**ERRATA SHEET**

**Prepared by:** Hanson Professional Services Inc.
**For:** Naples Municipal Airport – Water Management System Improvement and Taxiway “A” Extension
**FAA AIP No.** 3-12-0053-033-2012
**FDOT FM No.** 432848-1-94-01
**Hanson No.** 11A0142A

**THE FOLLOWING CHANGES ARE HEREBY MADE TO THE PROJECT SPECIFICATIONS**

<table>
<thead>
<tr>
<th>AC ITEM</th>
<th>CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART 1 (GENERAL PROVISIONS)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>SECTION 10 – DEFINITION OF TERMS</strong></td>
<td></td>
</tr>
<tr>
<td>Added various, regularly used definitions, renumbered the FAA standard:</td>
<td></td>
</tr>
<tr>
<td>10-03 <strong>ACI.</strong> The American Concrete Institute and its publications, latest edition, unless otherwise specified.</td>
<td></td>
</tr>
<tr>
<td>10-06 <strong>AISC.</strong> The American Institute of Steel Construction and its publications, latest edition unless otherwise specified.</td>
<td></td>
</tr>
<tr>
<td>10-09 <strong>APPROVED BY OWNER, ENGINEER, ARCHITECT, OR ARCHITECT / ENGINEER.</strong> Approval by the Owner, Engineer, Architect, or Architect/Engineer shall mean conditional or qualified permission to use material, equipment and methods, which comply with the intent of the Contract and will result in a completed project which is usable by the Owner for its intended purpose. This in no case releases the Contractor from responsibility to fulfill requirements of the Contract Documents.</td>
<td></td>
</tr>
<tr>
<td>10-12 <strong>AWS.</strong> The American Welding Society, its publications and certifications.</td>
<td></td>
</tr>
<tr>
<td>10-16 <strong>CERTIFICATE OF SUBSTANTIAL COMPLETION.</strong> The date of substantial completion of the project or specified part of the project is the date when construction is sufficiently completed, in accordance with the contract documents, so that the project or specified part of the project can be utilized for the purpose for which it was intended. After review of the project by the Engineer and the Engineer’s determination that the work is substantially complete in conformance with the contract documents, the Owner and the Engineer may issue to the Contractor a Certificate of Substantial Completion. The certificate will indicate the date on which the project was declared to be substantially complete and such date, at the discretion of the Owner, may be the date for stoppage of Contractor time charges. The certificate shall include a tentative list of work items to be completed or corrected prior to final acceptance and shall stipulate the time allowed to complete these items. The date of Substantial Completion is not the date upon which all guarantees and warranties begin. Guarantees and warranties begin on the date of final acceptance.</td>
<td></td>
</tr>
<tr>
<td>10-22 <strong>D.O.T. SPECIFICATIONS.</strong> Refers to State Department of Transportation Specifications in the state where project is constructed.</td>
<td></td>
</tr>
</tbody>
</table>
ENGINEERING SUPERVISION. Where the term “Engineering Supervision” is used in these specifications, it implies periodic construction observation, review of RPR reports, review of test data, and evaluation of Project progress and quality, on behalf and for the benefit of the Owner. Engineering Supervision does not include direction and control of construction work or create a duty of supervision by the Engineer for the Contractor.

MILITARY STANDARD. Military Standard (MIL-STD) specifications from the U.S. Army Corps of Engineers.

NOTICE OF AWARD. The written notice by the Owner to the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, Owner will sign and deliver the Agreement.

RESIDENT PROJECT REPRESENTATIVE (RPR). The authorized representative of the Engineer and/or Owner is assigned to the site or any part thereof to make all necessary observations and coordinate testing of the work performed or being performed, or of the materials furnished or being furnished by the Contractor. Where the term “Inspector” is used in these specifications it shall have the meaning and definition of Resident Project Representative.

SHOP DRAWINGS. All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the Contractor to illustrate some portion of the work and all illustrations, brochures, standard schedules, performance charges, instructions, diagrams and other information prepared by a Supplier and submitted by the Contractor to illustrate material or equipment for some portion of the work.

SUBCONTRACTOR. An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the work at the site.

SECTION 20 - PROPOSAL REQUIREMENTS AND CONDITIONS

PREQUALIFICATION OF BIDDERS. A new fourth paragraph has been added:

“The Contractor shall submit with his bid the qualifications for the Water Monitoring Station supervisory personnel described in P-650. This is a mandatory requirement for bidder qualification/pre-qualification that is additional to those described above, and shall be submitted even if the bidder is otherwise pre-qualified with FDOT.”

EXAMINATION OF PLANS, SPECIFICATION, AND SITE. A new second paragraph has been added:

“Prior to submitting a Proposal, each Bidder shall examine and thoroughly familiarize himself with all existing conditions, including all applicable laws, codes, ordinances, rules and regulations that affect his work.”

SECTION 30 - AWARD AND EXECUTION OF CONTRACT

REQUIREMENTS OF CONTRACT BONDS is modified to clarify project bonding requirements, beginning in the first paragraph: “... bidder shall furnish to the Owner separate performance and payment bonds and each bond shall be in a sum equal to the full amount of the
contract. Such bonds shall substantially conform to the statutory forms contained in Section 255.05, State of Florida Statutes, and shall conform thereto in all material respects.

The surety company shall be legally authorized to do business in the project State locales. In case of default on the Contractor’s part, collecting losses under the surety bonds, including both engineering and legal services shall lie against the surety bonds. After a 10-day period following notification of the bonding company, of default on the Contractor’s part, Contract Time shall resume and Liquidated Damages, if any, shall also lie against the surety bond.

The Contractor will be required to give a one-year guarantee covering workmanship, equipment and materials. The Contract Bonds shall remain in force for one year from the date of final acceptance of such equipment, materials and construction.”

30-08

FAILURE TO EXECUTE CONTRACT is modified to include non-delivery of insurance documents as just cause for cancellation of the award of contract.

SECTION 40 – SCOPE OF WORK

40-06

REMOVAL OF EXISTING STRUCTURES has been modified as follows: “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. Unless provided for in Item P-151, the cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.”

SECTION 50 - CONTROL OF WORK

50-01

AUTHORITY OF THE ENGINEER. A new second paragraph has been added:

“Specific components of the project including erosion and sedimentation control, pond dewatering, graded aggregate filter, and water monitoring stations include elements or are affected by conditions that require or may require Engineer direction to successfully complete. This authority to direct is outlined in the various technical specification sections where it is known or anticipated to be necessary. Project Safety remains under the Contractor’s control and direction during the period when the Engineer is directing those specific work elements.”

50-03

COORDINATION OF CONTRACT, PLANS, AND SPECIFICATIONS is modified in the fifth (5th) sentence to include that “...contract Special Provisions or Errata shall govern over contract Technical Specifications, contract General Provisions, plans, cited standards for materials or testing, and cited FAA Advisory Circulars;”

SECTION 60 - CONTROL OF MATERIALS

60-02

SAMPLES, TESTS, AND CITED SPECIFICATIONS. The language as changed below, is consistent with the contract provisions allowing acceptance based on supplied information from manufacturer’s and material suppliers. It also clarifies the difference between Quality Assurance for the Sponsor and Quality Control by the Contractor in this section, minimizing confusion and dispute over which tests are Sponsor and which are Contractor paid.
“Unless otherwise designated, all materials used in the work shall be accepted by the Engineer before incorporation in the work. Any work in which untested materials are used without acceptance 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. Quality assurance testing in accordance with the cited standard methods of ASTM, 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 second paragraph has also been modified as follows: “The Contractor shall employ a testing organization to perform all Contractor required tests. This includes the initial testing required to demonstrate compliance with the contract plans and specifications on documents such as shop drawings, mix designs and similar; and all Contractor Quality Control tests. . .”

An additional paragraph is added: “It is explicitly noted that inspection and testing of the work by representatives of the Owner is solely for the benefit of the Owner to determine the quality of materials and workmanship. While the Contractor may avail himself of the Owner’s testing/inspection data, any decisions made by the Contractor resultant to the Owner’s test/inspection information shall be made at the Contractor’s own risk. The Contractor shall have the right to conduct similar tests and inspections at his own expense to satisfy his need for information and data pertaining to materials and workmanship.”

SECTION 70 - LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

70-07 The following paragraphs are added to PUBLIC CONVENIENCE AND SAFETY:

“The Contractor is referred to the Special Provisions and the “Project Operational Safety Plan” for additional safety measures or precautions which will be required for the project.

Project Safety: The Contractor and his subcontractors shall comply with all Federal/State Occupational Safety and Health Act (OSHA) Standards and any other rules and regulations applicable to construction and/or maintenance activities in the State of Florida. The Contractor and his subcontractors shall also comply with Chapter 442, Florida Statutes (Toxic Substances in the Workplace), Florida CS/SB2626 “Trench Safety Act”, and any county or city or any other agency’s rules and regulations regarding safety.

The Owner or Engineer may, but is not required to, order that the work be stopped if a condition of immediate danger is found to exist. Nothing contained herein shall be construed to shift responsibility or risk of loss for injuries or damage sustained as a result of a violation of this specification from the Contractor or his subcontractors to the Owner or Engineer; and the Contractor and his subcontractors shall remain solely and exclusively responsible for compliance with all safety requirements and for the safety of all persons and property at the project site.

The parties hereto expressly agree that the obligation to comply with applicable safety provisions is a material provision of this contract and a duty of the Contractor and his subcontractors. The Owner reserves the right to require demonstration of compliance upon reasonable request. In the event the Contractor or his subcontractors is unable to demonstrate compliance with the safety provisions of the contract, the parties agree that such failure is deemed to be a material breach of this agreement; and the Contractor and his subcontractors agree that upon such breach, all work
pursuant to the Contract shall terminate until demonstration to the Owner that the safety provisions of this agreement have been complied with. In no event shall action or failure to act on the part of the Owner or Engineer be construed as a duty to enforce the safety provision of this agreement nor shall it be construed to create liability for the Owner or Engineer for any act or failure to act in respect to the safety provisions of this agreement.”

70-14 In the item CONTRACTOR RESPONSIBILITY FOR WORK the first paragraph is expanded by adding: “. . . government authorities. However, where onset of natural phenomena is publicly forecasted in advance (such as extreme rainfall, frost, or similar) the Contractor shall take every precaution to minimize or eliminate damage to the work. These provisions shall not negate nor waive the Contractor’s responsibility as imposed or stipulated in SECTION SP-30.0 CONTRACTORS INSURANCE of the SPECIAL PROVISIONS.”

SECTION 80 – PROSECUTION AND PROGRESS

80-02,03 These two items, NOTICE TO PROCEED and PROSECUTION AND PROGRESS stipulate a 24 hour Contractor advance notice period before construction operations begin and also, prior to resumption if work is discontinued. The notice period is increased to 72 hours to allow reasonable time to mobilize Engineer, RPR or other personnel, as well as for the coordination with the Owner on affected airport operations.

80-05 The item CHARACTER OF WORKERS, METHODS, AND EQUIPMENT is amended to meet FAA airport security requirements by adding to the second paragraph: “All Contractor and Subcontractor employees may be required to submit to security clearance prior to their employment for this project, as required by FAA.”

TECHNICAL SPECIFICATIONS (PART II THROUGH PART XI)

PART 2 – EARTHWORK

P-100 A section entitled ITEM P-100 MOBILIZATION is added to include, define and provide payment for preparatory contractor operations at the onset of the project work.

P-153 ITEM P-153 CONTROLLED LOW-STRENGTH MATERIAL (CLSM) under METHOD OF MEASUREMENT Paragraph 153-6.1 revised as follows:

153-6.1 Measurement. Controlled low strength material shall not be measured for separate payment, but shall be considered as incidental to the work of which it is a part. The locations where controlled low strength material shall be incorporated in the work shall be clearly shown on the Drawings be measured by the number of cubic yards (cubic meters) as computed from the neatline plan and section, adjusted for the quantities for any embedments, and as specified, completed, and accepted.

Under BASIS OF PAYMENT Paragraph 153-7.1 revised as follows:

153-7.1 Payment. Separate payment for controlled low strength material shall not be made as it shall be considered as incidental to the work of which it is a part. Accepted quantities of controlled low strength material shall be paid for at the contract unit price per cubic yard (cubic meter). Payment shall be full compensation for all materials, equipment, labor, and incidentals required to complete the work as specified.
P-154  

**ITEM P-154 SUBBASE COURSE** under **MATERIALS Paragraph 154-2.1** revised as follows:

**154-2.1 MATERIALS.** The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with *P 211 Lime Rock Material*, fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetable matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the requirements specified.

Add fourth paragraph to 154-2.1 as follows: The gradation of the prepared Subbase material shall be tested in accordance with ASTM C 136 a minimum frequency of once per each days placement. Testing in accordance with ASTM D 4318 for liquid limit and plasticity of the portion of material finer than the No. 40 sieve shall be performed a minimum frequency of once per each days placement. The Contractor shall provide a sufficient sample size for all required testing.

Under **CONSTRUCTION METHODS Paragraph 154-3.5.1 MIXED IN PLACE** revised as follows: When materials from different sources are to be proportioned and mixed or blended in place, the relative proportions of the components of the mixture shall be as determined by the Contractor, confirmed by testing specified herein, and approved designated by the Engineer.

Under **Paragraph 154-3.7 FINISHING AND COMPACTING:**

Paragraph 1 revised as follows: After spreading or mixing, the subbase material shall be thoroughly compacted by rolling and sprinkling, when necessary. Sufficient rollers shall be furnished to adequately handle the rate of placing and spreading of the subbase course. The finished Subbase shall have a minimum LBR of 20 (CBR = 16).

Paragraph 2 revised as follows: The field density of the compacted material shall be at least 100 percent of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D 1557. The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D 6938. The moisture content of the material at the start of compaction shall not be below nor more than 2 percentage points above the optimum moisture content. The prepared Subbase shall be tested for density and moisture acceptance at a frequency not less than once per each 1,000 Square Yards placement per layer, or fraction thereof.

Under **METHOD OF MEASUREMENT Paragraph 154-4.1** revised as follows:

**154-4.1** The yardage of subbase course to be paid for shall be the number of cubic square yards (cubic meters) of subbase course material placed, compacted, and accepted in the completed course. The quantity of subbase course material shall be measured in final position based upon depth tests or cores taken as directed by the Engineer, or at the rate of 1 depth test for each 500 sq yd (420 sq m) of subbase course, or by means of average end areas on the complete work computed from elevations to the nearest 0.01 ft (3 mm). On individual depth

Naples Municipal Airport   January, 2013
Water Management System Improvement and Taxiway “A” Extension   Errata-6
measurements, thicknesses more than 1/2 in (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 in (12 mm) in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities. Under BASIS OF PAYMENT Paragraph 154-4.1 revised as follows:

154-5.1 Payment shall be made at the contract unit price per cubic square yard (cubic meter) for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Pay items revised as follows:

Payment will be made under:

| Item P-154-1 | Stabilized Subbase (12” Thick) -- per Square Yard (SY) |
| Item P-154-2 | Stabilized Subbase (6” Thick Shoulders) -- per Square Yard (SY) |

Item P-154-5.1 Subbase Course per cubic yard (cubic meter)

P-156 Under ITEM P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL the following items are revised:

156-3.1 GENERAL. The second paragraph has been revised to read: The Engineer Contractor shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

Under METHOD OF MEASUREMENT the following new paragraphs are added:

156-4.3 “The erosion and sediment control measures shown on the plans are considered minimal steps; therefore, additional erosion and sediment control measures may be required due to Contractor’s sequence of work, method of construction, negligence, carelessness, or failure to install and properly maintain control devices. No measurement for payment will be made for this additional work”.

156-4.4 “Separate measurement for payment will be made for permanent sodding and topsoiling under their respective bid items. No measurement for payment will be made for temporary sodding, or temporary measure for erosion control purposes”.

P-161 ITEM P-161 GABIONS. A new specification item has been added for gabions.

P-162 ITEM P-162 GRADED AGGREGATE FILTER. A new specification item has been added for graded aggregate filter.

P-163 ITEM P-162 POND DEWATERING. A new specification item has been added for pond dewatering.
PART 3 – FLEXIBLE BASE COURSES

ITEM P-211 LIMEROCK BASE COURSE

Paragraph 211-2.1 MATERIALS – Under C. SUBMITTALS:

Added as No. 1: 1. Lime Rock Certification: Submit a Certification that the Lime Rock Material is from a Florida Department of Transportation Approved Source.

Added first sentence to No. 2, as follows: 2. Lime Rock Chemical Analysis: Submit a chemical analysis for the Lime Rock material.

Added text to the beginning of No. 3, as follows: 3. Lime Rock Material Properties: Submit an analysis of the lime rock liquid limit and plasticity index in accordance with ASTM D 4318. The Liquid Limit shall not exceed 35, and the plasticity index shall not exceed 6. Submit LBR test results (FM 5-515) showing moisture content/density/LBR relationships demonstrating that the lime rock material meets or exceeds a value of LBR 100 (CBR meets or exceeds a value of 80). The lime rock shall not contain more than 0.5% of roots, leaf mold, organic, or foreign matter and shall be obtained from pits from which all overburden has been removed previous to blasting and quarrying.

Added text to the beginning of No. 4, as follows: 4. Lime Rock Gradation Analysis:

Added as No. 5: 5. Demonstration Test Cores of the full-depth lime rock base course material shall be performed prior to full construction of the base course. The sample area may be the same as that for the asphalt test strip, but in no event less than 1,000 square yards, with a minimum of four (4) extraction cores. The test cores must remain a solid mass during extraction and not fall apart like a core of unstabilized crushed aggregate would. Should the test cores not perform as specified, the lime rock shall be rejected and the contractor shall replace the material with a conforming lime rock material at his expense. If the demonstration test cores are acceptable, the prepared test area may be incorporated into the work. If the source of lime rock material changes during the construction, new demonstration testing shall be performed for acceptance of the material.

Under CONSTRUCTION METHODS Paragraph 211-3.3 PREPARING UNDERLYING COURSE. A second paragraph has been added as follows: Grade control between the edges of the pavement shall be accomplished by grade stakes, steel pins, or forms placed in lanes parallel to the center line of the pavement and at intervals sufficiently close that string lines or check boards may be placed between the stakes, pins, or forms.

Paragraph 211-3.5 ROLLING. The second paragraph has been modified as follows: The field density of the compacted material shall be at least 100 percent of the maximum density of laboratory specimens prepared from samples of the base material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D 1557. The in-place field density shall be determined in accordance with ASTM D 1556, or by Nuclear Density Gage in accordance with the General Provisions. The moisture content of the material at the start of compaction shall not be below nor more than 1-1/2 percentage points above the optimum moisture content.
Paragraph 211-3.5 ROLLING. A third paragraph has been added as follows: Blading and rolling shall be done alternately as required or directed to obtain a smooth, even surface and shall be continued until the entire depth of base is compacted into a dense, unyielding mass. Re-rolling of the previous day's spread shall be done as directed. When the shoulder backfill material has been placed, the shoulder shall be thoroughly rolled and compacted.

211-3.6 FINISHING BASE COURSE. First paragraph has been modified as follows: After the watering and rolling of the base course, the entire surface shall be scarified to a depth of at least 3 in (75 mm) and shaped to the exact crown and cross section with a blade grader. The scarified material shall be rewatered and thoroughly rolled. Rolling shall continue until the base is bonded and compacted into a dense, unyielding mass, true to grade and cross section. During final compaction, blading and rolling shall continue alternately as required or directed until the base is bonded and compacted into a dense, unyielding mass, true to grade and cross section. The compaction operations for such areas shall be completed prior to making the density tests on the finished base course which shall be 100 percent of the maximum density as determined by ASTM D 1557. The scarifying and rolling of the surface of the base shall follow the initial rolling of the lime rock by not more than 4 days. When the lime rock base is constructed in two layers, the scarifying of the surface shall be to a depth of 2 in (50 mm).

Under METHOD OF MEASUREMENT Paragraph 211-4.1 has been modified as follows: The quantity of lime rock base course to be paid for shall be the number of cubic square yards (cubic meters) of base material placed at the thickness specified, bonded, and accepted in the completed base course. The quantity of base course material shall be measured in final position, based upon depth tests taken as directed by the Engineer, at the rate of 1 depth test for each 300 sq yd (250 sq m) of base course, or by means of average end areas on the complete work computed from elevations to the nearest 0.01 ft (3 mm). On individual depth measurements, thicknesses more than 1/2 in (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 in (12 mm) in computing the yardage for payment.

BASIS OF PAYMENT Paragraph 211-5.1 First paragraph has been modified as follows: Payment shall be made at the contract unit price per cubic yard (cubic meter) for lime rock base course of the designated thickness indicated in the plans and in the bid form. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Second paragraph has been deleted: The cost of removing cracks and checks including the labor and material for repriming, and the additional lime rock necessary for crack elimination, will not be paid for separately but shall be included in the contract price per cubic yard (cubic meter) for lime rock base course.

Third paragraph has been modified as follows:

Payment will be made under:

Item P-211-5.1 Lime rock base course per cubic yard (cubic meter)

Payment shall be made under:

P-211-1 Lime Rock Base Course (8") -- per square yard
PART 5 – FLEXIBLE SURFACE COURSES

**ITEM P-401SP PLANT MIX BITUMINOUS PAVEMENTS (SUPERPAVE™)**

Note: P-401SP is not an FAA standard spec; it is an Engineering Brief.

PART 7 – MISCELLANEOUS

**ITEM P-602 BITUMINOUS PRIME COAT, Paragraph 602-2.1, TABLE 1. BITUMINOUS MATERIAL** is revised as follows:

<table>
<thead>
<tr>
<th>Type and Grade</th>
<th>Specification</th>
<th>Application Temperatures$^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Deg. F</td>
</tr>
<tr>
<td><strong>Emulsified Asphalt</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS-1, SS-1h</td>
<td>ASTM D 977</td>
<td>70-160</td>
</tr>
<tr>
<td>MS-2, HFMS-1</td>
<td>ASTM D 977</td>
<td>70-160</td>
</tr>
<tr>
<td>CSS-1, CSS-1h</td>
<td>ASTM D 2397</td>
<td>70-160</td>
</tr>
<tr>
<td>CMS-2</td>
<td>ASTM D 2397</td>
<td>70-160</td>
</tr>
<tr>
<td><strong>Cutback Asphalt</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC-30</td>
<td>ASTM D 2028</td>
<td>80+</td>
</tr>
<tr>
<td>RC-70</td>
<td>ASTM D 2028</td>
<td>120+</td>
</tr>
<tr>
<td>RC-250</td>
<td>ASTM D 2028</td>
<td>165+</td>
</tr>
</tbody>
</table>

$^1$ The maximum temperature for cutback asphalt shall be that at which fogging occurs.

Under Paragraph 602-3.3 APPLICATION OF BITUMINOUS MATERIAL, the second paragraph is changed to read: The bituminous material including solvent shall be uniformly applied with a bituminous distributor at the rate of 0.25 to 0.50 gallons per square yard (1.20 to 2.40 liters per square meter) for cutback asphalt, and 0.1 to 0.3 gallons per square yard for emulsified asphalt, depending on the base course surface texture. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

Section 602-3.5 is deleted entirely: **FREIGHT AND WEIGH BILLS.** Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weigh bills when materials are received in any other manner, of the bituminous materials actually used in the construction covered by the contract. The Contractor shall not remove bituminous material from the tank car or storage tank until the initial outage and temperature measurements have been taken by the Engineer, nor shall the car or tank be released until the final outage has been taken by the Engineer.

Copies of freight bills and weigh bills shall be furnished to the Engineer during the progress of the work.

Under **METHOD OF MEASUREMENT 602-4.1,** first paragraph revised to read: The bituminous material for prime coat shall not be measured for payment, but shall be considered as incidental work to the asphalt pavement course of which it is a part, be measured by the [gallon (liter)] [ton (kg)]. Volume shall be corrected to the volume at 60°F (15°C) in accordance with ASTM D 1250 for cutback asphalt, and Table IV-3 of The Asphalt Institute’s Manual MS-6 for emulsified asphalt.
Under **BASIS OF PAYMENT 602-5.1**, paragraph revised to read: Separate payment for bituminous prime coat shall not be made as it shall be considered as incidental work to the asphalt pavement course of which it is a part. Payment shall be made at the contract unit price per [gallon (liter)] [ton (kg)] for bituminous prime coat. This price shall be full compensation for furnishing all materials and for all preparation, delivering, and applying the materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Under **BASIS OF PAYMENT 602-5.1**, second paragraph deleted:

Payment will be made under:

- **ITEM P-602-5.1** Bituminous Prime Coat per [gallon (liter)] [ton (kg)]

Under **ITEM P-603 BITUMINOUS TACK COAT “MATERIALS,”** replace paragraph 603-2.1 as follows:

**603-2.1 BITUMINOUS MATERIALS.** The bituminous material shall be either cutback asphalt, emulsified asphalt, or tar and shall conform to the requirements of Table 1. The type, grade, controlling specification, and application temperature of bituminous material to be used shall be specified by the Engineer.

**603-2.1 BITUMINOUS MATERIALS.** The Contractor shall use non-tracking type polymer-modified tack coat (NTSS-1hm or approved equal) on this project, in accordance with the manufacturer’s recommendations and specification section P-603. The tack coat shall be consistent with the P-401SP, SP76-22 polymer modified meeting the requirements of ASTM D6373.

Delete Table 1 Bituminous Material.

**603-3.3 APPLICATIONOF BITUMINOUS MATERIAL** add text to paragraph 3 as follows:

The bituminous material including vehicle or solvent shall be uniformly applied with a bituminous distributor at the rate of 0.05 to 0.15 gallons per square yard (0.24 to 0.72 liters per square meter) depending on the condition of the existing surface. The type of bituminous material and application rate shall be approved by the Engineer prior to application. A rate of 0.05 gallons per square yard shall be used for new asphalt surface course placed on top of new asphalt pavement. Tack coat shall also be applied to the vertical surfaces of saw-cut but joints and other miscellaneous structures where bonding of the new hot-mix asphalt is desired.

Add “breaking” to paragraph four as follows: Following the application, the surface shall be allowed to cure without being disturbed for such period of time as may be necessary to permit drying out, breaking, and setting of the tack coat. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the next course has been placed. Suitable precautions shall be taken by the Contractor to protect the surface against damage during this interval.

Delete paragraph **603-3.5 FREIGHT AND WEIGH BILLS** in its entirety.

Under **METHOD OF MEASUREMENT 603-4.1**, paragraph changed as follows: The bituminous material for tack coat shall not be measured for payment, but shall be considered as incidental work to the asphalt pavement course of which it is a part, be measured by the [gallon (liter)] [ton (kg)]. Volume shall be corrected to the volume at 60 °F (15 °C) in accordance with ASTM D 1250 for cutback asphalt, ASTM D 633 for tar, and Table IV 3 of
The Asphalt Institute’s Manual MS 6 for emulsified asphalt. Water added to emulsified asphalt will not be measured for payment.

Under **Basis of Payment 603.5-1**, paragraph 1 changed and paragraph 2 deleted as follows:

**Basis of Payment 603.5-1** Separate payment for bituminous tack coat shall not be made as it shall be considered as incidental work to the asphalt pavement course of which it is a part. Payment shall be made at the contract unit price per [gallon (liter)] [ton (kg)] of bituminous material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

**Item P-603-5.1** Bituminous Tack Coat per [gallon (liter)] [ton (kg)]

**P-605**

Under **Description**, Paragraph 605-1.1 changed as follows: This item shall consist of providing and installing a resilient and adhesive joint sealing filler capable of effectively sealing joints and cracks in pavements, and at the locations depicted on the Electrical Drawings.

Under **605-2.1 Joint Sealers**, second paragraph changed as follows: Each lot or batch of sealing compound shall be delivered to the jobsite in the manufacturer’s original sealed container. Each container shall be marked with the manufacturer’s name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer’s certification stating that the compound meets the requirements of this specification.

Under **Construction Methods**, Paragraph 605-3.1 Time of Application changed as follows: Joints and other areas as depicted on the Electrical Drawings shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be above 50 °F (10 °C) at the time of installation of the poured joint sealing material.

Under **605-3.2 Preparation of Joints** 605-3.2 changed as follows:

**a. Sawing** All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

**b. Sealing** Immediately before sealing, the joint concrete shall be thoroughly cleaned of all remaining laitance, curing compound, and other foreign material. Cleaning shall be accomplished by sandblasting. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 in from it. Upon completion of cleaning, the joints shall be blown out with compressed air free of oil and water. Only air compressors with operable oil and water traps shall be used to prepare the joints for sealing. The joint material faces shall be surface dry when the seal is applied.
Under **605-3.3 INSTALLATION OF SEALANTS** 605-3.3 changed as follows:

Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

**Hot Poured Sealants.** The joint sealant shall be applied uniformly solid from bottom to top and shall be filled without formation of entrapped air or voids. A backing material shall be placed as shown on the plans and shall be nonadhesive to the concrete or the sealant material. The heating kettle shall be an indirect heating type, constructed as a double boiler. A positive temperature control and mechanical agitation shall be provided. The sealant shall not be heated to more than 20 °F (−11 °C) below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer’s shipping container. A direct connecting pressure type extruding device with nozzles shaped for insertion into the joint shall be provided. Any sealant spilled on the surface of the pavement, structures and/or lighting fixtures, shall be removed immediately.

**Cold Applied Sealants.** Cold applied joint sealing compound shall be applied by means of pressure equipment that will force the sealing material to the bottom of the joint and completely fill the joint without spilling the material on the surface of the pavement. A backing material shall be placed as shown on the plans and shall be nonadhesive to the concrete or the sealant material. Sealant that does not bond to the concrete surface of the joint walls, contains voids, or fails to set to a tack-free condition will be rejected and replaced by the Contractor at no additional cost. Before sealing the joints, the Contractor shall demonstrate that the equipment and procedures for preparing, mixing, and placing the sealant will produce a satisfactory joint seal. This shall include the preparation of two small batches and the application of the resulting material. Any sealant spilled on the surface of the pavement, structures and/or lighting fixtures, shall be removed immediately.

Under **METHOD OF MEASUREMENT, Paragraph 605-4.1** changed as follows: Joint sealing material shall not be measured for payment, but shall be considered as incidental to the work of which it is a part be measured by the gallon (liter) [pound (kg)] [linear foot (meter) of sealant in place, completed, and accepted.

Under **BASIS OF PAYMENT, Paragraph 605-5.1** changed as follows: Separate payment for joint sealing material shall not be made as it shall be considered as incidental to the work of which it is a part. Payment for joint sealing material shall be made at the contract unit price per gallon (liter) [pound (kg)] [linear foot (meter). The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- **Item P-605-5.1** Joint Sealing Filler, per gallon (liter)
- **Item P-605-5.2** Joint Sealing Filler, per pound (kg)

**Section MATERIAL REQUIREMENTS** changed as follows:

ASTM D-1854  Jet-Fuel-Resistant Concrete Joint Sealer, Hot Applied Elastic Type
AC ITEM  CHANGE

ASTM D 3406  Joint Sealants, Hot- Applied, Elastomeric Type, for Portland Cement Concrete Pavements
ASTM D 3569  Joint Sealant, Hot- Applied, Elastomeric, Jet- Fuel- Resistant Type, for Portland Cement Concrete Pavements
ASTM D 3581  Joint Sealant, Hot- Applied, Jet- Fuel- Resistant Type, for Portland Cement Concrete and Tar- Concrete Pavements
ASTM D 5893  Standard Specifications for Cold- Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D 6690  Joint and Crack Sealants, Hot- Applied, for Concrete and Asphalt Pavements
FED SPEC SS- S- 200E(2) Sealants, Joint, Two- Component, Jet- Blast Resistant, Cold- Applied

P-606

Under **ITEM P-606 ADHESIVE COMPOUNDS, TWO- COMPONENT FOR SEALING WIRE AND LIGHTS IN PAVEMENT** Paragraph 606-1.1 has been changed as follows:

606-1.1. This specification covers two types of material; a liquid suitable for sealing electrical wire in saw cuts in pavement and for sealing light fixtures or bases in pavement, and a paste suitable for embedding light fixtures in the pavement. Both types of material are two- component filled formulas with the characteristics specified in paragraph 606-2.4. Materials supplied for use with bituminous concrete pavements must be formulated so they are compatible with the bituminous concrete. The P-606 material shall be used for setting ID markers in P-610 Structural Portland Cement Concrete, as depicted on the drawings.

Under **Table 1. Property Requirements**, the following rows have been deleted:

<table>
<thead>
<tr>
<th>Bituminous Concrete</th>
<th>500 psi (35 kg/sq cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bituminous Concrete</td>
<td>50%</td>
</tr>
<tr>
<td>Adhesion to asphalt concrete</td>
<td>No test available.</td>
</tr>
</tbody>
</table>

Paragraph 606-3.7 COMPATIBILITY WITH ASPHALT CONCRETE has been deleted.

Paragraph 606-3.8 ADHESIVE COMPOUNDS - CONTRACTOR'S RESPONSIBILITY has been changed as follows:

The Contractor shall furnish the vendor’s certified test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with P-610 Structural Portland Cement Concrete pavements. The report shall be delivered to the Engineer before permission is granted for use of the material. In addition the Contractor shall obtain a statement from the supplier or manufacturer that guarantees the material for one year. The supplier or manufacturer shall furnish evidence that the material has performed satisfactorily on other projects.
Paragraph 606-4.1 under METHOD OF MEASUREMENT has been changed as follows:

606-4.1 The adhesive compound shall not be measured for payment, but shall be considered incidental to the work of which it is a part. By the [pound (kg)] [gallon (l)] of adhesive as specified, in place, complete and accepted. When required in the installation of an in run-way lighting system or portion thereof, no measurement will be made for direct payment of adhesive, as the cost of furnishing and installing shall be considered as a subsidiary obligation in the completion of the installation.

Paragraph 606-5.1 under BASIS OF PAYMENT has been changed as follows:

606-5.1 Separate payment shall not be made, where applicable, at the contract unit price per [pound (kg)] [gallon (l)] for the adhesive as it shall be considered incidental to the work of which it is a part. This price shall be full compensation for furnishing all materials, and for all preparation, delivering, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Item P-606-5.1 Adhesive Compound—per [pound (kg)] [gallon (l)]

Under ITEM P-620 RUNWAY AND TAXIWAY PAINTING Paragraph 620-2.2 PAINT the first sentence is changed to read: Paint shall be waterborne, epoxy, methacrylate, solvent-base, or preformed thermoplastic in accordance with the requirements of paragraphs 620-2.2 a. and e.

Under Paragraph 620-2.2

a. Waterborne sentence changed to read: a. Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type I, Type II, or Type III.

b. Epoxy section deleted in its entirety.

c. Methacrylate section deleted in its entirety.

d. Solvent Base sentence deleted.

e. Preformed Thermoplastic Airport Pavement Markings

(1)(a) changed to read:
(a) The markings must be supplied with an integral, minimum 6-inch wide non-reflectorized black border.

(2)(a) changed to read:
(a) The material, excluding the non-reflectorized black border, must contain a minimum of thirty percent (30%) intermixed graded glass beads by weight. The intermixed beads shall conform to Federal Specification. TT-B-1325D, Type I, gradation A Federal Specification. TT-B-1325D, Type IV.

Under Paragraph 620-2.3 REFLECTIVE MEDIA section and table revised as follows:
620-2.3 REFLECTIVE MEDIA. Glass beads for reflective waterborne paint shall meet the requirements for Federal Specification, TT-B-1325D, Type III, Gradation A. Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

<table>
<thead>
<tr>
<th>Paint Color</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>White</td>
<td>See Table 1.</td>
<td>See Table 1.</td>
<td>See Table 1.</td>
</tr>
<tr>
<td>Yellow</td>
<td>See Table 1.</td>
<td>See Table 1.</td>
<td>See Table 1.</td>
</tr>
<tr>
<td>Red</td>
<td>See Table 1 and Note.</td>
<td>Not used.</td>
<td>See Table 1 and Note.</td>
</tr>
<tr>
<td>Pink</td>
<td>See Table 1 and Note.</td>
<td>Not used.</td>
<td>See Table 1 and Note.</td>
</tr>
<tr>
<td>Black</td>
<td>Not used.</td>
<td>Not used.</td>
<td>See Table 1 and Note.</td>
</tr>
</tbody>
</table>

Under Paragraph 620-3.1 WEATHER LIMITATIONS section changed to read:

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. Painting operations shall be discontinued when the surface temperature exceeds 92 degrees F (33 degrees C) or lesser temperature as recommended by the paint manufacturer. Markings shall not be applied when the pavement temperature is greater than 120 °F (49 °C).

Under Paragraph 620-3.2 EQUIPMENT second paragraph changed to read: 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, and within the limits for straightness set forth herein. Suitable adjustments shall be provided on the sprayer(s) of a single machine or by furnishing additional equipment for painting the width required.

Under Paragraph 620-3.3 last sentence added as follows: Existent markings or stripes to be removed on pavement to remain in place shall be removed by sand blasting, or other approved method, to the satisfaction of the Engineer.

Under Paragraph 620-3.4 LAYOUT OF MARKING section changed to read: The proposed markings shall be laid out in advance of the paint application. Control points shall be spaced at such intervals as will ensure accurate location of all markings. The locations of markings to receive glass beads shall be shown on the plans. All runway, taxiway, apron, and other airfield pavement markings, with the exception of black outline markings, shall receive the application of glass beads specified herein. All markings shall have a minimum 6-inch wide, non-reflective black outline marking, except the outer edge of edge stripes applied at the edge of pavement.

The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the paint.
Except for the runway centerline stripe, which shall be centered on the runway pavement, single stripes shall be applied wholly on one side of the longitudinal pavement joints. Double or multiple stripes shall be centered over similar joints.

Under **Paragraph 620-3.5 APPLICATION** paragraphs 3-6 added and Table 1 changed as follows: TT-P-1952E Water Base Paint, as Temporary Markings without reflective media, may be applied twenty-four (24) hours after placement of bituminous pavements or pavement rejuvenator products. However, the paint shall not bleed, curl, or discolor when applied to the bituminous surfaces. For Temporary Markings, the application rate of the specified paint shall be reduced to 50% of the rate shown in Table 1.

Subject to the overall scheduling requirements, the Contractor shall allow the maximum cure time of 24 to 30 days to elapse after paving to allow the asphalt to oxidize prior to applying the Permanent Markings. The required cure time shall be as determined by the Engineer.

Hand held sprayers are not permitted except for irregular shapes and small areas. If the paint is applied to small areas by brush, the surface shall receive two coats; the first coat shall be thoroughly dry before the second coat is applied.

All painting shall be performed to the satisfaction of the Engineer by competent and experienced equipment operators, laborers, and artisans in a neat and workmanlike manner.

### Table 1 Application Rates For Paint And Glass Beads  
(See Note regarding Red and Pink Paint)

<table>
<thead>
<tr>
<th>Paint Type</th>
<th>Paint Sq ft per gallon, ft²/gal. (Sq ms per liter, m²/l)</th>
<th>Glass Beads, Type I, Grading A Pounds per gallon of paint-lb./gal. (Km per liter of paint-kg/l)</th>
<th>Glass Beads, Type III Pounds per gallon of paint-lb./gal. (Km per liter of paint-kg/l)</th>
<th>Glass Beads, Type IV Pounds per gallon of paint-lb./gal. (Km per liter of paint-kg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterborne</td>
<td>115 ft²/gal. max (2.8 m²/l)</td>
<td>7 lb./gal. min (0.85 kg/l)</td>
<td>10 lb./gal. min (1.2 kg/l)</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: The glass bead application rate for Red and Pink paint shall be reduced by 2 lb./gal. (0.24 kg/l) for Type I and Type IV beads. Type III beads shall not be applied to Red or Pink paint.

Under **Paragraph 620-3.5 APPLICATION** a sentence was added to the end of the current last paragraph as follows: 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. The Contractor shall make an accurate accounting of the paint materials used in the accepted work to assist the Engineer in verifying the average rate of application, (Paint and Glass Beads).

Under **Paragraph 620-3.7 PROTECTION AND CLEANUP** a sentence was added as follows: 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 be directly responsible and shall erect or
place suitable warning signs, flags or barricades, protective screens, or coverings as required. 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.

Under **METHOD OF MEASUREMENT Paragraph 620-4.1** has been changed as follows: The quantity of runway and taxiway markings to be paid for shall be the number of square feet (square meters) of painting, and the number of pounds (kg) of reflective media and/or the number of square feet (square meters) of preformed markings (one complete item in place) performed in accordance with the specifications and accepted by the Engineer. No measurement shall be made for outline black paint placed under runway or taxiway paint for the Contractor’s convenience, and is no longer visible when complete. Glass beads shall not be measured for payment but shall be incidental to the reflective paint marking or preformed marking of which it is a part.

Under **BASIS OF PAYMENT Paragraph 620-5.1 and Pay Items** have been changed as follows: Payment shall be made at the respective contract price per square foot (square meter) for painted pavement markings for runway and taxiway painting, and price per pound (kg) for reflective media and price per square foot (square meter) for preformed thermoplastic markings. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item. No separate payment shall be made for outline black paint placed under runway or taxiway paint for the Contractor’s convenience that is no longer visible when complete. No separate payment shall be made for glass beads that shall be considered incidental to the marking of which it is a part.

Payment will be made under:

P-620-1 Temporary Painted Pavement Marking without Reflective Media --per Square Foot (SF)

P-620-2 Permanent Painted Pavement Marking without Reflective Media --per Square Foot (SF)

P-620-3 Permanent Painted Pavement Marking with Reflective Media --per Square Foot (SF)

P-620-4 Preformed Thermoplastic Pavement Marking --per Square Foot (SF)

Payment will be made under:

Item P-620-5.1-1 Runway and Taxiway Painting [per square foot (square meter)] [lump sum]

Item P-620-5.1-2 Reflective Media [per pound (km)] [lump sum]

Under **ITEM P-610 STRUCTURAL PORTLAND CEMENT CONCRETE**, make the following changes:
The second paragraph of **610-2.2 COARSE AGGREGATE** is modified to include the sentence, “Alternatively, the coarse aggregate may conform to the grading requirements of FDOT Specification Section 901, Table 1 for Size Number 357, 56 or 67.”

The second paragraph of **610-2.3 FINE AGGREGATE** is modified to include the sentence, “Alternatively, the fine aggregate grading may conform to the requirements of FDOT Specification Section 902-2.1.”

In Sections **P610-2.7 Premolded Joint Material** and **P610-2.8 Joint Filler** add the following “…or as shown in the Plans”.

Section **610-2.8 Joint Filler** is modified to read as follows, since item P-605 is not included in this project, and to require the use of low modulus silicon sealant materials.

**610-2.8 JOINT FILLER.** “The filler for joints shall require the use of low modulus silicon sealant materials meet the requirements of Item P-605, unless otherwise specified in the proposal or as shown in the Plans.

Joint sealing materials shall be low modulus silicone sealant materials conforming to Federal Specification TT-S-001543A Class A (one part silicone sealants) and TT-S-00230C Class A (one component sealants). In addition, the silicone sealant materials shall meet the requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 932 “Non-Metallic Accessory Materials for Concrete Pavement and Concrete Structures”, subparagraphs 932-1.3.1 General, 932-1.3.2 Physical Requirements, 932-1.3.3 Methods of Test, 932-1.3.6 Certification, 932-1.3.8 Shipment, and 932-1.4 Primer.

**(FDOT 932-1.3.1) General:** Low Modules Silicone sealant shall be furnished in a one part silicone formulation meeting the requirements specified herein. Manufacturers or distributors seeking approval of Low Modulus Silicone Sealants shall demonstrate the performance of their products in accordance with FM 5-533.

Acetic acid cure sealants are not acceptable. A primer as specified in 932-1.4 for bonding sealant to concrete shall be used if required by the manufacturer. When a manufacturer’s product is tested and approved by the Department using a primer, primer will be required for project installation.

Low modulus silicone sealants may be either a non-self-leveling or a self-leveling type, unless specified otherwise in the plans or Specifications.

Silicones shall be identified in the following manner:

**Type B** - A very low modulus, self-leveling silicone formulation, used in sealing horizontal joints (including joints on moderate slopes) in cement concrete pavements and bridges (i.e., concrete-concrete joints). Tooling is not normally required.
(FDOT 932-1.3.2) Physical Requirements:

<table>
<thead>
<tr>
<th>SILICONE SEALANT TYPE</th>
<th>Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (maximum)</td>
<td></td>
</tr>
<tr>
<td>Extrusion rate</td>
<td>0.224 – 1.45 lb/hr</td>
</tr>
<tr>
<td>Tack-free time</td>
<td>120 minutes, maximum</td>
</tr>
<tr>
<td></td>
<td>1.10 to 1.40</td>
</tr>
<tr>
<td>Durometer hardness, Shore A</td>
<td></td>
</tr>
<tr>
<td>(Cured seven days at 77 ± 3ºF and 50 ± 5% Relative Humidity)</td>
<td>40-80</td>
</tr>
<tr>
<td>Durometer hardness, Shore 00</td>
<td></td>
</tr>
<tr>
<td>(Cured 21 days at 77 ± 3ºF and 50 ± 5% Relative Humidity)</td>
<td></td>
</tr>
<tr>
<td>Tensile stress (maximum) at 150% elongation</td>
<td>40 psi</td>
</tr>
<tr>
<td>Elongation (Cured seven days at 77 ± 3ºF and 50 ± 5% Relative Humidity)</td>
<td></td>
</tr>
<tr>
<td>Elongation (Cured 21 days at 77 ± 3ºF and 50 ± 5% Relative Humidity)</td>
<td>800% minimum</td>
</tr>
<tr>
<td>Ozone and Ultraviolet Resistance</td>
<td>No chalking, cracking or bond loss after 5,000 hours, minimum</td>
</tr>
<tr>
<td>Bond to concrete mortar briquets (primed if required) (Cured seven days at 77 ± 3ºF and 50 ± 5% Relative Humidity)</td>
<td></td>
</tr>
<tr>
<td>Bond to concrete briquets (Cured 21 days at 77 ± 3ºF and 50 ± 5% Relative Humidity)</td>
<td>40 psi minimum</td>
</tr>
<tr>
<td>Movement Capability</td>
<td>No adhesive or cohesive failure and adhesion, 10 cycles at -50 to +100%</td>
</tr>
</tbody>
</table>

(FDOT 932-1.3.3) Methods of Test:

Flow.................................................................MIL S 8802
Extrusion Rate.............................................MIL S 8802
Tack Free Time.............................................MIL S 8802
Specific Gravity.............................................ASTM D 792, Method A
Durometer Hardness.......................................ASTM D 2240
Tensile Stress..............................................ASTM D 412 (Die C)
Elongation..................................................ASTM D 412 (Die C)
Ozone and Ultraviolet....................................ASTM C 793
Movement capability and adhesion..................ASTM C 719

Bond to mortar briquets: Portland Cement Mortar: Briquets shall be molded and cured 28 days minimum in accordance with AASHTO T 132. Cured briquets shall be dried at 230 ± 5ºF, sawed in half and bonded together with a thin section of sealant. After cure of sealant, briquets will be tested in accordance with AASHTO T 132.

(FDOT 932-1.3.6) Certification: The Contractor shall provide the Engineer certification conforming to the requirements of Section 6 “Control of Materials” of the Standard
Specifications for Road and Bridge Construction (2007 Edition) from the manufacturer, confirming that the low modulus silicone sealant meets the requirements of this Section.

(FDOT 932-1.3.8) Shipment: Sealant material shall be delivered in containers plainly marked with the manufacturer’s name or trademark, product name, LOT number, and date of expiration.

(FDOT 932-1.4) Primer: When required by the manufacturer’s product, a primer shall be used with the Low Modulus Silicone Sealant.

The manufacturer shall perform his quality control tests on each LOT of sealant primer material furnished to each project and furnish a certified report that each LOT of primer material furnished to a project meets his Company’s Specifications for that product and the primer is suitable for its intended use.

Sealant primer material shall be delivered in containers plainly marked with the manufacturer’s name or trademark and product name, LOT number and date of expiration.”

METHOD OF MEASUREMENT has been revised to read: “There shall be no separate measurement for payment for Item P-610 Portland Cement Concrete.”

Basis of Payment has been revised to read: “No separate payment for structural Portland cement concrete shall be made. The cost shall be included as incidental to the various structures that incorporate it.”

P-650 ITEM P-650 WATER MONITORING STATIONS. A new specification item has been added for water monitoring stations.

PART 9 – DRAINAGE

D-701 ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS. Under 701-3.1 EXCAVATION, add the following sentence to the first paragraph, “Dewatering, if required, shall be performed using a system acceptable to the Engineer and is considered incidental to excavation for pipe removal and replacement.”

Add the following sentence to the first paragraph of 701-3.4 JOINING PIPE, “All pipe or culvert joints shall be wrapped with geotextile fabrics as shown in the detail in the project plans”.

D-751 Under ITEM D-751 MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES, Paragraph 751-3.1.c. is modified to read, “The Contractor shall do all bracing, sheathing, sloping shoring and/or dewatering necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for compliance with the Florida “Trench Safety Act”. Dewatering costs are considered incidental to construction and no separate payment for such shall be made.”

Paragraph 751-3.1.d. is modified to include the removal of dewatering equipment and to indicate that the cost of removal of measures required by the “Trench Safety Act” is to be included in the unit price bid for compliance with the Act.
D-752 Under **ITEM D-752 CONCRETE CULVERTS, HEADWALLS AND MISCELLANEOUS DRAINAGE STRUCTURES**, delete Sections 752-4.1 through 4.3 under **METHOD OF MEASUREMENT** and insert the following:

“752-4.1: Mitered end sections shall be measured per each, of the various sizes, in-place, complete and accepted.”

Delete Section 752-5.1 under **BASIS OF PAYMENT** and insert the following: “752-5.1 Payment will be made at the contract unit price per each for mitered end sections of the various sizes.”

**PART 10 – TURFING**

T-904 Under **ITEM T-904 SODDING**, paragraph 904-2.1 SOD has been revised to indicate the composition of sod used and deletes the reference to special provisions.

T-905 Under **ITEM T-905 TOPSOILING**, paragraph 905-2.1 Topping, modify the last sentence of the first paragraph to reflect … “not less than 2% nor more than 80% of the material…”

T-908 Under **ITEM T-908 MULCHING**, paragraph 908-2.2 Inspection, first sentence is revised to indicate 15 days, rather than 5 days after acceptance of the bid for materials notification.

**PART 11 – LIGHTING INSTALLATION**

L-100 A section entitled **ITEM L-100 GENERAL PROVISIONS AND REQUIREMENTS FOR ELECTRICAL WORK** is added as this is not covered under the FAA Standard Specifications.

L-104 A section entitled **ITEM L-104 GENERAL ELECTRICAL SAFETY REQUIREMENTS AND TEMPORARY AIRFIELD LIGHTING** is added as this is not covered under the FAA Standard Specifications.

L-105 A section entitled **ITEM L-105 ALTERATIONS, REMOVAL AND DEMOLITION** is added as this is not covered under the FAA Standard Specifications.

L-106 A section entitled **ITEM L-106 SUBMITTALS, RECORD DOCUMENTS AND MAINTENANCE MANUALS** is added as this is not covered under the FAA Standard Specifications.

L-108 **L-108 UNDERGROUND POWER CABLE FOR AIRPORTS**

Under 108-1.1 DESCRIPTION, paragraph changed as follows:

A. This item shall consist of furnishing and installing power cables direct buried and furnishing and/or installing power cables within conduit or duct banks in accordance with the Contract Documents 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 fully functional and operating condition as a completed unit to the satisfaction of the Engineer. This item
shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of any cable for FAA facilities. Requirements and payment for trenching and backfilling for the installation of underground conduit and duct banks are covered under Item L-110 “Airport Underground Electrical Duct Banks and Conduits.”

Under **EQUIPMENT AND MATERIALS, 108-2.1 GENERAL** changed as follows:

**C.** Manufacturer's certifications shall not relieve the Contractor of the Contractor’s responsibility to provide materials in accordance with the Contract Documents and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with the Contract Documents shall be removed, when directed by the Engineer and replaced with materials, which do comply with the Contract Documents, at the sole cost of the Contractor.

**D.** All materials and equipment used to construct this item shall be submitted to the Engineer for acceptance. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

**E.** The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the Contract Documents plans and specifications. All submittals shall comply with Item L-106 “Submittals, Record Documents and Maintenance Manuals” and other requirements of the Contract Documents. Where other parts of the Contract Documents apply, the stricter item shall govern. 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 shown in the Contract Documents.

**F.** All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall be responsible to maintain an insulation resistance of 400 megohms minima, (1000V megger) with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period.

**G.** The crew mix for work performed within Item L-108 shall be one licensed journeyman electrician for each three apprentices/helpers.

Under **108-2.2 CABLE**, items changed/added/deleted as follows:
A. 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. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 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 NEC requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

B. Production Test Records. A certified copy of factory test reports for all cable provided for this project testifying that the cable complies with FAA AC 150/5345-7, latest edition, shall be submitted to the Engineer within 48 hours of the cable arriving on site and prior to the installation of the cable. Production testing records must be maintained for a period of three years and made available for review by third-party certifiers quality inspection personnel. Factory test reports for all cable shall be provided in the O & M Manual.

C. Airfield lighting fixtures shall be connected into the series circuit in the sequence shown in the Contract Documents. The Contractor shall perform the required fixture sequence operational tests to demonstrate to the Engineer that the fixtures are connected in the proper sequence. The “return” conductor shall not be connected to any airfield lighting fixtures.

D. The L-824 5 kV airfield lighting series circuit cable shall be supplied with factory imprinted numbers “ONE” through “SIX”.

E. ODD numbered circuits shall utilize:

F. 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. Conductors for parallel (voltag) circuits shall be sized and installed in accordance with NFPA – 70, “National Electrical Code”.

G. Control cable shall be 19 gauge AWG, PE-39, copper-bearing shield, filled solid copper bearing gopher resistant cable and comply with the following:

<table>
<thead>
<tr>
<th>Engineering Specification</th>
<th>Type</th>
<th>Product Specification</th>
<th>Conductor</th>
<th>Insulation</th>
<th>Core Assembly</th>
<th>Filling Compound</th>
</tr>
</thead>
</table>
| 2002                      | RUS (REA) | PE–39 GR | #19 AWG solid annealed copper individually twisted pairs, quantity of pairs as specified | Solid, high density polyethylene, color coded in accordance with telephone industry standards | Less than 25 Pairs – assembled in a single group. More than 25 pairs are arranged in groups, each group having a color coded unit binder | The entire core assembly is completely filled with ETPR compound, filling the interstices between the pairs and...
<table>
<thead>
<tr>
<th>Core wrap</th>
<th>Non-hygrosopic dielectric tape applied longitudinally with an overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper-bearing shield</td>
<td>Corrugated, copper-bearing gopher resistant tape applied longitudinally with an overlap. The sheath interfaces are flooded with an adhesive water blocking compound.</td>
</tr>
<tr>
<td>Jacket</td>
<td>Black, linear low density polyethylene</td>
</tr>
</tbody>
</table>

12 Pair #19 AWG - General Cable part # 7528763 or accepted equivalent.  
25 Pair #19 AWG - General Cable part # 7528789 or accepted equivalent.  
50 Pair #19 AWG - General Cable part # 7528797 or accepted equivalent.  

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Documents on the plans.

**H. Fiber Optic Cable** shall be in accordance with Specification L-108-16602.

**I. Control cable for the airfield lighting control system distributed control** shall be as manufactured by Beldon, 2 pair 24 AWG copper, shielded cable, Beldon M 9842 CM. Installation and termination of the airfield lighting control system distributed control cable shall be incidental to the Contractor’s airfield lighting control system L-109 pay item.

Under **108-2.3 BARE COPPER WIRE (COUNTERPOISE, BARE COPPER WIRE GROUND AND GROUND RODS)**, items changed/added/deleted as follows:

**A.** Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG solid for counterpoise and or No. 6 #2 AWG solid stranded for copper counterpoise ground wire conforming to ASTM B3 and ASTM B8, and shall be bare copper wire [tinned copper] conforming to the requirements of ASTM D B33.

**B.** Wire for airfield lighting lightning protection ground grid installations shall be 4/0 AWG stranded copper wire conforming to ASTM B3 and ASTM B8, and shall be bare copper wire conforming to the requirements of ASTM B33.

**C.** Each fixture shall be individually bonded to the base can with a #6 AWG stranded copper, green THWN-2 insulated bonding jumper. The wire shall conform to ASTM B3, ASTM B8 and ASTM B33.

**D.** Each field lightning arrestor assembly shall be individually bonded to the base can with a #2 AWG stranded copper, green THWN-2 insulated bonding jumper. The wire shall conform to ASTM B3, ASTM B8 and ASTM B33.

**E.** Each sign shall be bonded to the sign ground rod with a #2 AWG stranded copper, green THWN-2 insulated bonding jumper. The wire shall conform to ASTM B3, ASTM B8 and ASTM B33. The sign bonding jumper shall be six inches longer than the sign tethers to allow the tethers to properly operate.

**F.** Ground rods shall be [solid stainless steel] [copper] or sectional copper-clad steel. The ground rods shall be of the length and diameter specified in the Contract Documents on the plans, but in no case shall they be less than 10 feet 8 feet (240 cm) long nor less than ¾ inch.
G. The overall length of each ground rod shall be determined by earth resistance testing. Each ground rod shall be tested for a not-to-exceed earth resistance of ten (10) ohms prior to the connection of the counterpoise or grounding conductors. Additional sections shall be added to the ground rod installation until the not-to-exceed value of ten (10) ohms is obtained. Earth resistance tests shall be performed in accordance with Item L-111.

H. Where ground conditions prohibit the driving of ground rods vertically into the earth a “made” electrode may be used with written acceptance by the Engineer. Types of made electrodes are listed below:

1. Each 10 foot sectional ground rod required shall be replaced by a 30 foot long length of 4/0 AWG BSD stranded copper conductor buried horizontally in a 36 inch deep trench, backfilled and compacted in accordance with P-152.

2. Concrete encased electrode, encased in a minimum of 2” concrete, 1/2” diameter rebar 20 feet long or #2 AWG bare copper conductor 20 feet long.

3. Other electrodes as permitted by NFPA – 70, “National Electrical Code”.

I. Grounding conductors for parallel (voltage) circuits shall be sized and installed in accordance with NFPA – 70, “National Electrical Code”.

Under 108-2.4 CABLE CONNECTIONS items changed/added as follows:

A. In-line connections of underground primary cables shall be of the type called for in the Contract Documents on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

B. The Cast Splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by Minnesota Mining and Manufacturing Company, “Scotchcast” Kit No. 82--B, or as manufactured by Hysol Corporation, “Hyseal Epoxy Splice” Kit No. E1135, or equivalent, is used for potting the splice is acceptable. The Cast Splice shall not be used for splicing airfield lighting series circuits. The Cast Splice is acceptable only for the splicing of control cable.

1. Splicing materials used for splicing control cable shall be as follows: Cast splices shall be 3-M Type 8984-07 Scotchcast 89 series enclosure with Scotchcast 4407 encapsulating and blocking compound.

2. Connectors shall be 3-M Type ULG butt splices. The butt splices shall be installed utilizing a crimping tool accepted by 3-M. All splices and splicing materials shall be installed in accordance with 3-M recommendations.

E. The Taped or Heat-Shrunked Splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape shall meet the requirements of ASTM D 4388 and the plastic tape shall comply with Mil Spec. MIL-I-24391 or Fed. Spec. A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing.
tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a continuous thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture and dirt proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent. The Taped or Heat-Shrinked Splice shall not be used for splicing airfield lighting series circuits. Tape or heat shrink tubing may be used in conjunction with L-823 connectors in item C or D above.

G. All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except the base can ground clamp connector shall be used for attachment to the base can. Not more than one (1) single #2 AWG solid copper conductor shall be permitted to be terminated on any single base can ground clamp. Multiple base can ground clamps shall be used for additional connections. All exothermic grounding and bonding connections shall be made in accordance with the manufacturer’s recommendations and listings. All counterpoise and grounding/bonding connections shall be UL 467 Listed for direct earth burial and encasement in concrete and UL 96 Listed for Lightning Protection.

Under 108-2.4 SPICER QUALIFICATIONS, items changed/added/deleted as follows:

A. Every airfield lighting cable splicer shall be qualified in making 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 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.

B. At least thirty (30) days prior to performing any airfield lighting cable splicing/terminating, Contractor shall submit to the Engineer a written list of proposed cable splicing/terminating personnel, including written evidence that the proposed personnel have had a minimum of two (2) hours of technical training by an accepted splice/termination kit manufacturer personnel. Accepted training shall include a thorough review of kit components and splicing/terminating techniques and procedures. Field splices shall only be installed by personnel acceptable to the Engineer. All splicing/terminating personnel shall demonstrate the complete installation of a L-823 kit for the airfield lighting maintenance supervisor or designee. The kit shall be installed in accordance with the manufacturer's recommendations and the requirements of the Contract Documents. Each acceptable splicer shall be assigned a unique number. Each splice kit installed shall be identified with the splicer’s unique number as shown in the Contract Documents.

C. Persons performing exothermic welds shall be trained by the exothermic weld manufacturer. Exothermic weld submittals shall include the materials proposed for use, the names and experience levels of the trained personnel, the exothermic weld manufacturer's certificate of training and the exothermic weld manufacturer's inspection/acceptance criteria. Each trained person shall perform a sample exothermic weld for the airfield lighting maintenance supervisor or designee. The Engineer shall inspect the exothermic weld in accordance with the manufacturer's inspection/acceptance criteria. The sample exothermic weld shall be performed and accepted prior to any project work being performed. Exothermic welds shall be inspected in accordance with Item L-111.
D.Persons performing grounding and bonding connections shall be trained by the connector/lug manufacturer. Grounding and bonding connector and lug submittals shall include the materials proposed for use, the names and experience levels of the trained personnel, the connector/lug manufacturer’s certificate of training and the connector/lug manufacturer’s inspection/acceptance criteria. Each trained person shall perform a sample connector/lug for the airfield lighting maintenance supervisor or designee. The Engineer shall inspect the connector/lug in accordance with the manufacturer’s inspection/acceptance criteria. The sample connector/lug shall be performed and accepted prior to any project work being performed.

108-2.4 CONCRETE changed as follows:

A. Concrete for cable markers shall conform to Specification Item P-610, “Structural Portland Cement Concrete” or accepted FDOT Class II equivalent, using 1 inch maximum size coarse aggregate (FDOT #57 stone) with a minimum 28 day compressive strength of 3,400 PSI. Where reinforcing is specified, reinforcing steel shall conform to ASTM A 615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

108-2.4 FLOWABLE BACKFILL changed as follows:

A. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153 “Controlled Low Strength Material” or accepted FDOT equivalent.

Under 108-2.8 CABLE IDENTIFICATION TAGS, items changed as follows:

A. Cable identification tags (cable ID tags) shall be 2” diameter, 18 gauge type 316 stainless steel made from a non-corrosive material with the circuit identification stamped engraved or laser etched and black filled onto the tag. Font shall be Helvetica Medium or accepted equivalent. The tags shall be of the type as detailed in the Contract Documents on the plans. The method of engraving/etching, method of attachment, etc., shall in accordance with the requirements contained in the Contract Documents. Text height shall be 3/8” minimum. Cable ties used to attach the cable ID tags shall be UV resistant and have 50 pound breaking strength as manufactured by Thomas & Betts TY525MX or accepted equivalent.

B. The Contractor’s submittal shall include four sample cable ID tags stamped with the characters “TW A D”. Partial acceptance of the twenty-four cable ID tags will require resubmittal of the unacceptable cable ID tags prior to construction beginning. Once the cable ID tags are accepted, the Engineer will use the samples as a basis of comparison for acceptance of the field installed cable ID tags.

108-2.8 TAPE changed as follows:

A. Electrical tapes shall be Scotch Electrical Tapes – part number Scotch 88 (1-1/2” wide) and Scotch 130C linerless rubber splicing tape (2” wide), as manufactured by the Minnesota Mining and Manufacturing Company, or approved accepted equivalent. Heat shrinkable tubing shall have CONTINUOUS integral sealant and shall be as manufactured by Raychem, Inc. or accepted equivalent.
108-2.9 **ELECTRICAL COATING** changed as follows:

A. Scotchkote shall be as manufactured by Minnesota Mining and Manufacturing Company, or approved equivalent.

108-2.11 **EXISTING CIRCUITS** items changed/added as follows:

A. Whenever the scope of work requires connection to an existing circuit, or should the scope of work involve working adjacent to or near an existing circuit, and the work could have an adverse impact on the existing circuit, the circuit’s insulation resistance shall be tested, in the presence of the Engineer. The test shall be performed in accordance with item L-111 and prior to any activity affecting or impacting the respective circuit. The Contractor shall record the results on forms included in Item L-111, acceptable to the Engineer. When the work affecting the circuit is complete (or at end of shift prior to energization), the circuit’s insulation resistance shall be checked again, in the presence of the Engineer. The Contractor shall record the results on forms included in Item L-111, 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. The Contractor shall measure and record the insulation resistance of all airfield lighting circuits prior to starting any work. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

B. Should the Contractor fail to perform the tests prior to starting work, the Contractor shall be responsible to bring the impacted circuits to a minimum 50 megohm earth resistance value or higher value in conformance with the airport’s test records.

108-2.10 and 108-2.11 added as follows:

108-2.10 **FIELD LIGHTNING ARRESTOR ASSEMBLY CONNECTIONS:**

A. The field lightning arrestor assembly shall be bonded to an internal ground lug in the base can with a #2 AWG stranded green THWN-2 insulated copper conductor. A Thompson 561T plated lug or accepted equivalent shall be used for connection to the field lightning arrestor assembly and for connection to the base can when the base can is not equipped with an internal ground lug. Field lightning arrestor assembly connections shall be considered incidental to the L-125 field lightning arrestor assembly pay item.

108-2.11 **DETECTABLE WARNING TAPE:**

A. Plastic, detectable, color as noted warning tape shall be polyethylene film with a metalized foil core and shall be 3 inches (75 MM) wide. Detectable warning tape is incidental to the respective pay item of which it is a component part. The tape shall continuously read "CAUTION - ELECTRIC LINE BELOW", red; “CAUTION - COMMUNICATION LINE BELOW”, orange; “CAUTION - WATER LINE BELOW”, blue; “CAUTION - FUEL LINE BELOW”, yellow; color and message as applicable to the utility. The tape shall be as manufactured by Reef Industries, Inc., or accepted equivalent. Color code used shall comply with American Public Works Association (APWA) Uniform Color Code.
CONSTRUCTION METHODS

108-3.1 GENERAL:

A. The Contractor shall install the specified cable at the approximate locations indicated in the Contract Documents on the plans. The Engineer shall indicate specific locations. 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.

B. 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 in the Contract Documents on the plans.

C. 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 in the Contract Documents on the plans. All L-824 cables shall be identified with a cable ID tag with its respective circuit/loop number at all accessible locations. Accessible locations are defined in the NEC. Cable ID tags 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. Where no connectors are installed, two cable ID tags shall be installed, one on each side of where a future L-823 connector could be installed.

D. Attach cable ID tag 12 inches from the L-823 connectors.

E. Provide not less than 3 feet of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Each end of a conductor with a L-823 connector shall have three feet of slack in each base can (6 feet total when connected). A conductor without an L-823 connector shall have six feet of slack coiled in the base can. When fixtures are interleaved, cable slack shall be provided only in the cables providing power to the fixture in the respective base can. Cables pulled straight through an interleaved circuit base can shall not be provided with cable slack. 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 two feet vertically above the top of the access structure. This requirement also applies where primary cable passes through empty base cans, junction and access structures to allow for future connections, or as designated by the Engineer.

F. The underground cable work to be performed under this contract shall consist of furnishing and installing new cables as shown in the Contract Documents and as directed by the Engineer.

G. All airfield lighting series circuit primary cable and secondary cable connections shall be made by means of field-attached plug-in connector kits or factory-attached plug-in connector kits in accordance with FAA Specification L-823. Connectors shall be compatible for insulation used. The various type connector kits to be used shall be as
described in FAA Advisory Circulars and indicated in the Contract Documents. Airfield lighting circuits shall not intermix except as shown in the Contract Documents.

H. L-823 connectors shall be used for all airfield lighting cable terminations. L-823 connectors shall be installed in each cable connecting to a L-830 isolation transformer, lighting fixture, sign, wind cone, etc. A L-823 connector shall only be installed where connections to devices are made. L-823 connectors shall not be installed in the conductors pulled through a base can or home run conductors (supply or return) except at test points as shown in the Contract Documents.

I. L-823 connectors shall be installed so a portion of the loop can be bypassed. The female receptacle shall always be connected to the end of the conductor connected to the S1 (supply) terminal of the CCR. The male plug shall always be connected to the end of the conductor connected to the S2 (return) terminal of the CCR.

J. The location of any additional connectors installed by the Contractor due to cable pull lengths or unique field conditions shall be recorded on the as-built drawings.

K. The Contractor shall furnish and install an additional 10 L-823 connector kits at specific locations as requested by the Owner. Any of the 10 L-823 connector kits remaining at the end of the contract and not installed shall be turned over to the Owner’s Maintenance Department at the project end. The 10 L-823 connectors are in addition to any and all connectors required for construction or maintenance of the airfield lighting systems.

L. Furnishing and installing all L-823 connectors, heat shrink tubing, tape, cable ID tags, ty-raps and all appurtenances is incidental to the respective cable pay item of which it is a component part.

108-3.2 INSTALLATION IN DUCT BANKS OR CONDUITS:

C. Unless otherwise designated in the Contract Documents plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check conduit/duct routes prior to pull rope installation construction to obtain assurance that the shortest routes are selected and interferences are avoided.

D. Duct banks or conduits shall be installed as a separate item in accordance with Item L-110, "Airport Underground Electrical Duct Banks and Conduit." The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to insure that the duct bank or conduit is open, continuous and clear of debris. Mandrel size shall be compatible with conduit/duct size. The Contractor shall swab out all conduits/ducts and clean base can, manhole, etc. interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbbed the base cans and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc. is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor’s expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts. The cable shall be installed in a manner to prevent harmful stretching of the conductor, injury to the insulation, or damage to the outer protective covering. The ends of all cables

Naples Municipal Airport
Water Management System Improvement
and Taxiway “A” Extension
January, 2013
Errata-31
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/duct and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit/duct, all cable shall be pulled in the conduit/duct at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall be governed by cable manufacturer’s recommendations. A non-hardening lubricant recommended for the type of cable being installed shall be used where pulling lubricant is required.

E. Contractor shall submit pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer. The Engineer shall have the opportunity to observe cable pulling set-up and operations; with and without the dynamometer. 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.

G. Home run cables shall not be pulled continuously for distances greater than 600 feet at any one time. The following procedure shall be used to pull cables. First pull 600 feet of a continuous cable and coil. Secondly, pull the 600 foot section of cable through the next 600 foot segment of system. Then pull 600 feet more of cable at the first location and coil and repeat second step. These steps will be repeated until cable is in place continuously in system without splices or connections unless otherwise accepted in writing by the Engineer or as indicated in the Contract Documents. If the Contractor proposes to use an alternate method, the alternate method shall be detailed and submitted to the Engineer for acceptance.

H. Not less than three (3) feet of cable slack shall be left on each side of all connections, isolation transformers, light units and at all other points where cable is connected to field equipment. Additional slack cable shall be left in runway/taxiway light bases, base cans, hand holes, pull boxes, manholes, etc., where it is required to bring the cable above ground level to make connections. The amount of slack cable per end shall be 3 feet per base can. In hand holes, pull boxes and manholes the cable shall have enough slack to make a full sized 360 degree loop for straight pulls and at least a 450 degree loop for 90 degree pulls, the full size loop shall be the circle whose diameter is equal to the width or length, whichever is greater, of the manhole.

108-3.3 INSTALLATION OF DIRECT-BURIED CABLE IN TRENCHES:

A. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable(s) shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable(s) shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Not less than three feet of slack shall be provided at each connector, base can, manhole, pull box, etc. Sharp bends or kinks in the cable shall not be permitted. Direct buried cables shall be bedded in a 4” envelope of natural earth or sand containing no mineral or aggregate particles that would be retained on a 1/4-inch sieve.
B. Where cables must cross over each other, a minimum of 3-inch vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade. Where two or more cables are laid parallel in the same trench, they shall be placed laterally a minimum distance of 3 inches apart, and the trench shall be widened sufficiently to accomplish this.

C. Primary airfield lighting cables installed shall have cable ID tags 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 ¼ inch in size. Cable ID tags shall comply with L-108-2.8. The cable circuit identification shall match the circuits noted in the Contract Documents on the construction plans.

F. The Contractor shall excavate all cable trenches to a width not less than 6 inches. Unless otherwise specified in the Contract Documents on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench. All loose materials shall be removed from the bottom of the trench. The trench bottom shall be compacted in accordance with the Table in Item L-108-3.3.K below.

G. When rock is encountered, the rock shall be removed to a depth of at least 3 4 inches below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch sieve. Flowable backfill material may alternatively be used. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under Item P-152.

I. It is the Contractor’s responsibility to locate existing utilities within the work area prior to excavation. Where existing active cable(s) cross proposed installations, the Contractor shall insure that these cable(s) are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified in the Contract Documents on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

J. In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement as determined by the Engineer.

L. The second and subsequent layers shall be thoroughly tamped and compacted to at least the density indicated in the table above of the adjacent undisturbed soil, and to the satisfaction of the Engineer. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required.

M. Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of in accordance with the Contract Documents plans and specifications.
N. Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the Engineer. If not shown on the plans, the warning tape shall be located six inches above the direct-buried cable or the counterpoise wire if present. A 4-6 inch wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct-buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inches minimum below finished grade.

O. A 3 inch wide color as noted polyethylene film detectable warning tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be installed 8 inches minimum below finished grade. The tape shall be installed flat/horizontally such that the tape presents the most visible and perceptible appearance in the sole opinion of the Engineer.

P. Restoration. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding, topsoiling and fertilizing [liming] [seeding] [sprigging] [mulching] as shown in the Contract Documents on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions and compaction shall meet the requirements of Item P-152. Restoration shall be considered incidental to the pay item of which it is a component part.

Q. Installation of counterpoise over existing conduit/duct systems shall be in accordance with Item L-108-3.6.

108-3.4 CABLE MARKERS FOR DIRECT-BURIED CABLE items changed/added as follows:

A. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inches (100-150 mm) thick, extending approximately 1 inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (60 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word “CABLE” and directional arrows on each cable marking slab. The letters shall be approximately 4 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.

B. Stencils shall be used for all lettering. No hand lettering is allowed. Furnishing and installation of conduit/duct or cable markers is incidental to the respective cable or conduit/duct pay item.

108-3.5 SPLICING:

A. Connections of the type shown in the Contract Documents on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:
B. **Cast Splices.** These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured in accordance with manufacturer's instructions and to the satisfaction of the Engineer. The Cast Splice shall not be used for splicing airfield lighting series circuits. The Cast Splice is acceptable only for the splicing of control cable.

D. Only cable splicers as qualified in 2.5 shall be allowed to splice airfield lighting cables.

F. Cable insulation removal and insulation penciling shall only be performed with acceptable cable stripping and penciling tools. Two acceptable tools are the Ripley WS-49 Airport Lighting Tool and Crouse Hinds Cable Penciler #10036-36. Other tools may be acceptable upon submittal of a sample tool for review. Knives, side cutters, diagonal pliers and other such tools are strictly prohibited.

G. Any nicks or cuts in the copper conductor are reason for rejection of the splice.

H. The L-823 kits shall be assembled in STRICT accordance with manufacturer's instructions.

I. Connection of the L-824 series circuit conductors to the L-823 connector pin/receptacle shall be made utilizing a crimping tool accepted by the connector/lug manufacturer that will produce a complete crimp before the tool can be removed. The crimping tool used by the splicer shall be listed on the L-823 kit manufacturer’s literature included in the kit. Make the number and type of crimps as required by the L-823 kit manufacturer.

J. Install plug and receptacle housings in accordance with the L-823 kit manufacturer’s instructions.

K. During installation, mating surfaces of connectors shall be kept covered until connected and shall be clean when plugged together. Vent trapped air between the plug and receptacle in accordance with the manufacturer's instructions. Heat shrink or tape the completed L-823 connector kit, as required by Contract Documents.

L. Install heat shrink over the L-823 connector kits or tape the L-823 connector kits in accordance with the Contract Documents.

1. Install heat shrink kits as follows:

   a. Install heat shrink kits in accordance with the manufacturer’s recommendation and the Contract Documents. Allow splice to completely cool, ½ hour minimum, before placing in base can.

   b. Burning or scorching of the cable or heat shrink shall be grounds for rejection of the completed splice.

2. OR - All L-823 connectors shall be taped as follows:
a. First – Apply three layers of 2” wide 3M Scotch 130C linerless rubber splicing tape, or accepted equivalent. When applying 130C tape stretch to a minimum of 3/4 of its original width to produce a uniform wind. Center tape on mating surfaces of connector body. Extend tape a 1.5” on both sides of connector body mating surfaces.

b. Second – Apply three half-lapped layers of 3M Scotch 88 tape or accepted equivalent. When applying 88 tape stretch to a minimum of 5/8 of its original width to produce a uniform wind. Apply tape with no tension on last wrap to prevent flagging. Extend tape 3” on both sides of connector body mating surfaces.

M. Do not tape or heat shrink isolation transformer secondary connectors to signs, wind cones and elevated fixtures.

N. Attached cable splicer ID to splice.

P. Taped Splices. Taped splices shall not be used for L-824 airfield lighting circuits. Refer to FAA-SO-STD-71, “Specifications for Installation and Splicing of Underground Cables” for the application of taped splices. A taped splice shall be made in the following manner:

Q. 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.

R. Apply high-voltage rubber tape one half-lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. Throughout the rest of the splice less tension should be used. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately 1 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.

S. 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.
T. Surfaces of 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 coatings shall be removed to expose base metal. Clean all surfaces at least ¼” (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 items changed/added/deleted as follows:

A. If shown on the plans or included in the job specifications, bare counterpoise copper wire shall be installed for lightning protection of the underground cables. Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. Where the cable or duct/conduit trench runs parallel to the edge of pavement, the counterpoise shall be installed in a separate trench located half the distance between the pavement edge and the cable or duct/conduit trench. In trenches not parallel to pavement edges, counterpoise wire shall be installed continuously a minimum of 4 inches above the cable, conduit or duct bank, or as shown on the plans if greater. Additionally, counterpoise wire shall be installed at least 8 inches below the top of subgrade in paved areas or 10 inches below finished grade in unpaved areas. This dimension may be less than 4 inches where conduit is to be embedded in existing pavement. Counterpoise wire shall not be installed in conduit.

B. The counterpoise wire shall be routed around to each light fixture base, mounting stake, or junction/access structures. The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit.

C. The solid bare copper wire, #2 AWG shall be installed for lightning protection of the underground cables. The insulated cables for the taxiway and runway circuits shall be protected by a bare copper counterpoise wire installed in the same trench for the entire length of cable/duct/conduit as indicated in the Contract Documents. The counterpoise wire shall be securely electrically and mechanically bonded to each light fixture base and to ground rods located not more than 500 feet (150 M) apart around the entire circuit in addition to the ground rods for the signs and wind cones.

D. Ground rods shall be provided in longer lengths or closer than 500 feet (150 M) and where noted on the Drawings to meet testing requirements specified in Item L-111. All ground rods shall be separately tested to obtain a not to exceed ten (10) ohms prior to connection of grounding conductor. The Contractor shall perform the necessary inspection and test for these items concurrently with the installation because of subsequent inaccessibility of some components. Each ground rod shall be located and dimensioned on the As-built Drawings.

E. Each fixture shall be individually bonded to the base can with a #6 AWG copper, green THWN-2 insulated bonding jumper. Each field lightning arrestor assembly shall be individually bonded to the base can with a #2 AWG copper, green THWN-2 insulated
bonding jumper. Each sign shall be bonded to the sign ground rod with a #2 AWG copper, green THWN-2 insulated bonding jumper.

F. The counterpoise installed under this Contract shall be securely mechanically and electrically bonded to existing counterpoise wires on intersecting runways and taxiways. Special care shall be exercised to locate all such intersections and to make the required connections. The counterpoise shall be bonded to the ground grid at each crossing. All connections to the counterpoise conductors and ground rods shall be made by the exothermic process or accepted equivalent, except the base can ground clamp connector shall be used for attachment to the base can.

G. The counterpoise shall be positioned as follows.

1. 8" (20 CM) above the conduit/duct (including concrete) centerline when installed at right angles to or under pavement or in grassy areas.

2. Exceptions may have to be made to 1. above under full strength pavement. The 8" (20 CM) will vary, dependent upon base and pavement thickness. See base can installation details.

3. Large conduit/duct banks may require two or more counterpoise conductors. See conduit/duct bank details.

I. The minimum distance between top of conduit/duct in duct bank and counterpoise is eight (8) inches (20 CM). Maintain a complete cone of protection measured 45 degrees each side of vertical over the conduits, ducts or cables to be protected.

J. Earth resistance testing shall be performed in accordance with Item L-111 and the test results shall be recorded on forms included in Item L-111. The Engineer shall have the opportunity to observe all earth resistance testing.

K. 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. The connections shall be made by exothermic process or other accepted equivalent process.

L. If shown on the plans or in the specifications, a separate equipment (safety) ground system shall be provided in addition to the counterpoise wire using one of the following methods:

(1) A ground rod installed at and securely attached to each light fixture base, mounting stake if painted, and to all metal surfaces at junction/access structures.

(2) Install an insulated equipment ground conductor internal to the conduit system and securely attached it to each light fixture base and to all metal surfaces at junction/access structures. This equipment ground conductor shall also be exothermically welded to ground rods installed not more than 500 feet (150 m) apart around the circuit.
M. **Counterpoise Installation Above Multiple Conduits and Duct Banks.** Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete cone of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduit/ducts shall be adequate to provide a complete cone of protection measured 30 degrees each side of vertical. Reference details in the Contract Documents.

N. Where conduit/duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the conduit/duct bank. Reference details on the Contract Documents construction plans.

O. **Counterpoise Installation at Existing Duct Banks.** When airfield lighting cables are indicated on the plans in the Contract Documents to be routed through existing conduit/duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing conduit/duct bank where the cables being protected enter and exit the conduit/duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

P. Surfaces of 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 coatings shall be removed to expose base metal. Clean all surfaces at least ¼” (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.

108-3.7 **EXOTHERMIC WELDS:**

A. Bonding of counterpoise wire shall be by the exothermic welding process or by an accepted equivalent method. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

B. All buried copper and weld material at weld connections shall be thoroughly coated 6 mil of 3M “Scotchkote,” or approved equivalent, or coated with coal tar bitumastic material to prevent surface exposure to corrosive soil or moisture.

C. Please refer to L-108-2.5 for exothermic welder qualifications. Persons performing exothermic welds shall be trained by the exothermic weld manufacturer. Exothermic welds shall be inspected in accordance with Item L-111.

D. 100% of all exothermic welds shall be inspected by the Contractor’s Superintendent or Engineer accepted designee. Each exothermic weld shall be photographed (close up within 12” of exothermic weld) with a digital camera (2 megapixel color minimum).

E. The exothermic weld inspector shall maintain a log by photograph number indicating date, time, location by fixture number, acceptance or rejection and inspectors signature. The inspector shall maintain an updated hard copy of the photos and log at the jobsite. The hard copy shall not be more than three days behind actual work progress. The
inspector shall turn over to the Engineer an electronic copy of the log and photos at the end of each week. The O&M Manuals shall include a color copy of each of the photographs and the log for 100% of the exothermic welds.

F. Each person performing exothermic welding shall have a copy of the manufacturer’s inspection/acceptance criteria on their person and shall check each exothermic weld for acceptability. The Contractor, as part of the as-built drawing requirements, shall maintain a plan set marked up with the location of each exothermic weld and the welder performing the exothermic weld.

G. The Engineer will perform a random inspection of the exothermic welds. Should the exothermic welder have a 5% failure rate, that exothermic welder will no longer be allowed to install exothermic welds. The Contractor shall expose all exothermic welds performed by that exothermic welder for inspection by the Engineer. All costs associated with the retesting and rework of the failed exothermic welds shall be borne by the Contractor.

H. Upon completion the counterpoise shall be tested in accordance with L-111.

108-3.8 TESTING items changed/added/deleted as follows:

A. In addition to the testing required by this item, supplemental acceptance testing shall be conducted in accordance with L-111. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the Engineer. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the Engineer. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase and results meeting the specifications below must be maintained by the Contractor throughout the entire project as well as during the ensuing warranty period. For projects completed in phases, the respective required testing must be completed by phase. The test results shall comply with the requirements below and shall be maintained by the Contractor throughout the entire project as well as during the ensuing warranty period.

B. 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:

D3. That the insulation resistance to ground of all new non-grounded series circuits or cable segments is not less than 500 ±0 megohms. The Contractor shall maintain an insulation resistance value of 400 megohms (1000 volt megger) on all new work throughout the warranty/guarantee period. Cable shall be tested in accordance with L-111.

D4. That the insulation resistance to ground of all non-grounded conductors of new multiple circuits or circuit segments is not less than 500 ±0 megohms. Cable shall be tested in accordance with L-111. Testing of control cables shall be in accordance with FAA-SO-STD-71.
D6. 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.4 hours.

D7. That the impedance to ground of each ground rod does not exceed ten (10) $25\text{ ohms}$ prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be utilized, as described by ANSI/IEEE Standard 81, to verify this requirement.

D8. Proving Counterpoise, the Contractor shall test all the counterpoise conductors for continuity with a low resistance ohmmeter. A method of testing is to use a MEGGER DUCTER Low Resistance ohmmeter Model DLRO-10 or accepted equivalent to determine the actual resistance of the conductor under test and through mathematical computation prove the continuity of the conductor. The counterpoise proving test method shall be submitted to the Engineer for acceptance. All such testing shall be at the sole expense of the Contractor. See L-111 for testing requirements.

E. Two Copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the Engineer in accordance with Items L-106 and L-111. Where connecting new cable to existing cable, ground insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

F. There are no approved "repair" procedures for items that have failed testing other than complete replacement.

108-3.9 OPERATION AND MAINTENANCE MANUALS added as follows:

A. The Contractor shall provide data for all cables, connectors, ground rods, etc., supplied under this item in the Operation and Maintenance Manuals. This data shall include cut sheets from the manufacturer for replacement purposes and tabulated test results. Refer to Item L-106. Final payment for any contract amounts shall not be processed without proper submittal of these manuals and approval by the Engineer.

Under METHOD OF MEASUREMENT, items changed/added/deleted as follows:

108-4.1 TRENCHING OR SAWCUTS

A. Trenching or saw cuts shall be considered incidental to the item being installed and shall include measured by the linear feet (meters) of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory. No separate measurement for payment will be made for this work.

B. When specified, separate measurement shall be made for trenches of various specified widths.

C. The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered/required shall be included in the unit price bid for the work.
108-4.2 CABLE:

A. Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) of cable or counterpoise wire installed in trenches, duct bank or conduit, including ground rods and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack. The #6 and #2 AWG stranded copper bonding jumpers shall be considered incidental to the item being installed and shall not be measured separately for payment.

108-4.3 GROUND RODS AND PITS:

A. The quantity of ground rods or ground rod inspection pits to be paid for under this item shall consist of the number of items installed and accepted as a complete unit ready for operation. Ground rods shall be measured as each 10 foot section is installed as required to achieve the specified earth resistance value. Each ten foot section shall be paid as a single 0.75" diameter by 10.00' long copper clad steel sectional ground rod.

Under BASIS OF PAYMENT, items changed/added as follows:

108-5.1 CABLE:

A. Payment will be made at the contract unit price for trenching, wire, cable and/or bare counterpoise wire installed in trench/saw cut (direct-buried), or wire, 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 supervision, transportation, labor, equipment, tools, connector kits, cable terminations, lugs, ID tags, testing, and all incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item. The cost of the #6 AWG stranded copper bonding jumpers, the cost of the #2 AWG stranded copper bonding jumpers and conductor terminations shall be considered incidental to the item being installed. The #2 AWG solid copper counterpoise installed external to and with directional bore duct shall be paid at the #2 AWG solid copper counterpoise installed in trench unit price.

B. The cost for all steel, arc welding, saw cutting, sealer/adhesive, exothermic welds, cable terminations, detectable warning tape and all other incidentals and appurtenances required to install the counterpoise or ground grid conductors as required by the Contract Documents shall be included in the linear foot unit price bid for the work. The cost of all excavation, backfill, saw cuts; dewatering and restoration regardless of the type of material encountered/required shall also be included in the unit price bid for the work.

108-5.2 GROUND RODS AND PITS, items changed/added as follows:

A. Payment will be made at the contract unit price for each ground rod or ground rod inspection pit installed in place by the Contractor and accepted by the Engineer. Each ten foot section shall be paid as a single 0.75" diameter by 10.00' long copper clad steel sectional ground rod. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all supervision.
transportation, labor, equipment, tools, installed complete with exothermic connections, excavation, backfill, and all required incidentals necessary to complete this item. The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall also be included in the unit price bid for the work.

Payment will be made under:

- Item L-108-1 1/C L-824-Type C Unshielded #8 AWG 5 KV Stranded Copper Cable, Installed in Duct or Conduit -- per Linear Foot (LF)

- Item L-108-2 1/C #2 AWG Solid Copper Counterpoise Wire, installed over duct or conduit -- per Linear Foot (LF)

- Item L-108-3 0.75” Diameter By 10.00’ Long Copper Clad Steel Sectional Ground Rod -- per Each (EA)

Under MATERIAL REQUIREMENTS, items changed/added as follows:

- AC 150/5340-30 Design and Installation Details for Airport Visual Aids
- AC 150/5345-26 FAA Specification for L-823 Plug and Receptacle, Cable Connectors
- AC 150/5345-53 Airport Lighting Equipment Certification Program
- AC 150/5370-2 Operational Safety on Airports During Construction
- AC 150/5370-10 Standards for Specifying Construction of Airports

Under REFERENCE DOCUMENTS, items added as follows:

- NFPA No. 70E Standard for Electrical Safety in the Workplace
- FAA-STD-019e Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment
- IEEE STD 142 Grounding of Industrial and Commercial Power Systems

L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

Under DESCRIPTION, items changed/added/deleted as follows:

110-1.1 DESCRIPTION: This item shall consist of furnishing and installing underground electrical conduits and duct banks (single or multiple conduits encased in concrete, or direct buried as required by the Contract Documents) installed in accordance with the Contract Documents this specification at the locations and in accordance with the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple ground and ducts. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed
areas; concrete encasement, mandrelng, pulling lines, duct markers, plumbing of conduits, and the testing of the installation as a completed system ready for installation of cables in accordance with the Contract Documents 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.

110-1.2 The Contractor shall protect paved surfaces from damage caused by any equipment with tracks, stabilization feet, hydraulic fluids, etc. during construction.

110-1.3 The terms conduit, duct or duct bank shall be considered as a listed raceway of nominally circular cross-sectional area designed to provide physical protection and routing for conductors. Where a requirement of these Contract Documents would be applicable to one, it shall be considered applicable to all combinations of raceways included in this item.

Under EQUIPMENT AND MATERIALS

110-2.1 GENERAL:

A. All equipment and materials covered by referenced documents specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable documents specification when so specified requested by the Engineer.

B. Manufacturer's certifications shall not relieve the Contractor of the Contractor’s responsibility to provide materials in accordance with the Contract Documents these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not substantially comply with the Contract Documents these specifications shall be removed, when directed by the Engineer, and replaced with materials, which do comply with the Contract Documents 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 acceptance 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, catalog numbers or models applicable to this project. Indicate all optional fittings and accessories equipment and delete non-pertinent data. Submittals for conduits and ducts components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles (highlighting is not acceptable). Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.

D. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the Contract Documents plans and specifications. All submittals shall comply with Item L-106 “Submittals, Record Documents and Maintenance Manuals” and other requirements of the Contract Documents. Where other parts of the Contract Documents apply, the stricter section shall govern. [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 shown in the Contract Documents.

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, including incidental repair costs such as pavement replacement, all at with no additional cost to the Owner.

F. The crew mix for work performed within Item L-110 shall be one licensed journeyman electrician for each three apprentices/Helpers.

110-2.2 STEEL CONDUIT. Rigid galvanized steel conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standard 6, 514B, and 4242 for those applications described in Article 344 of the current National Electrical Code.

110-2.3 PLASTIC CONDUIT. Plastic conduit and fittings shall conform to the requirements of Fed. Spec. WC-1094, Underwriters Laboratories Standards UL-651 and Article 347 of the current National Electrical Code and shall be one of the following, as shown on the plans in the Contract Documents:

A. Type I Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.

B. Type II Schedule 40 PVC suitable for either above ground or underground use. Plastic conduit and fittings shall be Type II (Schedule 40 and Schedule 80 where noted) heavy-wall polyvinylchloride (PVC) conduit listed by an independent testing laboratory for above ground exposed, underground concrete encased (CE) and underground direct earth burial (DEB) applications as described in Article 352 of the current National Electrical Code.

The type of adhesive shall be as recommended by the conduit/fitting manufacturer. All joints shall be solvent welded in accordance with the recommendation of the manufacturer. The plastic conduit, fittings, spacers, expansion joints and joint adhesive/solvent shall be products of one manufacturer to assure compatibility.

110-2.4 SPLIT CONDUIT. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic Schedule 40 PVC, interlocking type as manufactured by Carlon or accepted equivalent.

110-2.6 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, or accepted FDOT Class II equivalent, Specification Section 346 “Standard Specification for Road and Bridge Construction” using [-] 1 inch maximum size coarse aggregate (FDOT #57 stone) with a minimum 28 day compressive strength of [-] 3,400 PSI. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A 615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.
High early strength P-610 concrete will be required for use with ducts, conduits, base cans and other work as directed by the Engineer, in existing operational areas and within the safety areas of operational pavement to comply with the project phasing and scheduling requirements, and where the pavement is required to open to aircraft at the end of the designated work period. The extra cost for the high early strength P-610 concrete shall be considered incidental to the respective pay item of which it is a component part.

110-2.7 FLOWABLE BACKFILL. Where specified, flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153 “Controlled Low Strength Material” or accepted FDOT Non-Excavatable Flowable Fill (125 psi minimum), FDOT Specification Section 121 “Standard Specification for Road and Bridge Construction” or equivalent.

110-2.8 DETECTABLE WARNING TAPE. Plastic, detectable, color as noted magnetic warning tape shall be polyethylene film with a metallized foil core and shall be 4-6 3 inches (75-150-MM) wide. Detectable warning tape is incidental to the respective bid item. The tape shall continuously read "CAUTION - ELECTRIC LINE BELOW", red; “CAUTION - COMMUNICATION LINE BELOW”, orange; “CAUTION - WATER LINE BELOW”, blue; “CAUTION - FUEL LINE BELOW”, yellow; or color and message as applicable to the utility. The tape shall be as manufactured by Reef Industries, Inc., or accepted equivalent. Color code used shall comply with American Public Works Association (APWA) Uniform Color Code.

110-2.9 ELBOWS. All elbows and bends used in PVC duct system with less than a 12 foot radius shall be rigid galvanized steel conduit coated with 10 mil of asphalt sealer or factory bonded PVC cover. 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. Any exposed galvanizing or steel shall be coated with 10 mil of asphalt sealer. Field bending of PVC ducts using open flame devices is strictly prohibited.

110-2.10 DIRECTIONAL BORE DUCTS. Directional bored ducts shall be installed in accordance with Item L-110 and L-110S-02310. No separate payment will be made for directional bore duct. Directional bore duct shall be considered a component part of the respective L-110 concrete encased duct pay item. The directional bored HDPE duct shall “rest” for 48 hours after installation prior to the installation of any couplings or fittings. Couplings and fittings shall be installed in STRICT accordance with the manufacturer’s recommendations and instructions.

110-2.11 INNER DUCT. Where specified, outside use inner duct shall be HDPE and inside use inner duct shall be Plenum Gard by Carlon or accepted equivalent. In each new communication and FAA duct bank, one half of the 4” ducts shall have three each 1” inner ducts and two each 1-1/4” inner ducts installed. The Contractor’s submittal shall verify that the five inner ducts will fit in the 4” PVC ducts. In each existing duct receiving the new FAA cables, install 3 each 1” inner ducts and 2 each 1-1/4” inner ducts. [Inner duct shall be MaxCell # MXC-3456-RD and # MXC-3456-BL by TVC Communications, Wadsworth, Ohio, 1-800-345-8454 or 1-330-335-1588 or accepted equivalent. In each new communication and FAA duct bank, one half of the 4” ducts shall have two each 3-cell MaxCell inner ducts installed. In each existing duct receiving the new FAA cables install two
AC ITEM   CHANGE

each 3-cell MaxCell inner ducts. Secure both ends of all inner ducts to prevent the inner duct from slipping back into the duct. In each new 4" communication duct install one MaxCell 4"-3 cell #MXC4003GR and one MaxCell 3"-3 cell #MXC3456RD by Maxcell 600 Plum Creek Drive, Wadsworth, Ohio 44281 or accepted equivalent. Terminate Maxcell using the inflatable termination bag method. Secure both ends of all inner ducts to prevent the inner duct from slipping back into the duct.

110-2.12 PAVEMENT REINFORCEMENT MESH. Pavement reinforcement mesh shall be GlasPave 25 brand as manufactured by Saint Gobain Technical Fabrics, GlasPave 25 brand as manufactured by Tensar International Corp. or accepted equivalent. The furnishing and installation of the pavement reinforcement mesh shall be considered incidental to the respective pay item of which it is a component part. Installation of pavement reinforcement mesh is not required where asphalt rubber membrane interlayer (ARMI) is installed.

CONSTRUCTION METHODS

110-3.1 GENERAL:

A. The Contractor shall install underground duct banks and conduits at the approximate locations indicated in the Contract Documents on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the Contract Documents plans. Duct banks and conduits shall be of the size, material, and type indicated in the Contract Documents on the plans or specifications. Where no size is indicated in the Contract Documents 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 in the Contract Documents 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 below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches below the subgrade. The depth below finished grade or below top of pavement for 2" conduits between base cans shall be determined by the depth of the base can. Conduits shall drain from base can to base can toward the drain system provided. The conduit system shall promote drainage.

B. Connection/termination of the conduit/duct shall be completed in accordance with the Contract Documents. All connections/terminations of a conduit/duct to a base can, manhole, hand hole or other equipment/enclosures shall be considered incidental to the conduit/duct pay items provided. The connection/termination shall still be considered incidental should the Contractor have to create the opening for the connection/termination such as coring a manhole wall, a base can or a base can concrete anchor.

C. All work shall be performed in a craftsperson-like manner and in accordance with the Contract Documents, FAA Advisory Circulars and if applicable, local, state and national
codes. There are no approved "repair" procedures, other than complete replacement of the item. Any corrective measures shall be acceptable to the Engineer.

D. Additional L-867 or L-868 cans (as required) and blank covers shall be added as pull boxes for duct runs of long lengths (generally longer than 500 feet to preclude exceeding the manufacturer's recommended cable pull tension.

E. The Contractor shall mandrel each individual new conduit and each existing conduit to be utilized in the project 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 cross-sectional area hole.

F. The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc. interiors IMMEDIATELY PRIOR to pulling cable. Once cleaned and swabbed the base cans, manhole, pull boxes, etc. and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc. is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor’s expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

G. For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200 pound test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated in the Contract Documents on the plans, the open ends shall be plugged/capped as required by the Contract Documents with removable tapered plugs, designed for this purpose.

H. 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 accepted approved spacers at intervals not to exceed 5 feet.

I. Unless otherwise shown in the Contract Documents on the plans, concrete encased duct banks shall be utilized when crossing under pavements expected to carry aircraft loads.

L. When rock is encountered, the rock shall be removed to a depth of at least 3 inches 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 sieve. [P-610 or P-153] 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 in accordance with and paid for under Item P-152.

M. 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 acceptance approval by the Engineer. If not shown in the
Contract Documents on the plans, the warning tape shall be located eight inches below finished grade six inches above the duct/conduit or the counterpoise wire if present.

P. Whether or not specifically indicated in the Contract Documents on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed in accordance with Item P-152 and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved accepted by the Engineer.

Q. All excavation including rock, concrete, etc. shall be unclassified and shall be considered incidental to the respective L-110 pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of Item L-110. The cost of all excavation and backfill regardless of type of material encountered, shall be included in the unit price bid for the L-110 Item.

S. Any excess excavation shall be filled with suitable material approved accepted by the Engineer and compacted in accordance with item P-152.

T. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cable(s) cross proposed installations, the Contractor shall insure that these cable(s) are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified in the Contract Documents on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

U. In the event that any previously identified cable is damaged during the course of construction, the Contractor shall immediately notify the Engineer and be responsible for the complete repair.

V. All loose materials shall be removed from all excavations for electrical items. The bottom of the excavation shall be compacted to the following criteria:

<table>
<thead>
<tr>
<th>SOIL TYPE</th>
<th>DESIGN AIRCRAFT GROSS WEIGHT</th>
<th>TEST STANDARD</th>
<th>UNDER PAVEMENT</th>
<th>IN TURF</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30% RETAINED ON ¾&quot; SIEVE</td>
<td>&gt;60,000 LBS</td>
<td>ASTM D1557</td>
<td>100%</td>
<td>95%</td>
</tr>
<tr>
<td>&lt;30% RETAINED ON ¾&quot; SIEVE</td>
<td>&lt;60,000 LBS</td>
<td>ASTM D698</td>
<td>100%</td>
<td>98%</td>
</tr>
<tr>
<td>&gt;30% RETAINED ON ¾&quot; SIEVE</td>
<td>&gt;60,000 LBS</td>
<td>AASHTO T-180</td>
<td>100%</td>
<td>95%</td>
</tr>
<tr>
<td>&gt;30% RETAINED ON ¾&quot; SIEVE</td>
<td>&lt;60,000 LBS</td>
<td>AASHTO T-99</td>
<td>100%</td>
<td>95%</td>
</tr>
</tbody>
</table>

Backfill shall comply with the same compaction requirements.
W. 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 unit price for the duct. Milling of existing pavements shall be as shown in the Contract Documents. Saw cutting and milling operations for conduit installation shall be considered incidental to the respective pay item of which it is a component part.

X. When existing cables are to be placed in split duct encased in concrete, the cable shall be carefully located and exposed by hand. Prior to being placed in split 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 in the Contract Documents or as required by the Engineer.

Y. The pavement reinforcement mesh shall be installed at the location shown in the Contract Documents. Install pavement reinforcement mesh in strict accordance with the manufacturer’s instructions. The pavement reinforcement mesh shall extend a minimum of one foot beyond the edges of the material/paving interfaces in both longitudinal and lateral directions.

Z. For existing duct banks located in milled asphalt that are uncovered during construction, the Contractor shall:

1. Determine the amount of concrete cover over the duct and advise the Engineer.

2. Mill the concrete duct encasement with the asphalt.

3. Install pavement reinforcement mesh over the duct in accordance the paragraph above.

4. The installation of pavement reinforcement mesh shall be considered incidental to the duct pay items provided. The milling shall be considered incidental to the respective milling pay item.

AA. All concrete and flowable fill used for this item shall be completely consolidated and contain no voids. The Contractor shall consolidate the concrete by mechanical means. All concrete and/or flowable fill exposed or placed within the paving base materials shall be finished smooth with a steel trowel and broom finished where it becomes a part of the finished surface.

110-3.2 DUCT BANKS CONDUITS WITH CONCRETE ENCASEMENT.

A. Unless otherwise shown in the Contract Documents plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (45 cm) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (45 cm) below finished grade where installed in unpaved areas.
B. Unless otherwise shown in the Contract Documents on the plans, duct banks under paved areas shall extend at least 3 ½ feet (90 150 cm) beyond the edges of the pavement or 3 ½ feet (90 150 cm) beyond any underdrains that may be installed alongside the paved area, whichever is greater. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, proper provisions can be made to avoid them. Unless otherwise shown in the Contract Documents 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. Where two or more conduits in the duct bank are intended to carry conductors of equivalent voltage insulation rating, the Contractor shall space the conduits not less than 1 ¼ inches (37 50 mm) apart (measured from outside wall to outside wall). Where two or more conduits in the duct bank are intended to carry conductors of differing voltage insulation rating, the Contractor shall space the conduits not less than 3 inches 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 in the Contract Documents on the plans. End bells or couplings shall be installed flush with the concrete encasement at access points.

D. When specified, the Contractor shall reinforce the bottom, side and top of encasements with steel reinforcing mesh or fabric or other approved acceptable 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 in the Contract Documents 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 (150 cm) intervals.

F. Install a plastic, detectable, color as noted, ¾-6 inch (75-150 mm) wide warning tape 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. The tape shall be installed flat/horizontally such that the tape presents the most visible and perceptible appearance in the sole opinion of the Engineer.

G. 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 in the Contract Documents on the drawings or as required by the Engineer.

H. All construction joints in concrete encased ducts shall have steel dowels as shown in the Contract Documents evenly spaced and installed at the joint. The dowels shall be deformed steel reinforcing bars sized as noted in the Contract Documents, with 1/2 of the length embedded in the plastic concrete of the initial pour. The dowels shall be securely aligned to maintain their function for the subsequent pour.

110-3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT.

B. Unless otherwise shown in the Contract Documents 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 used.
C. Unless otherwise shown in the Contract Documents on plans, conduits shall be installed so that the tops of all conduits are at least 18 inches (45 cm) below the finished grade.

G. Install a plastic, detectable, color as noted, 3 inch (75 mm) wide warning tape 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. The tape shall be installed flat/horizontally such that the tape presents the most visible and perceptible appearance in the sole opinion of the Engineer.

110-3.4 MARKERS.

A. The location of each end and of each change of direction of conduits and duct banks shall be marked at 200 foot maximum intervals along the duct run by a concrete slab marker 2 feet (60 cm) square and 4-6 inches (100-150 mm) thick extending approximately 1 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 base can, manhole, junction/access structure or building.

B. The Contractor shall impress the word “DUCT”, “END OF DUCT” or “CONDUIT” as required by the Engineer, on each marker slab. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the Engineer. The letters shall be 4 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. Stencils shall be used for all lettering. No hand lettering is allowed.

110-3.5 BACKFILLING FOR CONDUITS WITHOUT CONCRETE ENCASEMENT.

110-3.6 BACKFILLING FOR DUCT BANKS WITH CONCRETE ENCASEMENT.

A. Under paved areas, after the concrete encased ducts have been properly installed and the concrete has had time to cure the trench shall be backfilled as described below and in accordance with the paving requirements of the Contract Documents. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet of duct bank or one work period's construction, whichever is less.

B. In turfed areas, after the concrete has cured, the remaining trench shall be backfilled and compacted in accordance with Item P-152 “Excavation and Embankment” except that the material used for backfill shall be select material not larger than 4 inches in diameter. In addition to the requirements of P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet of duct bank or one work period's construction, whichever is less.

C. P-153, Flowable backfill may alternatively be used as an alternative backfill method to meet the requirements of paragraph A. In addition, where called for in the Contract Documents P-153 shall be used as the exclusive backfill to the subgrade line.

F. Any excess excavated material shall be removed and disposed of off site or in accordance with instructions issued by the Engineer.
110-3.7 RESTORATION. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding, topsoiling, fertilizing and liming shown on the plans as required by the Contract Documents. 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.

110-3.8 DUCT EXTENSION TO EXISTING DUCTS. Where existing 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 listed for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the Contract Documents. Existing ducts to be extended shall have both ends exposed and shall be mandreled to determine the existing duct’s acceptability for use. This work is incidental to the respective pay item for new duct.

110-3.9 CONDUIT PITTING LUBRICANT. Thomas and Betts Kopr-Shield or accepted equivalent shall be applied to all steel metallic thread type fittings for underground conduits.

110-3.10 BASE CAN DRAIN WELL. A base can drain well shall be installed where called out and in accordance with the Contract Documents.

110-3.11 OPERATION AND MAINTENANCE MANUALS. The Contractor shall provide data for all equipment, material and components supplied or furnished under this section in the Operation and Maintenance Manuals. This data shall include cut sheets from the manufacturer, the manufacturer's installation instructions, any required test results or certifications and other data as required by Item L-106. The Manuals shall be in accordance with Item L-106. Final payment for any contract amounts shall not be processed without proper submittal of these manuals and review and acceptance by the Engineer.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear foot of conduits and multiway duct banks installed, including encasement, locator tape, trenching and backfill with designated, resolution, and for drain lines, and the termination at the base can, manhole, drainage structure, junction plaza or building all measured in place, completed, and accepted. The quantity shall be counted on the vault side of the junction can plaza (JCP) should the JCP have ducts entering that side from more than one JCP. In locations where multiple ducts split and recombine at JCPs, length measured for payment shall be the length of the shortest duct run. Separate measurement shall be made for the various combinations, types and sizes.

110-4.2 Split duct shall be measured and paid for by the individual linear foot. For example 25 feet of 1 way 4” split duct would be paid as 25 linear feet of 4” split duct. 25 feet of 4 way 4” split duct would be paid for as 100 linear feet of 4” split duct. Inner duct will be measured by the linear foot.

110-4.3 Inner duct shall be paid by the linear foot of inner duct installed without regard for individual MaxCell sizes. For example, installation of one MaxCell 4” 3 cell #MxC4003GR

Naples Municipal Airport
Water Management System Improvement
and Taxiway “A” Extension
January, 2013
Errata-53
and one MaxCell 3" 3 cell #MXC3456RD in 100 linear feet of duct would result in the Contractor being paid for 200 linear feet of inner duct.

**110-4.4** Base Can Drain Wells shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

Under **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. Duct shall be paid for within the multi-way combinations provided in the pay items. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary including but not limited to, duct, couplings, elbows, end bells, inner duct, spacers, concrete, rebar, pavement reinforcement mesh, detectable warning tape, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required to complete this item in accordance with the provisions and intent of the Contract Documents and to the satisfaction of the Engineer.

**110-5.2** No separate payment will be made for directional bore duct. Directional bore duct shall be considered a component part of the respective L-110 concrete encased duct pay item.

**110-5.3** Payment will be made at the contract unit price per linear foot for inner duct installed in accordance with the Contract Documents.

**110-5.4** Split duct work includes all materials, supervision, labor, transportation and services required to hand excavate existing utilities, adjust to new grade, furnish and install concrete encased split duct, excavation, backfill, site restoration and all incidentals required to provide complete utility protection to the satisfaction of the Engineer.

**110-5.5** The accepted quantity of base can drain wells shall 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 as may be required to complete the item as shown in the Contract Documents and for all labor, equipment, tools and incidentals necessary to complete the item, including but not limited to dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item in conformance with the Contract Documents.

**A.** Payment will be made under:

- Item L-110-1 1 Way 2" Schedule 40 PVC Direct Buried Duct -- per Linear Foot (LF)
- Item L-110-2 1 Way 2" Schedule 40 PVC Concrete Encased Duct -- per Linear Foot (LF)
- Item L-110-3 2 Way 4" Schedule 40 PVC Concrete Encased Duct -- per Linear Foot (LF)
- Item L-110-4 1 Way 4" PVC Split Duct Concrete Encased -- per Linear Foot (LF)
AC ITEM | CHANGE
---|---
L-111 | A section entitled **ITEM L-111 AIRFIELD ELECTRICAL INSTALLATION TESTING** is added as this is not covered under the FAA Standard Specifications.
L-125 | A section entitled **ITEM L-125 INSTALLATION OF AIRFIELD LIGHTING SYSTEMS** is added as this is not covered under the FAA Standard Specifications.
L-131 | A section entitled **ITEM L-131 DEMONSTRATIONS, TESTS AND PERFORMANCE VERIFICATION** is added as this is not covered under the FAA Standard Specifications.
This page intentionally left blank