 INSTALLATION

A. General: Install waterproofing and accessories according to manufacturer's instructions, standard details, and recommended practices.

   1. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts according to manufacturer's written instructions.
3.4 FIELD QUALITY CONTROL

A. Inspection: Arrange for manufacturer's representative and Owner's Representative to inspect during installation and completed waterproofing installation before covering with other construction and provide written report that installation complies with manufacturer's written instructions.

1. Remove and replace applications of bentonite waterproofing where inspection indicates that it does not comply with specified requirements.

2. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 07 17 00
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PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Miscellaneous stuffing insulation
2. Unfaced batt insulation
3. Sound attenuation blankets.
5. Rigid Insulation.

1.2 SUBMITTALS

A. Product Data: Each type of insulation product specified.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 QUALITY ASSURANCE

A. Insulation shall be legibly marked with the following data:

1. Its "R" value per inch and the mean test temperature
2. The manufacturer's name
3. The insulation type and its trade name
4. Water vapor transmission (perm inch average)
5. UL rating - flame spread, fuel contribution, smoke developed (ASTM E84 and D1692)

B. The "R" values indicated are for the insulation tested at 75 degrees F mean temperature. It shall be for the total thickness of the insulation and shall exclude surface resistance. Manufacturers shall certify that their insulation complies with these requirements.

C. Insulation delivered to the job without this identification or being less efficient than the insulation specified will be rejected.

D. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
E. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.


F. Toxicity/Hazardous Materials

1. Formaldehyde: Products containing urea-formaldehyde are not acceptable.
2. Chlorofluorocarbons (CFCs)/HCFCs: Products and equipment requiring or using CFCs or HCFCs during the manufacturing process are not acceptable.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS STUFFING INSULATION

A. Shall be inorganic (non-asbestos) mineral wool insulation without facing, for the purpose of filling and stuffing openings in walls around pipes, structural components, conduits, expansion joints to eliminate noise transfer and to insulate. Use to seal top of interior walls, between masonry and roof deck, or as otherwise indicated. Use at expansion joints as detailed or as otherwise indicated. Insulation shall have a flame spread rating of 15 or less, and a smoke development rating of 0; per ASTM E84. Miscellaneous stuffing insulation shall be formaldehyde-free. Approved manufacturers are as follows:

1. Thermafiber Corporation
2. Rock Wool Manufacturing Company
2.2 UNFACED BATT INSULATION

A. Unfaced preformed glass fiber batt insulation conforming to ASTM C665, Type I. Flame spread shall be 25, smoke developed 50 in accordance with ASTM E136. Unfaced batt insulation shall be formaldehyde-free. Approved manufacturers are as follows:

1. Basis of design Product and Manufacturer EcoBatt” by Knauf; subject to compliance with requirements other manufacturer offering products which may be incorporated into the work are but not limited to the following:
   a. Owens-Corning Fiberglas Corp.
   b. CertainTeed Corporation
   c. JohnsManville

2.3 SOUND ATTENUATION BLANKETS

A. Sound Attenuation Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool, with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

1. Basis of design Product and Manufacturer EcoBatt” by Knauf; subject to compliance with requirements other manufacturer offering products which may be incorporated into the work are but not limited to the following:
   a. Owens-Corning Fiberglas Corp.
   b. CertainTeed Corporation;
   c. JohnsManville.

2.4 SEMI-RIGID INSULATION

A. Glass-Fiber Board, Unfaced: ASTM C 612, Type IA; unfaced, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Johns Manville; a Berkshire Hathaway company; Fiberglass 703 or Johns Manville, IS300, 1-1/2-inch thick or a comparable product by one of the following:
   1. CertainTeed Corporation.
   2. Knauf Insulation.
   3. Owens Corning.

2.5 RIGID INSULATION

A. Polyisocyanurate Board, Foil Faced: ASTM C 1289, foil faced, Type I, Class 1 or 2.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Dow Chemical Company (The); THERMAX Heavy Duty Insulation or a comparable product by one of the following:
   b. Hunter Panels.
   c. Rmax, Inc.

2.6 INSULATION ACCESSORIES

   A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates

PART 3 - EXECUTION

3.1 EXAMINATION

   A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

   A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

   A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

   B. Install insulation that is undamaged, dry, and unsoiled

   C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

   D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

   E. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
3.4 MISCELLANEOUS STUFFING INSULATION

A. Where the Drawings call for interior walls to extend to deck or roof, openings in walls between rooms above the ceiling shall be sealed with mineral wool placed or stuffed in openings to eliminate noise transfer and air movement. Mineral wool insulation shall be provided at other building locations indicated or requiring minor fill to eliminate air movement.

B. All voids in the perimeter of the building shell shall be filled and closed with batt insulation or miscellaneous mineral wool stuffing insulation, whether or not indicated or shown. This includes behind all steel beams, wide flange beams, channels, CMU, miscellaneous framing, edge of roof deck to parapet walls, etc. If exposed to return air plenums or any type of plenum or ceiling space above lay-in and gypsum board ceilings, product shall be Class A rated and use mineral wool stuffing insulation. Coordinate with all trades.

3.5 BATT INSULATIONS

A. Install in areas as indicated. Install in strict accordance with the manufacturers written installation instructions. Install in all exterior wall voids, behind beams, and concealed locations in the exterior walls and roof areas of the building whether or not indicated. All gaps shall be filled with batt insulation.

B. Install thermal insulation as follows:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. Start from this furring channel with standard width insulation panel and continue in regular manner. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
4. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch (16-gage)-diameter tie wire and inserted through slot in web of member.

C. All voids in the perimeter of the building shell shall be filled and closed with batt insulation or miscellaneous mineral wool stuffing insulation, whether or not indicated or shown. This includes behind all steel beams, wide flange beams, channels, CMU, miscellaneous framing, etc.

3.6 SOUND ATTENUATION BLANKETS

A. Install in interior walls where indicated. Install with clips as recommended by the manufacturer. Install in strict accordance with the manufacturers written installation
instructions. Install from floor to full height of wall, or as otherwise indicated.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.8 GENERAL INSTALLATION PROVISIONS

A. Inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.


E. Recheck measurements and dimensions, before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

END OF SECTION 07 21 00
PART 1 - GENERAL

1.1 SUMMARY

A. Provide labor, materials, and equipment necessary for complete installation of HCFC FREE roof insulation for roofing of new buildings, as indicated on the Drawings and specified herein.

1.2 SUBMITTALS

A. Submit in accordance with Division 1 requirements.

B. Submit complete manufacturer shop drawings for roof insulation and for roof saddle system.

C. Submit complete product data for roof insulation boards and fasteners.

1. Roof insulation boards
2. Fasteners
3. Installation instructions for HCFC FREE Polyiso insulation board and fasteners
4. Product Data as per ASTM E2129-03 Standard Practice for Data Collection for Sustainability Assessment of Building Products

D. Insulation manufacturer’s certification that HCFC FREE Polyiso materials meet Zero ODP (Ozone Depletion Potential) and Zero GWP (Global Warming Potential) specification requirements.

1.3 QUALITY ASSURANCE

A. The insulation is to meet the physical properties of ASTM C 1289, latest edition, Type II; Class 1, Grade 3. The insulation shall provide a minimum Long Term Thermal Resistance (LTTR) value of 6.0 per inch @ 75 degrees F. 5.6 per inch shall be the basis for establishing thickness in inches required. The use of aged R-values based on the RIC-TIMA conditioning procedure 281-1 is not acceptable.

B. Hydrocarbon blowing agents: Third generation, using Zero Ozone Depletion (ODP) as in compliance with the US EPA requirements of January 1, 2003 requirement to eliminate production of HCFC 141b.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original packaging, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect from direct exposure to sunlight.

D. Do not install insulation which has become wet or damaged.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products of the following manufacturers will be considered for polyisocyanurate roof insulation providing they can furnish products equal to those specified and are approved by the membrane manufacturer, and does not restrict the terms of the roofing warranty.

1. Celotex, Tampa.
2. Dyplast Products.
3. Hunter Panels.
5. Rmax, Inc.

B. Nailable Base Roof Insulation (for performed metal roofing): Top layer of roof insulation at sloped roofs under the preformed metal roofing base bid shall be nailable base type roof insulation. Nailable base shall be minimum 7/16 inch thick, treated OSB board or exterior grade plywood. Nailable base shall be permanently laminated to polyisocyanurate roof insulation core. Bottom side of polyisocyanurate shall be fiber glass faced or manufacturer's standard. R value shall conform to 5.6 per inch requirements as specified herein. OSB sheathing shall conform to APA rated sheathing standard PRP 108, Exposure 1.

1. Products of the following manufacturers are acceptable:
   a. BPB, Tampa.
   b. Dyplast Products Co.
   c. Hunter Panels.
   d. Johns-Manville.
   e. Rmax, Inc.

2. Provide a minimum R-Value as indicated on the Drawings.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with insulation manufacturer's instructions and recommendations for the handling, installation, and bonding or anchorage or insulation to substrate.

B. Roof Insulation: Edges shall be ship-lapped or tongue and grooved to provide moderate contact but not deformed or placed in surface compression. Neatly cut and fit insulation around projections and vertical surfaces. Edges shall be mitered at ridges and elsewhere to prevent open joints or irregular surfaces. Stagger end joints in adjoining courses or base course. Stagger joints in succeeding layers with joints of layer below.

1. Secure insulation to deck using approved mechanical fasteners specifically designed and sized for attachment of specified insulation type to deck system shown. Fasten insulation over entire area of roofing at spacing as required by the Florida Building Code 6th Edition (2017). Fasteners penetrating metal deck shall be exposed not more than a maximum of ½ to ¾ inch beyond top flute of the deck.

3.2 COORDINATION

A. Installation of insulation shall be coordinated with other relative work preceding and subsequent to actual installation of insulation.

3.3 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.


E. Recheck measurements and dimensions, before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
END OF SECTION 07 22 00
PART 1 - GENERAL

1.1 SUMMARY

A. Exterior finish system for soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each component, trim, and accessory.

B. Shop Drawings:

1. Include plans, sections, details of components, details of penetrations and terminations, flashing details, joint locations and configurations, and connections and attachments to other work.

C. Samples for Initial Selection: For each type of finish-coat color and texture indicated.

1. Include similar Samples of exposed accessories involving color selection.

D. Samples for Verification: 12-inch-square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including.

1. Include exposed trim and accessory Samples to verify color selected.
2. Include a typical control joint filled with sealant of color selected, as specified in Section 07 92 00 "Joint Sealants."

E. Maintenance Data: For EIFS to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An installer certified in writing by manufacturer as qualified to install manufacturer’s system using trained workers.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1.5 FIELD CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 deg F for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.6 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace finish that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Bond integrity and weathertightness.
   b. Deterioration of finishes beyond normal weathering.

2. Warranty coverage includes:
   a. EIFS finish, including base and finish coats and reinforcing mesh.
   b. Accessories, including trim components and flashing.

3. Warranty Period: Five years from date of Substantial Completion.

B. Installer's Warranty: Warrant the system to be free from defects in workmanship for a period of five (5) years from the Date of Substantial Completion issued for the project or this portion of the project.

1. Warranty shall provide 100% labor and material to replace system shown to have defects in workmanship.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturer's standard formulation designed for indicated use; compatible with substrate and complying with one of the following:

B. Finish-Coat Materials: Manufacturer's standard acrylic-based coating complying with the following:
1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.

2.2 MANUFACTURER

A. Basis of design Product and Manufacturer; Sto F601, Sto Corp.

B. Other acceptable manufacturers that may be incorporated into the work are but not limited to the following:

1. Dryvit systems.
2. Other acceptable Manufacturers.

C. Application

1. Ground Coat for Soffit Applications (STO BTS Plus): A one-component, polymer modified, cementitous, high-build base coat with less than 33 percent portland cement content by weight.

2. Fabric for Soffit Applications: STO mesh, nominal 4.5 ounce per square yard, symmetrical, interlaced open weave glass fiber fabric made with minimum 25 percent by weight alkaline resistant coating for compatibility with Sto materials

3. Finish for soffit applications: STO exterior ready mixed coatings, as manufactured by STO Industries.

   a. Stolit 1.0, ready mixed, acrylic based coating. Abrasion resistant, vapor permeable, water based, flexible, and weather resistant to freeze/thaw cycles, wind driven rain and U.V. light.

   b. Color Selection: The lightness value of the exterior finish color to be applied over Dens-Glass Gold sheathing shall be 20 percent or greater, and the color fastness shall not be less than 7.

5. Textures: Match Architect's sample.

D. Water: Potable.

E. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784 and ASTM C 1063.

1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.

2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.

3. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.
2.3 MIXING

A. Comply with manufacturer’s requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by manufacturer. Mix materials in clean containers. Use materials within time period specified by manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Prepare and clean substrates to comply with manufacturer’s written instructions to obtain optimum bond between substrate and finish.

3.3 TRIM INSTALLATION

A. Trim: Apply trim accessories at perimeter, expansion joints, and elsewhere as indicated. Coordinate with installation of insulation.

1. Expansion Joint: Use where indicated on Drawings.
2. Casing Bead: Use at other locations.

3.4 BASE-COAT INSTALLATION

A. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.
3.5 FINISH-COAT INSTALLATION

A. Primer: Apply over dry base coat according to EIFS manufacturer’s written instructions.

B. Finish Coat: Apply over dry primed base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

1. Embed aggregate in finish coat according to manufacturer’s written instructions to produce a uniform applied-aggregate finish of color and texture matching approved sample.

3.6 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION 07 24 11
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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Weather barrier.

1.2 PERFORMANCE REQUIREMENTS

A. Performance Requirements:
   1. The weather barrier system shall be applied to the building envelope to control water and air leakage into and out of the conditioned space.
      a. The weather barrier system components include window and door flashing, weather barrier membrane system, and accessory materials for application to exterior building envelope substrates indicated
   2. Joints, penetrations and paths of water and air infiltration shall be made watertight and airtight.
   3. The system shall withstand positive and negative combined wind, stack and HVAC pressures on the building envelope without damage or displacement.
   4. The system shall be installed airtight and shall remain flexible allowing for the relative movement of building envelope components due to thermal and moisture variations.

1.3 SUBMITTALS

A. Product Data: For materials indicated; include manufacturer’s product data including weather barrier system materials and accessories, technical and test data, material descriptions and properties, installation instructions, and substrate preparation requirements.
   1. Include manufacturer’s written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Product Data: For coatings, indicating VOC content.
4. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For weather barrier system assemblies.
   1. Show locations and extent of barrier. Include details for substrate joints and cracks, counter flashing, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   2. Include details of interfaces with other materials that form part of barrier.

D. Qualification Data: For Installer.

E. Product Certificates: From barrier manufacturer, certifying compatibility of barrier and accessory materials with Project materials that connect to or that come in contact with the barrier.

F. Reports: Field quality control reports for the following.
   1. On-site testing.
   2. Observation of weather barrier installation.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain weather barrier materials and accessories from single source from single manufacturer.

B. Preinstallation Conference: Conduct conference at Project site.
   1. Review weather barrier requirements and installation, special details, mockups, and bond testing, barrier protection, and work scheduling that covers barriers.
   2. Contractor, Owner’s Authorized Representative, installing subcontractor, membrane system manufacturer's representative, and all subcontractors who have materials penetrating membrane system or finishes covering membrane system shall be present.
   3. Contractor shall notify Owner’s Authorized Representative at least seven days prior to time for conference.
   4. Contractor shall record minutes of meeting and distribute to attending parties.
   5. Agenda: As a minimum discuss:
      a. Surface preparation.
      b. Substrate condition and pretreatment.
      c. Minimum curing period.
      d. Special details and sheet flashing.
      e. Sequence of construction, responsibilities, and schedule for subsequent operations.
      f. Installation procedures.
      g. Inspection procedures.
      h. Protection and repair procedures.
      i. Review and approval of all glazing applications.
C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by weather barrier materials manufacturer.

D. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
   1. Build integrated mockups of exterior wall assembly incorporating backup wall construction, external cladding, window, door frame, penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of barriers, and sealing of gaps, terminations, and penetrations of barrier assembly.
      a. Mockup shall illustrate material interfaces and seals of weather barrier in accordance with manufacturer’s application instructions and recommendations.
      b. Coordinate construction of mockups to permit inspection of weather barrier before external cladding is installed.
      c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply barrier until mockups are approved.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Reports: Field quality control reports for the following.
   1. On-site testing.
   2. Observation of weather barrier installation.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from damage, weather, excessive temperatures and construction operations. Remove damaged material from site and dispose of in accordance with applicable regulations.

B. Protect weather barrier components from freezing and extreme heat.

C. Sequence deliveries to avoid delays, and to minimize on-site storage.

D. Remove and replace weather barrier materials that cannot be applied within their stated shelf life.

E. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS
A. Weather Conditions: Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used.
1. Apply at surface and ambient temperatures recommended by the manufacturer. Refer to manufacturer’s product data sheets for best practices.
2. Proceed with installation only when the substrate construction and preparation work are complete and in condition to receive the membrane system.

B. Exposure Limitations: Schedule work to ensure that weather barrier system is covered and protected from UV exposure within 180 days of installation. If weather barrier membrane system cannot be covered within 180 days after installation, apply temporary UV protection as recommended by membrane manufacturer.

1.7 WARRANTY:
A. Manufacturer’s Warranty Requirements: Submit manufacturer’s written warranty stating that installed weather barrier materials are watertight, free from defects in material and workmanship, and agreeing to replace defective materials and components.
1. Warranty period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Manufacturer’s standard formulation designed for indicated use; compatible with substrate and complying with one of the following:
1. Adhesives shall have a VOC content of 50 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health’s "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 WEATHER BARRIER SYSTEM
A. Products and Manufacturer – Basis of Design: Prosoco R-Guard Cat 5 Air & Water Resistive Barrier System; PROSOCO, Inc.
1. System Components:
   a. PROSOCO R-GUARD GypPrime
   b. PROSOCO R GUARD Stucco Prime
   c. PROSOCO R-GUARD Joint & Seam Filler
   d. PROSOCO R-GUARD FastFlash
   e. PROSOCO R-GUARD CAT-5
   f. PROSOCO R-GUARD AirDam sealant
2. Backer Rod: Compressible, closed cell rod stock as recommended by weather barrier system materials manufacturer for compatibility with AirDam sealant.
3. Weather Barrier Sealant: R-GUARD AirDam.
B. Other Acceptable Product and Manufacturer: Subject to compliance with requirements, the following may be used as a substitution for the Basis of Design specified:

1. Manufacturer: E.I du Pont de Nemours and Company
   a. System Description: DuPont Tyvek Fluid Applied WB
      1) Provide all materials and components for a complete weather barrier system.

2.3 ACCESSORY MATERIALS
A. General: Provide accessory materials recommended by weather barrier materials manufacturer to produce a complete weather barrier assembly. All accessory materials shall be compatible with primary weather barrier materials.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, areas, and conditions for compliance with installation requirements and other conditions affecting performance of the Work.
B. All surfaces shall be sound, clean and free of grease, dirt, excess mortar or other contaminants. Fill or bridge damaged surfaces, voids or gaps larger than one-half (1/2) inch with suitable material as required to comply with material manufacturer’s installation instructions and recommendations.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Verify that concrete has cured and aged for minimum time period recommended by barrier manufacturer.
   3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   4. Verify that masonry joints are flush and completely filled with mortar.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION
A. Clean, prepare, treat, and seal substrate according to manufacturer’s written instructions. Provide clean, dust-free, and dry substrate for barrier application.
B. Mask off adjoining surfaces not covered by barrier to prevent spillage and overspray affecting other construction.
C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another in accordance with weather barrier membrane materials manufacturer to provide continuous support for barrier materials.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to manufacturer's written instructions.

3.4 FLASHING AT WINDOWS, DOORS, OPENINGS AND PENETRATIONS:

A. Flashing: Apply flashing materials in accordance with manufacturer's application guideline illustrations.

3.5 WEATHER BARRIER COATING INSTALLATION

A. General: Apply weather barrier materials in accordance with manufacturer's application guideline illustrations. Apply coating within manufacturer's recommended application temperature ranges.

B. Inspect membrane before covering. Repair any punctures, translucent or damaged areas by applying additional material.

C. Correct deficiencies in or remove barrier that does not comply with requirements; repair substrates and reapply barrier components.

D. Primer: Apply Primer; do not allow Primer to dry. Limit application of Stucco Prime to surfaces that can be covered with stucco scratch coat while primer is still “transfer wet to touch.”

3.6 FLASHING TRANSITIONS

A. Apply joint and seam filler and liquid flashing membrane to waterproof transitions in rough opening and between dissimilar materials.

1. Fill any voids between the top of the flashing leg and the vertical wall with joint and seam filler. Tool to direct water from the vertical wall to the flashing.
2. Apply flashing material to the top edge of the flashing leg.
3. Apply products to create a monolithic “cap-flash” flashing membrane extending 2 inches up the vertical face of the structural wall and 1 inch over the flashing membrane.
4. Apply additional product as needed to achieve a void and pinhole free surface.
5. Allow flashing membrane to skin before installing other wall assembly, weather barrier components.

3.7 INSTALLATION OF SEALANT FOR WINDOWS AND DOORS

A. Sealant: Install sealant in continuous beads without air gaps or air pockets.
   1. Apply sealant to a clean, dry or damp surface
   2. Install sealant in continuous ribbons without gaps or air pockets, with complete wetting of the joint bond surfaces.
   3. Tool sealant immediately to ensure complete wetting of joint bond surface and to produce a smooth, concave joint profile flush with the edges of the adjacent surfaces. Where horizontal and vertical surfaces meet, tool sealant to create a slight cove so as to not trap moisture or debris.
   4. Do not allow sealant to overflow onto adjacent surfaces. Prevent staining of adjacent surfaces.
   5. Remove excess and misplaced sealant as work progresses. Clean the adjoining surfaces to remove misplaced sealant without damage to adjacent surfaces or finishes.

3.8 FIELD QUALITY CONTROL

A. On-Site Testing: The weather barrier material manufacturer’s authorized representative shall perform tests as required to confirm the weather barrier materials have been installed in accordance with material manufacturer’s instructions and written recommendations.

B. Observation of Weather Barrier Installation: The barrier material manufacturer’s authorized representative shall observe installation of materials. Observations includes, but are not limited to, the following:
   1. Site conditions for application temperature and dryness of substrates have been maintained.
   2. Substrate conditions for application have been maintained during materials installation.
   3. Continuity of weather barrier system has been achieved with no gaps or holes.
   4. Maximum exposure time of materials to UV deterioration has not been exceeded.
   5. Compatible materials have been used in all locations.
   6. Connections between assemblies have complied with weather barrier materials manufacturer’s requirements including surface preparation and continuity of seal.
   7. All penetrations have been sealed.

C. Material application will be considered defective if it does not pass on-site testing and site observations.
1. Apply additional barrier material, according to manufacturer’s written instructions, where testing and observation results indicate insufficient thickness.

2. Remove and replace deficient barrier components for retesting in accordance with manufacturer’s instructions and recommendations.

D. Repair damage to barriers caused by testing; follow manufacturer’s written instructions.

3.9 CLEANING AND PROTECTION

A. Protect weather barrier system from damage during application and remainder of construction period, according to manufacturer’s written instructions.

1. Protect weather barrier from exposure to UV light and harmful weather exposure as required by manufacturer.

2. Protect weather barrier from contact with incompatible materials and sealants not approved by weather barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 25 00
PART 1 - GENERAL

1.1 SUMMARY

A. Provide the Work required to provide and install the underslab vapor barrier and its accessories as indicated on the Drawings and as specified herein.

1.2 SUBMITTALS

A. Product data and general recommendations from materials manufacturer for types of underslab vapor barrier required.

B. Samples of underslab vapor barrier and auxiliary materials.

C. Submit pre-installation conference meeting minutes.

1.3 QUALITY ASSURANCE

A. Pre-installation Conference: Prior to installing vapor barrier and associated work, meet at Project site with the contractor. Review material selections and procedures to be followed in performing work. Notify Architect at least 48 hours before conducting meeting.

B. Definition: Vapor Barrier: A material or assembly of materials that resists water vapor transmission through it.

C. Vapor Barrier shall comply with:

1. ASTM E 1745, latest edition, “Water Vapor Barriers Used in Contact with Soil or Granular Fill under Concrete Slabs.”

2. ASTM E 1643, latest edition, “Installation of Water Vapor Barriers Used in Contact with Earth or Granular Fill Under Concrete Slabs.”

3. Federal Specification UU-B-790a Type 1, Grade A, Style 4.

1.4 PROJECT CONDITIONS

A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed and areas are free of standing or running water, ice, and frost.
PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: “Moistop Ultra 15 Underslab Vaper Barrier” as manufactured by Fortifiber Building Products Systems, Fernley, Nevada; www.fortifiber.com. Products of the following manufacturers are also acceptable provided compliance with requirements as specified herein:

1. Griffolyn Division of Reef Industries, Inc., Houston, Texas; www.reefindustries.com
2. Stego Industries, LLC, San Juan Capistrano, CA; www.stegoindustries.com

2.2 UNDERSLAB VAPOR BARRIER

A. Multi-layer composite polyethylene reinforced with fiberglass reinforcing.
B. Class A material in accordance with ASTM E 1745, latest edition.
C. Water Vapor Permeance: 0.02 perms (premium), ASTM F-1249/ASTM E-96.
D. Tensile Strength: 70 lbf/in.
E. Puncture Resistance: 3000 grams (premium) ASTM D-1709.
F. Thickness: 15 mil reinforced.

2.3 AUXILIARY MATERIALS

A. Joint Tape: Provide types of adhesive compound and tapes recommended by underslab vapor barrier manufacturer for seams in vapor barrier, and for projections through vapor barrier.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that all items that pass through the vapor barrier are properly and rigidly installed.
B. Substrate shall be free of projections and irregularities.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for handling and installing underslab vapor barrier materials.
B. Seal projections through vapor barrier and seal seams. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.

C. Overlap and seal all seams in strict accordance with the manufacturers written installation instructions.

3.3 PROTECTION

A. Protect completed vapor barrier during installation of the concrete slab on grade.

B. Repair and seal all punctures that may occur prior or during installation.

C. Vapor barrier shall be continuously sealed at all joints and projections.

END OF SECTION 07 26 10
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Preformed metal roofing and related Work as specified herein, and as required for a complete and watertight installation. Work under this Section includes, but is not limited to:

1. Metal roofing and fascia
2. Flashing, closures, and cap trim

1.3 SUBMITTALS

A. Shop Drawings: Show profile and gage of items, location and type of fasteners; location, gage, shape, and method of attachment of trim; and other details as may be required for a weather-tight installation.

1. Do not proceed with manufacture prior to review of shop drawings. Do not use Drawings prepared by Architect for shop or erection drawings.
2. Shop drawings shall show methods of erection, elevations, and plans of roof panels, sections, and details, anticipated loads, flashings, vents, sealants, interfaces with materials not supplied, and proposed identification of components parts and their finishes.
3. Shop Drawings shall bear the seal and signature of Structural Engineer registered in the State of Florida.
5. Submit laboratory test report showing roof assembly compliance with SSTD 12-99.

B. Submit current Florida Product Approval for metal roof panel system.

C. Submit 3 copies of proposed finish materials.

D. Submit pre-roofing conference meeting minutes.

E. Submit warranties as specified herein.
1.4 QUALITY ASSURANCE

A. Applicable standards:

3. ASTM A792: Specifications for steel sheet, aluminum-zinc alloy coated (galvanized) by the hot dip process, general requirements (galvalume).
4. ASTM E283: "Air Infiltration Test."
5. ASTM E331: "Water Penetration Test."

B. Manufacturer's qualifications: Manufacturer shall have a minimum of 15 years' experience in manufacturing panels of this nature, in a permanent, stationary, indoor production facility.

C. The installer shall have been actively installing the type of roofing system defined in these Specifications for a minimum of 5 years and be approved by the manufacturer of the system being installed.

D. Design: The preformed metal roof system shall be designed to sustain the specified loads in accordance with governing building codes in the county and state that this Project is located in. Components of the preformed metal roof system shall meet the design loads and applied in load combinations as specified in governing building codes, without exceeding the allowable working stresses.


E. When tested in accordance with ASTM E 1680 and ASTM E 1646, the panel assembly shall show no more than 0.01 cfm/ft² of air infiltration at 6.24 psf test pressure and no water leakage at 12 psf test pressure for 15 minutes with a volume spray of 5 gallons per hour.

F. Structural: Uniform load capacity shall be determined by testing in accord with the principles of ASTM E 1592 adapted to testing of formed sheet panels by clarifying specific sections of this standard as follows:

1. Roof test specimens shall be representative of the main body of the roof, free from influence of perimeter conditions. The setup shall be continuous over one or more supports and contain at least 5 panel widths.
2. No roof attachments are permitted at the sides other than the standard gable or rake condition. For uplift tests, at least one end seal shall be flexible and in no way restrain the crosswise distortion of panels. One end may simulate an eave condition if at least 12 feet away from the mid-roof clip under evaluation.
3. Roofing panels and accessories shall be production material of the same type and thickness proposed for use on the project.
4. Longitudinal seals or plastic film shall not span any crevice or cracks that may tend to separate under pressure (e.g. plastic films used to seal the chamber must be applied into the side seam of the panel so as to apply a uniform static pressure to the entire cross section of the panel).
5. Design capacity for conditions of gage, span or loading other than those tested may be determined by the interpolation of test results in accord with the AISI Cold Formed Steel Manual. Extrapolation outside the range of the tests is not acceptable.

G. Weather tightness: When tested in accord with the principles of NAAMM TM-1, the roof system without sealant in the ribs shall show no leakage when exposed to dynamic rain and wind velocity up to 70 mph for 5 minutes.

H. Thermal Cycle Test: An assembly consisting of clips, 3 or more panels in width, and spanning 3 or more supports with clips positively loaded to 10 pounds shall resist 100,000 thermal cycles and show no visible signs of wear from the exterior and erode no more than 25 percent of the panel of clip material from the underside (non-exposed surfaces).


1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver panels to job site properly packaged to provide against transportation damage.

B. Handling: Exercise extreme care in unloading, storing, and erecting panels to prevent banding, warping, twisting, and surface damage.

C. Storage: Store materials and accessories above ground on well skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up between panels.

1.6 JOB CONDITIONS

A. Pre-Roofing Conference

1. Prior to the installation of the roofing and associated work, meet at the project site with the installer, the installer of each component of associated work, the installers of deck or substrate construction to receive roofing work, the installers of other work in and around roofing that must follow the roofing work (including Mechanical Work), the Architect, and other representatives directly concerned with performance of the work, including (where applicable) insurers, test agencies, product manufacturers, governing authorities, and the Owner. Record (by Contractor) the discussions of the conference and the decisions and agreements (or disagreements) reached and furnish a copy of the record to each party attending. Review foreseeable methods and procedures related to the roofing work including, but not necessarily limited to, the following:
a. Review project requirements (Drawings, Specifications, and other Contract Documents).
b. Review required submittals, both completed and yet to be completed.
c. Review status of substrate work (not by the Metal Roofing Installer), including drying, structural loading limitations, and similar considerations.
d. Review required inspection, testing, certifying, and accounting procedures.
e. Review regulations concerning code compliance, environmental protection, health, safety, fire, and similar considerations.
f. Consider each party’s extant judgment, as advanced in the interest of successful completion of Work.

1.7 WARRANTY

A. The roofing contractor and construction manager each shall furnish a written guarantee covering the roofing and flashing work including the installation of products in the system, against defects in materials and workmanship for a period of 2 years. Guarantees are not intended to serve as protection against poor workmanship or inferior or improper materials at the time the roof is installed, but are for the purpose of protecting the Owner against future failures during the intended life of the roof covering.

B. The manufacturer for the preformed metal roofing shall also furnish to the Owner a written guarantee covering the finish of exposed coated metal surfaces against blistering, peeling, cracking, flaking, checking, chipping, rusting, and excessive chalking and color change for a period of 20 years.

1. Also provide a manufacturer’s 20 year weathertightness warranty equal to Industry Standard weathertightness warranty.

C. Guarantee/warranty shall include, but not be limited to, preformed metal roofing, fascias, roof insulations, flashings, cap flashings, closures and trims, fasteners, accessories, and sealants.

D. Guarantee/warranty period shall begin on the Date of Substantial Completion for the Project or such date that the roof is accepted by the Architect and Owner.

E. Repairs required, either permanent or temporary, to preformed metal roofing or roof flashings under this guarantee to keep the roof watertight shall be started within 3 days after notice of the need for repairs. Should the Contractor fail to make such repairs within a reasonable time period, the Owner may have such repairs made and charge the cost to the Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Preformed metal roofing shall be minimum 2 inches high, vertical leg field crimped, standing seam panels with concealed fasteners.
B. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required.

2. Fashion Inc.
3. MBCI, Inc.
4. Metal Sales Manufacturing Corp.

C. Finish to be factory applied Galvalume “Plus” coating over thoroughly cleaned and pretreated galvanized coated steel in single custom color as selected by the Architect. Coating to be applied before fabrication of roofing components.

D. Metal sheets or coils selected for forming into panels must be cut to size before receipt of finish coating or have cut edges specially coated with similar film of same applied finish after being sized. Actual finish and coating method intended for provision must appear on submitted shop drawings.

E. Panels must be shop fabricated. Field formed panels are not acceptable.

2.2 DESIGN OF SYSTEM

A. Panel shall be designed in accordance with sound engineering methods and practices and in accordance with the latest edition of AISI's "Specification for the Design of Cold Formed Steel Structural Members."

B. Roof structure shall be designed with proper recognition for the "floating system" which must exist to have a roof panel that meets expansion and contraction requirements.

C. Panel shall be designed so that damaged panels may be replaced without interfering with adjacent panels. Replacement shall not require the use of through the roof fasteners.

2.3 MATERIALS

A. Panels shall be fabricated in full lengths from ridge to eave without end laps. Panels shall be 16 inches wide maximum with concealed anchors that resist wind uplift yet permit expansion and contraction with temperature changes. Standing ribs 2 inches high minimum shall have a continuous groove capillary break. Ribs shall be securely locked over anchor clips with an electrically driven, field operated, roll forming tool. Individual panels shall be removable for replacement of damaged material. A minimum of two, 3/8-inch high intermediate stiffener ribs shall be located in the flat pan to minimize oil-canning and telegraphing of structural members, striated panels are also acceptable. Panels shall be Galvalume “Plus” prefinished 50 ksi steel per ASTM A792.

1. 24 gauge “Galvalume Plus” panels.
2. Galvalume sheet shall be produced in accordance with ASTM A792 with coating designation of AZ55.
4. Oil coating shall be kept at a minimum. Clean panels of all oil prior to shipment.
5. Use clean, dry gloves during handling and installation.
6. Care shall be exercised to prevent the roofing panels from sliding over each other during shipment and installation.

B. Clip angle "bearing plate" shall be a minimum of 18 gauge 36,000 psi G90 hot dip galvanized steel. The concealed backing plate shall have recessed pre-punched holes for deck attachment.

C. Concealed clips shall be not less than 24 gauge galvanized coated, 50,000 psi minimum yield or nonmagnetic stainless steel. Clip design is to be such that it will accommodate expansion and contraction requirements while being anchored securely to structure.

D. Concealed fasteners shall be self drilling, self tapping sheet metal screws of SAE #1022 steel with .0003 inch minimum zinc coating meeting Federal Specification QQ-Z325 Type II.

E. Exposed fasteners shall be self tapping, stainless steel sheet metal screws. Provide self drilling, self tapping screws where required by conditions.

F. Roofing panels shall be manufactured in continuous lengths to eliminate perpendicular panel end laps. End laps will not be allowed.

2.4 ROOF SYSTEM ACCESSORIES

A. Trim, and Flashings

1. Fascia, eave, and rakes shall be 22 gauge Galvalume “Plus” finish on all exposed sides and edges.

B. Sealant: The standard of quality shall be that of a reputable and established sealant manufacturer, approved by the manufacturer of the metal building in which the sealant is used. Sealants shall have good cohesion as well as good adhesion to the protective coated metal and shall not be corrosive to components on which it is applied. Each shall have adequate handling characteristics during normal ranges of construction or erection temperatures. The sealant shall be one that will retain its weather sealing properties under the conditions for which it is used and each (sealant) is recommended for only the applications listed hereafter.

1. Extrudable sealant, non-migratory, nondrying, and non-skinning synthetic elastomer base material conforming to the National Association of Architectural Metal Manufacturer's NAAMM Standard SS-1a-68, and except for the "tack free time", shall conform to the performance requirements of Federal Specification TTC-598-b Type 1. Use at the following locations:

   a. Factory applied sealant in longitudinal ribs of standing seam roof panels.
   b. Spot sealing laps (where applicable) of standing seam roof panels.
   c. Sealing ridge cover and miscellaneous flashing.
   d. Sealing curbs for roof accessories.
2. Extruded butyl material conforming to performance requirements of Military Specification #MIL-C-18969B Type II Class B. With the exception of the "compressor set" requirement, it shall also conform to the National Association of Architectural Metal Manufacturer's NAAMM Standard #SS-1b-68 Class A for nonskimming resilient preformed compounds. Size of tape shall be that recommended by the building manufacturer. Use at the following locations:

   a. Sealing swaged end laps of standing seam roof panels.

3. Extrudable sealant, nondrying (but skinning) and nonmigratory synthetic elastomer base material, conforming to the performance requirements of Federal Specification TT-C-598-b Type 1. Use at the following locations:

   a. Sealing ridge channels
   b. Sealing exposed seams, butts, and laps at roof curbs

C. Membrane Underlayment: Provide 40 mil minimum thickness product, by one of the following:

   1. "WinterGuard HT," CertainTeed Corp.
   2. "Grace Ultra," Grace Construction Products
   3. "TW Metal and Tile Underlayment," Tamko Roofing Products

PART 3 - EXECUTION

3.1 INSTALLATION

   A. Areas on which insulation and metal roofing is to be installed shall be completely secured and free of dirt and debris.

   B. Notify Architect in writing of defects in substrate that would be detrimental to metal roofing installation prior to start of Work.

   C. Start of insulation and metal roofing installation shall constitute acceptance of substrates by this Contractor.

   D. Membrane Underlayment: Install membrane underlayment over 100% percent of the roof area in accordance with the membrane manufacturer’s written installation instructions.

3.2 METAL ROOFING INSTALLATION

   A. Erection of the preformed metal roofing system shall be performed in accordance with the manufacturer's erection drawings.

   B. Set bearing plates on surface of insulation board at standing slip angle locations.
C. Install concealed clips on top of bearing plates with self drilling shoulder screws into metal roof deck below. Size and length of screws and bearing plates shall be as recommended by manufacturer.

D. Interlocking ribs shall be crimped together by an electric powered mechanical device in accordance with the roof manufacturer's instructions, immediately after securing in place.

E. Preformed metal roofing and fascia work shall be watertight and weathertight, lines and angles sharp and true, plain surfaces free from waves and buckles. Workmen shall be experienced in the trade and thoroughly capable of performing the Work in accordance with these requirements.

F. Fasteners are to be concealed wherever possible. Exposed fasteners shall be stainless steel painted to match.

G. Brake formed cap, trim, closure, and flashing sections are to be furnished with a minimum of joints.

1. Brake formed members with exposed corner intersections shall have corner pieces shop fabricated. Other miscellaneous trim corners may be field cut, mitered, or butted.

2. Trim shall be of the same material as, and have a finish to match, the metal roofing panels.

H. Install roof jacks at pipe penetrations in metal roofing and roof curbs at all roof mounted equipment indicated on the Drawings. Provide required fastened, foam rods, plastic cement, and other sealant or material to provide watertight and weathertight construction.

I. Install panels and accessories in strict accordance with the panel manufacturer's written instructions and the approved shop drawings. Use electrically driven " crimper tool " for closing seams wherever possible. Attach panels to framing members per the manufacturer's written instructions, providing fixed anchorage or allowing thermal movement where specified on shop drawings.

J. Use appropriate clips, fasteners, braces, and anchors as indicated on the Drawings and any other items required for a complete installation and as recommended by manufacturer.

K. Make repairs and perform additional work necessary to provide a roof watertight and acceptable to the Architect prior to start of roofing guarantee.

L. The installation shall be designed to safely resist the positive and negative loads.

M. Roof panels shall be able to support walking loads without excessive distortion or telegraphing of the structural supports. For the maximum span used on the project, panels shall withstand a 250 pound concentrated load applied to a 4 square inch pad located at the center of the panel flat without buckling of the rib or noticeable permanent distortion of the panel.
N. Roof panel and flashing attachments shall be designed to accommodate the thermal expansion and contraction of the exterior material through a total of 150 degrees F. temperature change.

O. Factors of safety on design loads to ultimate strength of fasteners shall be as stated in the industry standard for the material into which the fastener is driven.
   1. AISI for steel

P. Provide all items and accessories as required for a complete installation in every respect.

3.3 GENERAL INSTALLATION PROVISIONS

A. Comply with manufacturer’s installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

B. Inspect materials immediately upon delivery and again prior to installation. Reject damaged and defective items.


E. Recheck measurements and dimensions, before starting each installation.

END OF SECTION 07 41 13
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general and special provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section Includes:
      1. Wall Flashings.
      2. Formed steep-slope roof sheet metal fabrications.

1.3 COORDINATION
   A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
   B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.
      1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      2. Review special roof details, roof drainage and condition of other construction that affect sheet metal flashing and trim.
      3. Review requirements for insurance and certificates if applicable.
      4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
B. Shop Drawings: For sheet metal flashing and trim.
   1. Include plans, elevations, sections, and attachment details.
   2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
   3. Include identification of material, thickness, weight, and finish for each item and location in Project.
   4. Include details for forming, including profiles, shapes, seams, and dimensions.
   5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   6. Include details of termination points and assemblies.
   7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
   8. Include details of special conditions.
   9. Include details of connections to adjoining work.
   10. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.
   1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   2. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS
A. Qualification Data: For fabricator.
B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS
A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE
A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Coatings & Waterproofing Inc.
   b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
   c. Henry Company.

3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Elastomeric Sealant: Color matched Silicone refer to section 07 92 00 “Joint Sealants.”
2.5  FABRICATION, GENERAL

A.  General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1.  Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2.  Obtain field measurements for accurate fit before shop fabrication.
3.  Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4.  Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B.  Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C.  Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

D.  Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E.  Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F.  Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G.  Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

H.  Do not use graphite pencils to mark metal surfaces.

2.6  WALL SHEET METAL FABRICATIONS

A.  Opening Flashings: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:

1.  Aluminum: 0.032 inch thick.
2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters:
   1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
   2. Fabricate in minimum 96-inch-long sections.
   3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
   4. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
   5. Gutter Profile: As indicated, in accordance with cited sheet metal standard.
   7. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
      a. Aluminum: 0.032 inch thick.

B. Downspouts: Fabricate downspouts to shape and dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
   1. Fabricate from the following materials:
      a. Aluminum: 0.032 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Rivets: Rivet joints in aluminum where necessary for strength.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

3.5 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:
   1. Join sections with riveted and sealed with sealant.
   2. Provide for thermal expansion.
   3. Attach gutters at eave or fascia to firmly anchor them in position.
   4. Provide end closures and seal watertight with sealant.
   5. Slope to downspouts.
   6. Fasten gutter spacers to front and back of gutter.
   7. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
   8. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
   9. Anchor gutter with straps spaced not more than 24 inches apart to roof deck unless otherwise indicated, and loosely lock to front gutter bead.
   10. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts:
   1. Join sections with 1-1/2-inch telescoping joints.
   2. Provide hangers with fasteners designed to hold downspouts securely to walls.
   3. Locate hangers at top and bottom and at approximately 60 inches o.c.
   4. Provide elbows at base of downspout to direct water away from building.
   5. Connect downspouts to underground drainage system.
3.6  ERECTION TOLERANCES
A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7  CLEANING AND PROTECTION
A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer’s written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sealants for interior and exterior applications.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

E. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

F. Field Test Report Log: For each elastomeric sealant application. Include information specified in "Field Quality Control" Article.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

I. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Manufacturer's Representative: Manufacturer's representative shall certify the installation of sealant materials and shall attend pre-construction meetings, make site visits during construction and after completion of each phase of work that directly applies to the materials being installed before issuing a warrantee certification.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Build mockup of each type of sealant and backing installation; minimum length 8 feet.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

   1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 degrees F.
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Manufacturer’s Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: As specified beginning from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content: Sealants and sealant primers shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
4. Sealant shall comply with the testing and product requirements of the California Department of Public Health’s “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.” The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
2.2 PRODUCTS AND MANUFACTURERS

A. Products: Provide the following products for each application listed. Substitutions for exterior building joint sealants shall be listed on the Validated Products list published by the Sealant, Waterproofing, and Restoration Institute (SWRI).

   a. Product and Manufacturer:
      1) Dow Corning 790 Silicone Building Sealant; Dow Corning Corp.
   b. Warranty: Manufacturer's standard 20-year warranty.

2. Joint Sealant - One-Part: For masonry-to-aluminum, steel-to-aluminum, concrete-to-aluminum, steel-to-steel, and other metal-to-metal joints (including KYNAR coatings); one-part silicone sealant having a joint movement capability of plus-or-minus 50% elongation, and Shore A durometer hardness of 30.
   a. Product and Manufacturer:
      1) Dow Corning 795 Silicone Building Sealant; Dow Corning Corp.
   b. Warranty: Manufacturer's extended 20-year warranty.

3. Joint Sealant - Two-Part, Pourable Urethane Sealant: For horizontal joints, exterior and interior; provide joint sealant with a joint movement capability of plus-or-minus 25%.
   a. Products and Manufacturers: Provide one of the following.
      1) Vulkem 245; Tremco, Inc.
      2) NR200 Urexpan; Pecora Corp.
      3) Sikaflex 2c SL; Sika Corp.
      4) THC-900; Tremco, Inc.
   b. Warranty: Manufacturer's extended 5-year warranty.

4. Joint Sealant - Two-Part Urethane Non-Sag Sealant: For general interior use; provide joint sealant with a joint movement capability of plus-or-minus 50%.
   a. Products and Manufacturers: Provide one of the following.
      1) Vulkem 922; Tremco, Inc.
      2) Dynatrol II; Pecora Corp.
      3) Sikaflex 2c NS; Sika Corp.
      4) NP II; Sonneborne Building Products Division, ChemRex, Inc.
   b. Warranty: Manufacturer's extended 5-year warranty.
5. Joint Sealant - One-Part Latex Sealant: For interior use for horizontal and vertical joints around door frames, and joints between dissimilar materials.
   a. Products and Manufacturers: Provide one of the following.
      1) AC-20 + Silicone; Pecora Corp.
      2) Sherwin Williams; 850A
      3) Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
      4) Tremflex 834; Tremco, Inc.
   b. Warranty: Manufacturer's standard warranty.

   a. Products and Manufacturers: Provide one of the following.
      1) Dow Corning 786 Silicone Mildew Resistant Sealant; Dow Corning Corp.
      2) SCS1700 Sanitary; General Electric Co.
      3) Pecora 898 Silicone Mildew Resistant Silicone Sealant; Pecora Corp.
      4) Tremsil 200; Tremco, Inc.
   b. Warranty: Manufacturer's extended 3-year warranty.

7. Joint Sealant - Acoustic Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   a. Product and Manufacturer: Provide the following.
      1) Pecora Corporation; AC-20 FTR.
      2) USG Corporation; SHEETROCK Acoustical Sealant.

2.3 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.
2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Backer Rod (Joint Fillers, Compressible Filler): Type B, ASTM C 1330, preformed, cylindrical, flexible, compressible, resilient, non-staining, bi-cellular material, with a density of 24-48 km/m³ per ASTM D1622, tensile strength greater than 200 kPa per ASTM D 1623, and water absorption less than 0.1 g/cc per ASTM C 1016.

1. Product and Manufacturer - Basis of Design:
   a. Sof Rod; Nomaco, Inc., Zebulon, NC.

2. Other Acceptable Manufacturers: Manufacturers offering products having performance characteristics meeting or exceeding those specified may be incorporated into the Work.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Verify location and application of acoustical sealant and all other sealants indicated. Do not allow sealants to come into contact with incompatible materials. Prevent reaction to metals and other substances; protect all surfaces.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates, unless otherwise recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience.

   1. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

   1. Install sealants by proven techniques and at the same time backings are installed.
   2. Place sealants so they directly contact and fully wet joint substrates.
   3. Completely fill recesses provided for each joint configuration.
   4. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

B. Backing Materials: Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Bond-Breaker Tape: Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form
smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Perform field-test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants by hand-pull method described below:
   a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from crosscut end of 2-inch piece.
   b. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
   c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

4. Inspect tested joints and report on the following:
   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   b. Whether sealants filled joint cavities and are free from voids.
   c. Whether sealant dimensions and configurations comply with specified requirements.
5. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 07 92 00
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