

provided by the Contractor for the 24-hour per day closures, night closures, and weekend closure work.

Stand-by equipment may only be used to replace broken equipment during a work period. The Contractor shall properly repair or replace broken equipment before being allowed to proceed with the next work period. Broken equipment must be repaired or removed from the work area within 30 minutes and replaced with stand-by equipment.

The Contractor shall submit a listing and description of all regular and standby equipment that will be provided for production paving. The list shall include all equipment, by number, type, size, and manufacturer to the Engineer for acceptance. This submittal will be paid for under the mobilization pay item.

Should Contractor fail to have adequate standby equipment in place at beginning of each phase or daily shift, Owner may, at its sole discretion, refuse to allow Contractor access to the Runway. Said denial shall only be lifted when Contractor provides adequate standby equipment. Contractor shall not be entitled to additional time to compensate for lost time due to inadequate standby equipment being available.

EXECUTION

102-3.1 GENERAL INFORMATION.

- a. All Contractors will comply with the following:
 1. All applicable Occupational Safety and Health Administration (OSHA), Federal Aviation Administration (FAA), Federal Aviation Regulations (FAR), Transportation Security Administration (TSA) Part 1542, Department of Transportation (DOT), Airport Ordinances, Federal, State, and Local safety standards.
 2. Other reasonable safety rules and practices as may be established from time to time by the Fort Lauderdale Executive Airport.
- b. In compliance with FAA AC 150/5370-2F, or current edition as of bid date, the Contractor shall prepare a Safety Plan Compliance Document (SPCD). This document shall include a general statement by the Contractor that he/she has read and will abide by the CSPP. Any details not identifiable for the CSPP should be included within the SPCD. The SPCD is similar to the CSPP but shall not contain duplicate information. The contractor must submit the SPCD to the Fort Lauderdale Executive Airport for approval prior to the issuance of the NTP. The SPCD shall include but not be limited to the following Checklist as applicable to the scope of the project:
 1. **Coordination.** Discuss details of proposed safety meetings with the Airport and with contractor employees and subcontractors.
 2. **Phasing.** Discuss proposed construction schedule elements, including:
 - i. Duration of each phase.
 - ii. Daily start and finish of construction, including "night only" construction.

- iii. Duration of construction activities during:
 - 1. Normal runway operations.
 - 2. Closed runway operations.
 - 3. Modified runway "Aircraft Reference Code" usage.
- 3. **Areas and operations affected by the construction activity.** These areas and operations should be identified in the CSPP and should not require an entry in the SPCD.
- 4. **Protection of NAVAIDS.** Discuss specific methods proposed to protect operating NAVAIDS.
- 5. **Contractor access.** Provide the following:
 - i. Details on how the Contractor will maintain the integrity of the Airport security fence (contract security officers, daily log of construction personnel, and other).
 - ii. Listing of individual requiring driver training (for certificated airports and as requested).
 - iii. Radio communications.
 - 1. Airport Operations will communicate with the Air Traffic control tower.
 - 2. Types of radios and backup capabilities.
 - 3. Who will be monitoring radios.
 - 4. Details on how the contractor will escort material delivery vehicles.
- 6. **Wildlife management.** Discuss the following:
 - i. Methods and procedures to prevent wildlife attraction.
 - ii. Wildlife reporting procedures.
- 7. **Foreign Object Debris (FOD) management.** Discuss equipment and methods for control of FOD, including construction debris and dust.
- 8. **Hazardous material (HAZMAT) management.** Discuss equipment and methods for responding to hazardous spills.
- 9. **Notification of construction activities.** Provide the following:
 - i. Contractor points of contact.
 - ii. Contractor emergency contact.
 - iii. Listing of tall or other requested equipment proposed for use on the airport and the time frame for submitting 7460-1 forms not previously submitted by the Airport operator.
- 10. **Inspection requirements.** Discuss daily (or more frequent) inspections and special inspection procedures.
- 11. **Underground utilities.** Discuss proposed methods of identifying and protecting underground utilities.
- 12. **Penalties.** Penalties should be identified in the CSPP and should not require an entry in the SPCD.
- 13. **Special conditions.** Discuss proposed actions for each special condition identified in the CSPP.
- 14. **Runway and taxiway visual aids.** Including marking, lighting, signs and visual NAVAIDS. Discuss proposed visual aids including the following:
 - i. Equipment and methods for covering signage and airfield lights.
 - ii. Equipment and methods for temporary closure markings (paint, fabric, other).
 - iii. Types of temporary Visual Guidance Slope Indicators (VGSI).
- 15. **Markings and signs for access routes.** Discuss proposed methods of demarcating access routes for vehicle drivers.

16. **Hazard marking and lighting.** Discuss proposed equipment and methods for identifying excavation areas.
 17. **Protection of runway and taxiway safety areas.** Including object free areas, obstacle free zones, and approach/departure surfaces. Discuss proposed methods of identifying, demarcating, and protecting airport surfaces including:
 - i. Equipment and methods for maintaining Taxiway Safety Area standards.
 - ii. Equipment and methods for separation of construction operations from aircraft operations, including details of barricades.
 18. **Other limitations on construction** should be identified in the CSPP and should not require an entry in the SPCD.
- c.** The Safety Program, including the SPCD, shall be submitted to the Fort Lauderdale Executive Airport for review.
- d.** Regular progress meetings will be conducted during construction. Part of the meeting will be dedicated to safety. During these meetings, the Contractor shall submit to the Fort Lauderdale Executive Airport the following safety information:
1. Estimated man-hours worked from the previous period;
 2. Number of near misses from the previous period;
 3. Number of accidents from the previous periods;
 4. Number of recordable injuries from the previous period; and
 5. Summarization of any accident that took place from the previous period.
- e.** In estimating the work involved in the Contract, the Contractor shall be familiar with all existing and limiting conditions that will or may have a bearing on the performance of the Contract with regard to safety. Any limiting conditions shall be identified in writing.
- f.** All costs related to the required Safety Program shall be included in the Contractor's bid. Costs provided to administer and maintain the Safety Program shall be complete and shall include costs for all required personnel, activities, facilities, media, tools, drug testing, and any specialty equipment required to ensure a comprehensive, qualified Safety Program to suit a per week/per shift basis.
- g.** Prior to mobilization the Contractor shall complete a Contractor Employee Review of the Contractor Safety Guidelines. This document shall be kept on site and updated for every new employee who will work on the project.
- h.** Authorized Movement Area routes will be determined by the City. The Contractor shall not enter or cross any open runway or taxiway without an authorized escort. Non-compliance will result in removal of the violator from the job site and the violator's Airport Identification Badge will be confiscated. Emergencies and operating conditions may necessitate sudden changes, both in Airport operations and in the operations of the Contractor. Aircraft operations shall always have priority over any and all of the Contractor's operations. Should runways or taxiways be required for the use of aircraft and should Airport Operations, the Control Tower, or the Airport Engineer deem the Contractor to be too close to active runways or taxiways the Contractor shall suspend his

operations, remove his personnel, plant, equipment, and materials to a safe distance and stand by until the runways and taxiways are no longer required for use by aircraft. There will be no compensation for delays or inefficiencies due to these changes.

- i. Throughout the duration of the Contract, any practice or situation that the Airport Engineer determines to be unsafe or a hindrance to regular Airport operations shall be immediately rectified.
- j. Prior to commencement of construction activity, the Contractor shall notify in writing, at least 72 hours in advance, Airport Operations and the Airport Engineer of its intentions to begin construction, stating the proposed time, date, and area of which construction is to occur in order for the appropriate Notice-to-Airmen (NOTAM) to be issued. During the performance of this Contract, the Airport facility shall remain in use to the maximum extent possible. The Contractor shall not allow employees, subcontractors, suppliers, or any other unauthorized persons to enter in any Airport area which may be open for aircraft use.
- k. Should, in the opinion of the City, any problem or hazard arise during construction, the Contractor shall immediately rectify/correct the problem or hazard to the satisfaction of the City and the Fort Lauderdale Executive Airport:

102-3.2 CONTRACTOR REQUIREMENTS.

- a. All persons entering the project area designated as the construction site shall strictly follow OSHA, FDEP, FAA, DOT, and TSA regulations.
- b. The Contractor shall provide physical barriers along the perimeter of its work site and place signs identifying the area as a construction site. In some cases where the general public or open airfield is to be protected, additional and/or specialty barriers might be required and will need to be determined by the Airport.
- c. If used, the Contractor shall submit an FAA Form 7460-1 at least 60 days prior to any crane erections. All construction involving cranes shall further be coordinated at least 72 hours in advance, excluding weekends, with the FXE Airfield Operations Department. This does not include the time required for airspacing. The following information and actions are required:
 - 1. Location of the Crane.
 - 2. Maximum extendable height.
 - 3. Hours of operation.
 - 4. The top of each crane boom shall be marked by a 3' x 3' orange and white checkered flag — each box being 1' square.
 - 5. Each crane shall be lowered at night and during periods of poor visibility as directed by Airport Operations. In the event the crane is approved to remain extended during the hours from sunset to sunrise, the highest point of the crane boom will be lit with a red obstruction light in accordance with AC 70/7460-1.
- d. These established safety requirements shall govern Contractors and all persons within the designated construction site and are outlined to avoid infractions of common accepted safety practices.

- e. These safety requirements shall not be construed as complete and any requirements of the guidelines in conflict with OSHA and FAA shall be superseded by OSHA or FAA regulations.
- f. Any individual failing to follow these safety requirements will be directed by the Contractor to immediately abate the unsafe act, behavior, or equipment.
- g. All Contractor equipment brought onsite for use on or during the construction project shall be kept in a safe operating condition. Worn or damaged equipment shall be repaired, replaced or taken out of service (locked out) and removed from the job site.
- h. Contractor shall keep its work area in a clean and safe condition.
- i. The use of makeshift, defective or inadequate scaffolding, rigging, or staging is prohibited.
- j. Contractor shall verify and assure that every employee who operates any mobile equipment on Airport properties shall have a current valid driver's license.
- k. The Contractor shall comply with the National Electric Code (NEC) requirements regarding ground fault circuit interrupters for construction field tools and equipment.
- l. The Contractor shall maintain a Safety Program, for the purpose of safety, security, orientation, education, training, enforcement, and distribution.
- m. If a fire line or any type of fire suppression service is going to be taken out of service, the Contractor must coordinate with the City's Fire Marshal or a designated representative from the Fire Department at least three days in advance. In addition, the contractor shall complete an impairment notification to the insurance carrier.
- n. Contractor will provide all lighted, low profile, water or sand filled, taxiway/runway barricading.
- o. If working on the AOA, the Contractor will be required to prepare an FAA Safety Plan Compliance Document (SPCD) that is a part of the Safety Program.
- p. Employees shall not operate any equipment or vehicles more than 16 hours consecutively.

102-3.3 HAZARDOUS MATERIALS.

- a. Hazardous materials can be easily identified using the U.S. Department of Transportation (DOT) labeling and identification system. All hazardous materials arriving on site shall be properly labeled, stored, and managed as required by the Material Safety Data Sheet (MSDS) for that material.
- b. Contractors and Subcontractors are required to have copies of all MSDS's for all materials brought on site.
- c. Contractor to immediately report spills to Airport Operations.

102-3.4 VEHICLE OPERATION ON AIRPORT OPERATIONS AREA (AOA).

- a.** All vehicles that enter the AOA shall comply with the following:
- b.** All vehicles accessing the AOA shall be placarded with a company name and logo or some other approved form of identification.
- c.** All vehicles shall be limited to the perimeter service road, paved leasehold areas and/or construction areas unless specifically authorized by Airport Operations.
 - 1. All construction vehicles/mechanized equipment authorized within the Movement Area or related safety areas shall be marked with a flag on a staff attached to the uppermost portion of the vehicle/motorized equipment or an amber beacon so that the flag or beacon will be readily visible. The flag shall be at least a 3' x 3' square having a checkered pattern of international orange and white squares at least 1' on each side in accordance with FAA Advisory Circular 150/5210-5.D, or current edition as of bid date. The amber beacon will be as described in this specification.
 - 2. During nighttime hours, all equipment operating on the Airport exceeding 15 feet in height shall be lit with a red obstruction light in accordance with FAA Advisory Circular 70/7460-1, or current edition as of bid date. This light is to be located on the uppermost portion of the equipment.
 - 3. All construction equipment that exceeds 20 feet in height are required to be reviewed by the FAA for conformance with Part 77. This will require the submission of FAA form 7460-1 (submitted at: <http://oeaa.faa.gov>) and receipt of a "determination of no hazard to air navigation". The Contractor is also required to notify Airport Operations so that staff may issue any required NOTAMs.
- d.** Contractor utilized bicycles, motorcycles and two-wheeled scooters are prohibited on the AOA.
- e.** Vehicle(s)/equipment shall be operated in a manner that does not interfere with aircraft operations. All vehicle(s)/equipment shall yield right of way to all aircraft and emergency vehicles.
- f.** Vehicles/mechanized equipment operators shall obey all traffic signs and markings.
- g.** Vehicles/equipment shall not stop or be parked so as to block a driveway, AOA access gate, fire lane or aircraft
- h.** Vehicles/equipment shall not stop or be parked in areas other than those prearranged and approved by Airport Operations.
- i.** No equipment or vehicles may be parked within six feet of an AOA fence.
- j.** The established speed limit on the Ramp and AOA is 15 mph.
- k.** Vehicle(s)/equipment shall not be operated by individuals under the influence of any substance which impairs the ability to do so in a safe manner

- l.** If an incident occurs on the AOA, the incident shall be reported immediately to Airport Operations. The Contractor is still obligated to produce its own incident report to be submitted to the Airport upon request. The Contractor is required to submit an incident report no later than 24 hours after the incident.
- m.** Vehicle/mechanized equipment operators are not permitted to move about the Airport, outside the designated construction area, at night unless the vehicle has operating head lights, tail lights and brake lights, or is under the escort of a properly lighted vehicle. Head lights shall not be set on high beam when moving about the Airport at night.
- n.** Vehicles/mechanized equipment authorized on the Movement Area (runways, taxiways, and ramps) and/or associated safety areas shall be equipped with an electrically powered, amber color, 360-degree omni-direction light, mounted on the vehicle such that it is conspicuous from any direction.
- o.** At no time shall a vehicle enter the Movement Area and/or associated safety areas unless it is authorized by Airport Operations.
- p.** Seat belts shall be utilized on equipment/vehicles that are designed for usage.
- q.** The Airport may remove and impound, at the owner's expense, any vehicle/equipment which is disabled, abandoned, improperly parked, or represents an operational hazard
- r.** All vehicles/equipment shall be appropriately secured such that neither aircraft blast nor wind will result in their movement.

102-3.5 AOA CONTRACTOR ESCORTS AND FLAGGING.

- a.** The Contractor shall provide an adequate number of escorts/flaggers for material deliveries along haul routes and the movements of the Contractor's vehicles/mechanized equipment and personnel within the Movement Area and Non-Movement Areas as authorized by Airport Operations.
- b.** During any absence of the approved escort(s)/flagger(s) or for periods that they are unable to perform their specified duties, all work within the Movement Area and associated safety areas for projects shall stop. Additionally, all personnel and equipment shall be escorted to approved locations outside the Movement Area and related safety areas. **NO** contract time extension will be granted for time lost due to the absence of escort(s). Work shall resume only with the return of the approved escort(s).
- c.** The escort/flagger shall ensure that all equipment maintains proper clearances from moving aircraft.
- d.** For flaggers/escorts contracted through the Airport, the Contractor shall be responsible for the cost of each required flagger/escort.

102-3.6 SPECIAL CONSTRUCTION RULES ON THE AOA.

- a. When airfield construction is being performed on the AOA the following rules will apply unless modified in writing by Airport Operations.
- b. All construction activities on the AOA shall include a specific Construction Safety Phasing Plan (CSPP) and a Safety Plan Compliance Document (SPCD) as required by the FAA. The SPCD will address compliance to and details required by the CSPP and include any other topics of discussion that might be mentioned during the safety phase planning meeting.
- c. The safety phase planning meeting shall be held prior to mobilization to the AOA.
- d. Any Airport construction and/or alteration requires the Contractor to complete and submit FAA Form 7460-1 Notice of Proposed Construction or Alteration (available from the FAA Air Traffic Division Regional Office), and www.FAA.gov at least 60 days prior to the start of the project.
- e. The Contractor shall complete and submit FAA Form 7460-1 for all equipment and/or temporary structures, utilized during any Airport construction and/or alteration that exceeds a height of 20 feet above ground level. This includes
 - 1. Cranes;
 - 2. Derricks;
 - 3. Stockpiles of materials or equipment; and
 - 4. Earthmoving equipment.
- f. A copy of all completed FAA Form 7460-1's and the FAA's determination(s) shall be on file with the Airport prior to commencing the erection or construction of the item(s) proposed by the Contractor. The Contractor will provide Airport Operations with the FAA determination number, for internet review, or paper copy of the full determination.
- g. The Contractor shall erect and maintain fencing, barricades, signs and warning devices used to delineate the perimeter of all construction areas, as approved by the Airport Airfield Operations.
- h. All escorts performed within the Movement Area and/or associated safety areas, shall be provided by an authorized Escort.
- i. Deliveries are to be strictly controlled (by the Contractor) using personnel specifically acquainted with these rules. The Contractor shall provide properly manned escort vehicles as required to guide and escort all deliveries to the Work Area(s).
- j. At no time shall personnel, vehicles or equipment be located or enter any of the following areas unless authorized by Airport Operations.
 - 1. Within 250 feet parallel to an active runway centerline (to be indicated on the CSPP and/or SPCD).
 - 2. Within 400 feet parallel to an active runway centerline without equipment and stockpile removal.

3. Within 1,000 feet of the end of active runways (each end to be indicated in the CSPP and/or SPCD)
 4. Within 93 feet parallel to an active taxiway centerline without proper approval.
 5. Active NAVAID Critical Areas.
 6. On the Movement Area and/or associated safety areas during times of inclement weather or unusual events as determined by Airport Operations. During such times all work is to be suspended. All equipment shall be removed to approved staging areas
- k.** Trenches and/or Excavations Trenches and/or excavations shall not be allowed in the following areas without closure or restriction of the adjacent Movement Area:
1. Within 250 feet parallel to a runway centerline.
 2. Within 400 feet parallel to a runway centerline, without proper trench and excavation cover.
 3. Within 93 feet parallel to a taxiway centerline without proper approval.
 4. Within 1,000 feet of the end of a runway.
 5. Active NAVAID Critical Areas.
- l.** All stockpiled material(s)/supplies shall be constrained in a manner to prevent movement resulting from aircraft blast or wind conditions. Material(s)/supplies shall not be stored within 500 feet of aircraft turning areas or movement areas. Stockpiled material(s)/supplies shall not exceed 15 feet in height unless the Contractor has complied with all requirements for airspace review and secured approval from Airport Operations. All material(s)/supplies shall be positioned so it will not obstruct the line of sight from the Control Tower to the Movement Area. Marking and lighting shall be in accordance with the requirements contained in Barricade Details Checklist.
- m.** Stockpile material will not be permitted within 6 feet of an AOA fence.
- n.** Debris, waste, and loose materials shall not be allowed on the Movement Area. If debris and/or loose materials are observed to be on active portions of the Movement Area, the Contractor will be responsible for correcting the discrepancy immediately. At the direction of Airport Operations, debris problems occurring during construction, NOT corrected by the Contractor in a timely manner, will be corrected by the Airport at the Contractor's expense. The Contractor is responsible for controlling dust problems resulting from construction and clean-up processes, as defined by Airport Operations or the Fort Lauderdale Executive Airport Engineering Division, resulting from construction and clean up processes.

102-3.7 CONSTRUCTION SITE ACCESS AND HAUL ROADS.

The Contractor will not be permitted to use any access or haul roads other than those designated on the Contract Drawings. The Contractor shall submit specific proposed ingress and egress routes associated with specific construction activities to the City for evaluation and approval prior to commencing construction activities. Aircraft Rescue and Fire Fighting (ARFF) right-of-way on access roads, haul roads, taxiways, and runways shall not be impeded at any time.

102-3.8 CONSTRUCTION NEAR NAVIGATIONAL AIDS.

Construction materials and equipment shall not be placed or parked where they may interfere with the line-of-sight of the Air Traffic Control Tower (ATCT) and navigational aids in operation. The City shall determine if any materials or equipment will cause any type of interference.

102-3.9 FINES

Contractor will be required to pay fines assessed by or to the Fort Lauderdale Executive Airport for the following:

- a. Environmental penalties or fines resulting from non-compliance with local, state or federal regulations or requirements.
- b. FXE, FAA or TSA fines for airport security violations.
- c. FXE or FAA fines for runway incursions defined as “any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and take-off of aircraft.”
- d. FXE or FAA fines for operating on an active taxiway without proper clearance.

METHOD OF MEASUREMENT

- 102-4.1** Measurement for payment shall be the work under this Section completed and accepted in accordance with the Plans and these Specifications airport safety and maintenance of air operations area traffic requirements. Including but not limited to the completed and accepted Safety Plan Compliance Document.
- 102-4.2** Measurement of temporary fences for owl/tortoise nests for payment shall be the number of fences completed and accepted in accordance with the Plans and these Specifications.

BASIS OF PAYMENT

102-5.1 Payment for the work measured as described shall be made at the contract lump sum price bid for airport safety and maintenance of traffic, which prices and payments shall be full compensation for the work described in this section. Including but not limited to the completion and acceptance of the Safety Plan Compliance Document. Forty percent of the amount bid will be paid with the first estimate after the item is completely furnished and operational to the City's satisfaction. The remaining sixty percent will be prorated and paid with each application for payment based on the percent of contract completion. ***All barricades and their related costs shall be covered under the Airport Safety and MOT Pay Item.***

102-5.2 Payment for temporary fences for owl/tortoise nests shall be made at the contract price per each fence, which prices and payments shall be full compensation for furnishing all materials, equipment, labor, processes, tools, and incidental costs required to complete the work under this item.

Payment will be made under:

Item S-102-5.1	Airport Safety and Maintenance of Traffic - per lump sum
Item S-102-5.2	Temporary Fence for Owl/Tortoise Nests – per each

END OF ITEM S-102

ITEM S-103 PROJECT SURVEY AND STAKEOUT

DESCRIPTION

103-1.1 GENERAL. Under this item, the Contractor shall perform all necessary surveying and project stakeout required to construct all elements of the Project as shown on the Contract Drawings and specified in the Specifications. This shall include but not be limited to stakeout, layout and elevations for pavements, structures, forms and appurtenances as shown and required, consistent with the current practices and shall be performed by a State of Florida licensed professional land surveyor. The pre-construction and stakeout surveys shall proceed immediately following the Notice to Proceed or as soon as authorized by the Airport Staff in accordance with the phasing of the construction and shall be expeditiously progressed to completion in a manner and at a rate satisfactory of the City. The Contractor shall keep the Resident Project Representative (RPR) fully informed as to the progress of the stakeout survey.

All survey work shall be provided under the responsible care of a State of Florida licensed professional land surveyor.

MATERIALS

103-2.1 All instruments, equipment, stakes and any other material necessary to perform the work satisfactorily shall be provided by the Contractor. It shall be the Contractor's responsibility to maintain these stakes in their proper position and location at all times.

CONSTRUCTION METHODS

103-3.1 The Contractor shall trim trees, brush, roots and other interfering objects from survey lines in advance of all survey work to permit accurate and unimpeded work by his stakeout survey crews.

The exact position of all work shall be established from control points, baseline transit points or other points of similar nature which are shown on the Contract Drawings and/or modified by the Engineer. Prior to any layout of works to be constructed, the Contractor shall verify the location and accuracy of all control points provided in the plans. Any error, apparent discrepancy or absence in or of data shown or required for accurately accomplishing the stakeout survey shall be referred to the RPR and Engineer for interpretation or furnishing when such is observed or required.

The Contractor shall place two offset stakes or references at each centerline full and half station and at such intermediate locations as the RPR may direct. From computations and measurements made by the Contractor, these stakes shall be clearly and legibly marked with the correct centerline full and half station number, offset and cut or fill so as to permit the establishment of the exact centerline location and elevation during construction. If markings become faded or blurred for any reason, the markings shall be restored by the Contractor at the request of the RPR. He shall locate and place all cut, fill, slope, fine grade or other stakes and points, as the Engineer may direct, for the proper progress of the work. All control points shall be properly guarded and flagged for easy identification.

Drainage structures shall be staked out by the Contractor at the locations and elevations shown on the Contract Drawings or specified by the Engineer through the RPR.

Reference points, baselines, stakes and benchmarks for stockpiles shall be established by the Contractor.

The Contractor shall be responsible for the accuracy of his work and shall maintain all reference points, stakes, etc., throughout the life of the Contract. Damaged or destroyed points, benchmarks or stakes, or any reference points made inaccessible by the progress of the construction, shall be replaced or transferred by the Contractor, with no additional or separate compensation paid to the Contractor. Any of the above points which may be destroyed or damaged shall be transferred by the Contractor before they are damaged or destroyed. All control points shall be referenced by ties to acceptable objects and recorded. Any alterations or revisions in the ties shall be so noted and the information furnished to the RPR immediately. All stakeout survey work shall be referenced to the centerlines shown on the Contract Drawings. All computations necessary to establish the exact position of the work from control points shall be made and preserved by the Contractor. All computations, survey notes and other records shall be made available to the RPR upon request and shall become the property of the City.

The Contractor shall furnish, at his expense, all horizontal and vertical control, all staking and layout of construction work called for on the plans. The RPR, Engineer, and City shall not be responsible for such work. However, the City and Engineer reserve the right to check all said lines, grades, and measurements with their appointed surveyor. Should the City's surveyor detect errors in said lines, grades, and measurements, the contractor shall pay for all said surveying costs and subsequent surveying costs performed to verify correction of errors found in said lines, grades and measurements. Definition of an error shall be a discrepancy of $\frac{1}{4}$ " or more. In the case of a discrepancy between the technical specifications and this defined tolerance, the more severe tolerance shall govern.

During the progress of the construction work, the Contractor will be required to furnish all of the surveying and stakeout incidental to the proper location by line and grade for each phase of the work. For paving and any other operation requiring extreme accuracy, the Contractor will re-stake with pins or other acceptable hubs located directly adjacent to the work at a spacing directed by the RPR.

Any existing stakes, iron pins, survey monuments or other markers defining property lines which may be disturbed during construction shall be properly tied into fixed reference points before being disturbed and accurately reset in their proper position upon completion of the work.

Just prior to completion of the Contract, the Contractor shall reestablish, if necessary, and retie all control points as permanently as possible and to the satisfaction of the RPR.

103-3.2 AS-BUILT SURVEY.

103-3.2.1 PRE-CONSTRUCTION SURVEY. During the mobilization period, prior to the initiation of the project stakeout survey, the Contractor will perform a topographic survey of the project's existing conditions. This survey must be procured independently from the Engineer's survey. Upon its completion this survey it will be submitted, via a digital terrain model (DTM), to the Engineer for review. The Contractor will not be permitted to commence construction until such time as the Pre-construction survey is determined by the Engineer to be in reasonable close conformity to their design survey. Any delays in completing this process will be borne solely onto the Contractor at no additional cost to the project.

103-3.2.2 POST EXCAVATION SURVEY. Upon the completion of any excavation, the Contractor will perform a topographic survey. A DTM will be submitted to the Engineer for review and determination of pre and post volume of excavation. The submission of the Contractor's DTM is a prerequisite for any earthwork payment.

103-3.2.3 POST EMBANKMENT SURVEY. Upon the completion of any embankment, the Contractor will perform a topographic survey. A DTM will be submitted to the Engineer for review and determination of pre and post volume of embankment. The submission of the Contractor's DTM is a prerequisite for any earthwork payment.

103-3.2.4 POST MILLING/LEVELING SURVEY. Within each phase, after milling and prior to installation of a superior asphalt course, the milled surface shall be reviewed by the RPR in the presence of the Contractor to determine the acceptability of the milled surface to receive the asphalt surface course. In the opinion of the RPR areas where delamination and/or scabbing is apparent it will be identified and marked on the surface to receive additional milling. Such areas shall be re-milled to a slightly deeper depth to produce a sound and textured surface at no additional expense. In such areas a leveling course shall be installed to permit a subsequent uniform surface course lift to achieve final grade. Leveling material due to delamination and/or scabbing shall be paid for under the Leveling Course Pay Item.

Areas over milled due to the negligence of the Contractor and not as a result of correcting delamination and/or scabbing shall be built up with leveling material. In such areas a leveling course shall be installed to permit a subsequent uniform surface course lift to achieve final grade. In such cases, the grade correction cost shall be borne by the Contractor.

After all leveling material is installed (per phase) the Contractor shall prepare a Post Milling/Leveling survey to the grid provided on the Paving Elevation Plans. The survey will provide elevations to the grid and delineate the limits of leveling due to delamination and/or scabbing. The survey shall be provided to the RPR ~~7 calendar days~~ prior to the installation of the asphalt surface and shall demonstrate that the prepared surface is ready to receive a uniform course(s) that will achieve final grade.

103-3.2.5 FINAL AS-BUILT SURVEY. Upon completion of the work, after Substantial Completion and before Final Acceptance, the Contractor shall supply to the RPR a complete as-built survey of the entire project site including but not limited to electrical elements, drainage structures and features, and utilities. All survey points, including horizontal and vertical control, property corners, section corner and reference (hereinafter referred to as "survey point") shall be clearly marked and referenced prior to construction. These survey points must be sufficiently referenced so that they can be reestablished after construction if they are disturbed. All survey data shall be state plane coordinates, NAD 83 datum and NAVD 88.

This as-built survey will be a complete topographic and physical features survey of the entire project site surrounded by the limits of construction plus an additional 10' beyond the limits of construction in all directions. Topographic data will be collected in the same orientation and grid as provided in the plans. If no grid is provided, the Contractor will collect topographic information on a 25' x 25' grid with appropriate additional data as needed to asbuilt the work performed. Elevations shall be obtained on all rigid pavement joint intersections and ends. If any work is performed outside the limits of construction for

any reason, this limit of survey will be increased to include this area plus 25'. This survey shall be collected, certified by, and performed under the responsible care of a Florida Licensed Professional Land Surveyor as meeting the minimum Technical Standards for topographic surveys as set forth in chapter 21HH-6, Florida Administrative Code. The survey data must be supplied as a signed and sealed drawing (22" x 34" maximum size) at a minimum scale of 1"=50' and be electronically submitted in AutoCad format, along with the digital terrain model (DTM). Signed and sealed copies of all field notes, sketches and calculations must be submitted concurrently with the as-built survey. Larger scale details shall be provided to clarify any complicated or complex areas. A separate point database file shall be electronically submitted in TXT or ASCII format, with each point on a single row with comma delimited columns with data ordered as follows: point number, northing, easting, elevation, description.

The as-built survey is to be supplied to the RPR for review and approval not more than thirty (30) calendar days after substantial completion for the project has been given. If the acceptable as-built survey is not supplied within the required time, the City reserves the right to perform the required survey and bill the Contractor for this work.

The as-built survey shall include all information needed to complete all project permit (i.e. SWFWMD, etc ...) as required by the permits and/or agencies standard requirements. A minimum of six (6) signed and sealed copies of the as-built survey will be supplied to the Engineer and RPR.

103-3.2.6 Datum. All survey data shall be state plane coordinates, North American Datum of 1983 (NAD 83) datum and North American Vertical Datum of 1988 (NAVD 88). Topographic data will be collected in the same orientation and grid as provided in the plans. If no grid is provided, the Contractor will collect topographic information on a 25' x 25' grid with appropriate additional data as needed to asbuilt the work performed. Survey shall be collected, certified by, and performed under the responsible care of a Florida Licensed Professional Land Surveyor as meeting the minimum Technical Standards for topographic surveys as set forth in chapter 21HH-6, Florida Administrative Code. The survey data must be supplied as a signed and sealed drawing (22" x 34" maximum size) at a minimum scale of 1"=50' and be electronically submitted in AutoCad format, along with the digital terrain model (DTM). Signed and sealed copies of all field notes, sketches and calculations must be submitted concurrently with the as-built survey. Larger scale details shall be provided to clarify any complicated or complex areas. A separate point database file shall be electronically submitted in TXT or ASCII format, with each point on a single row with comma delimited columns with data ordered as follows: point number, northing, easting, elevation, description.

METHOD OF MEASUREMENT

103-4.1 Payment will be made at the lump sum price bid for this item.

BASIS OF PAYMENT

103-5.1 The lump sum price bid shall include the cost of furnishing all labor, equipment, instruments and all other material necessary to satisfactorily complete the Project stakeout and as built survey. Seventy-five percent (75%) of this item will be paid based on the percentage of work paid for a month vs. the total project cost. The remaining twenty-five percent (25%) will be paid after

the as-built survey has been given the RPR and approved.

This item will not be increased or decreased base on changes to the total contract amount.

Payment will be made under:

Item S-103-5.1

Project Survey and Stakeout – per Lump Sum

END OF ITEM S-103

THIS PAGE INTENTIONALLY LEFT BLANK

ITEM S-205 TEMPORARY ACCESS ROAD

DESCRIPTION

205-1.1 This item consists of a temporary access road composed of lime rock base or milled asphalt constructed on a compacted subgrade in accordance with these specifications and in conformity to the dimensions and typical cross sections shown on the plans. Cost shall include establishing, maintaining, and restoring to the existing condition, including sodding, of the access road.

MATERIALS

205-2.1 AGGREGATE.

- a. **Lime rock base.** Aggregates for lime rock base will conform with Technical Specification P-211 *Lime Rock Base Course*.

Gradation requirements. The gradation will conform with Technical Specification P-211 *Lime Rock Base Course*.

- b. **Milled asphalt aggregates.** Aggregates shall consist of clean, sound, durable particles of milled asphalt and shall be free from coatings of clay, silt, vegetable matter, and other objectionable materials.

Samples of milled material shall be furnished by the Contractor at the start of production and at intervals during production. The sampling points and intervals will be designated by the Engineer. The samples will be the basis of approval of specific lots of aggregates from the standpoint of the quality requirements of this section.

Gradation Requirements. The gradation of the milled material shall contain no particles exceeding 2" in diameter, and shall be uniformly graded from coarse to fine.

CONSTRUCTION METHODS

205-3.1 PREPARING UNDERLYING SUBGRADE. The underlying subgrade shall be checked and accepted by the Engineer before placing and spreading operations are started. Any ruts or soft yielding places caused by improper drainage conditions, hauling, or any other cause shall be corrected at the Contractor's expense before the surface is placed thereon. The existing subgrade shall be graded to conform to the typical section in the plans and compacted to 98% of its maximum dry density (ASTM D1557).

205-3.2 PLACING. The lime rock material shall be obtained offsite and placed in accordance with specification P-211. The maximum depth of a compacted layer will be in accordance with the plans.

The milled material shall be placed on the moistened subgrade in layers of uniform thickness with a mechanical spreader. The maximum depth of a compacted layer shall be 8 inches (150 mm). If the total depth of the compacted material is more than 6 inches (150 mm), it shall be constructed in two or more layers. In multi-layer construction, the milled asphalt shall be placed in approximately equal-depth layers. The previously constructed layer should be cleaned of loose

and foreign material prior to placing the next layer.

205-3.3 COMPACTION. Immediately upon completion of the spreading operations, the material shall be thoroughly compacted. The number, type, and weight of rollers shall be sufficient to compact the material into a dense, unyielding, uniform mass having the specified density.

205-3.4 FINISHING. The surface of the road shall be finished by blading or with automated equipment especially designed for this purpose.

205-3.5 SURFACE TOLERANCES. The finished surface shall not vary more than 3/8 inch when tested with a 16-foot straightedge applied parallel with or at right angles to the centerline. Any deviation in excess of this amount shall be corrected by the Contractor at the Contractor's expense.

205-3.6 THICKNESS CONTROL. The completed thickness of the road will shall be within 1/2 inch of the design thickness. Where the thickness is deficient by more than 1/2 inch, the Contractor shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

205-3.7 MAINTENANCE. The road will be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the base course, provided no damage results and provided that the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

METHOD OF MEASUREMENT

205-4.1 The quantity of Access Road will not be measured in this project.

BASIS OF PAYMENT

205-5.1 No payment will be made. Cost is incidental to C-105 Mobilization.

MATERIALS AND TESTING REQUIREMENTS

STM D 698	Test for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-pound (2.49 kg) Rammer and 12 in (305 mm) Drop
ASTM D 1556	Test for Density of Soil In Place by the Sand-Cone Method
ASTM D 1557	Test for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D 2167	Test for Density and Unit Weight of Soil In Place by the Rubber Balloon Method.
ASTM D 6938	In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods
ASTM D 3665	ASTM D 3665 Random Sampling of Construction Materials

END OF ITEM S-205

ITEM P-101 PREPARATION/REMOVAL OF EXISTING PAVEMENTS

DESCRIPTION

101-1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, ***hauling and disposal and stockpiling of demolished material*** and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

A portion of material milled from the runway will be used to construct service roads. The remainder of the material removed from the work areas is to be hauled off site. The Contractor is to coordinate with the airport staff to place millings for the service roads. The hauling and placement process is to be incidental to the unit price of the removal of the material and is to be conducted at no additional cost to the owner.

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

~~**a. Concrete pavement removal.** Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size of **one cubic foot**. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.~~

~~The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Spall and underbreak repair shall be in accordance with the plans. Any underlaying material that is to remain in place, shall be recompacted and/or replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at the Contractor's expense.~~

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the ***depths at the locations shown on the plans. The underlying material adjacent to the edge of and***

under the existing pavement which is to remain in place shall be protected from damage or disturbance during removal operations and until placement of new pavement or shaped as shown on the drawings or as directed by the RPR. Any material under the portion of the pavement to remain in place, which is disturbed or loses its compaction shall be carefully removed and repaired at no additional cost to the Owner. The Contractor's removal operation shall not cause damage to cables, utility ducts, pipelines, or drainage structures under the pavement. Any damage shall be repaired at the Contractor's expense. full depth of the asphalt pavement around the perimeter of the area to be removed. If the material is to be wasted on the airport site, it shall be broken to a maximum size of 3 inches(mm). All asphalt pavement removal is to be hauled off site and disposed of in accordance with local, state, and federal requirements.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

~~**d. General.** In all cases of full depth pavement removal, the Contractor shall protect and preserve the existing underdrain pipes and clean outs that are to remain. There shall be no additional cost for protecting and preserving the existing underdrain system to remain.~~

~~**e.** In areas that call for Asphalt Pavement Surface Removal, the asphalt shall be removed from the existing base while preserving the existing base. Any damage to the base that causes the base to be removed and replaced will be corrected at no additional cost to the Owner.~~

~~**f.** Concrete foundation removal is to include the removal of all rebar and other reinforcement elements. These items are to be considered incidental to the Concrete Removal Pay Item.~~

g. Asphalt Removal and Partial Lime Rock Removal will remove the asphalt from the base and then a variable depth of base as described in the plans. If the Contractor removes more base, then specified in the plans, the embankment used to bring the area to grade is to be installed at no additional cost to the Owner.

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. Remove all vegetation and debris from cracks to a minimum depth of 1 inch (25—mm). If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than 1/4 inch (6 mm) wide) with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch (3 mm), not to exceed 1/4 inch (6 mm). Any excess joint or crack sealer shall be removed from the pavement surface. ***There will be no separate payment for crack sealant, all crack sealants will be incidental to the Pavement Milling Pay Item.***

101-3.3 Removal of Foreign Substances/contaminates prior to overlay, seal-coat or remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, ***refer to Item P-620 for paint removal*** at least 90% of paint, and other foreign substances from

the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

Rotary grinding ~~may be used~~ **is the only acceptable method of removing foreign substances/contaminates**. ~~If chemicals are used, they shall comply with the state's environmental protection regulations.~~ **The use of chemicals will not be permitted to be used to remove foreign substances/contaminates.** Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch (3 mm) deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. ~~Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense.~~ **High-pressure water or water blasting will not be permitted to be used to remove foreign substances/contaminates.** No material shall be deposited on the pavement shoulders. All wastes shall be disposed of **offsite** ~~in areas indicated in this specification or shown on the plans.~~

101-3.4 Concrete spall or failed asphaltic concrete pavement repair.

a. **Repair of concrete spalls in areas to be overlaid with asphalt.** The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The perimeter of the repair shall be saw cut a minimum of 2 inches (50 mm) outside the affected area and 2 inches (50 mm) deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches (100 mm) in depth. This method of repair applies only to pavement to be overlaid.

b. **Asphalt pavement repair.** The Contractor shall repair all spalled **asphalt** concrete as ~~shown on the plans or as directed by the RPR~~ **directed by the Airport staff**. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. Materials and methods of construction shall comply with the applicable sections of these specifications.

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. **A portion of the millings shall be used to construct temporary services roads.** All **other** millings shall be removed and disposed off Airport. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense. **All existing utility structures within the milling area shall be preserved and protected throughout construction. Any damage to the exiting utility structures shall be repaired at the cost of the Contractor. Where the limits of milled pavements abut pavement to remain, the contractor shall neatly sawcut, vertically to the specified depth of overlay in accordance with the details on the plans. In areas that**

become overmilled due to poor quality control, the Contractor fill with leveling course at no additional cost to the Owner.

Preparation for temporary asphalt transition wedges between phases and their subsequent removal are to be paid for by the Max 2" Milling Pay Item.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. ~~The RPR shall layout the area to be milled with a straightedge in increments of 1-foot (30 cm) widths. The area to be milled shall cover only the failed area.~~ Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall be repaired by the Contractor at the Contractor's Expense.

b. Profiling, grade correction, or surface correction. The milling machine shall have a minimum width of 7 feet ~~([2-3] m)~~ and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and -1/4 inch ~~(+0 mm and -6mm)~~ of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to remove the millings or cuttings from the pavement and load them into a truck. All millings shall be removed and disposed of off the airport.

At the completion of milling, the RPR shall review the milled surface for scabbing or excessive smoothness. Such areas shall be scarified or re-mill to a slightly deeper depth to produce a sound and textured surface at no additional expense.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property.

~~d. Crack Sealing The RPR or Engineer will review the milled surface for cracks in need of sealing and provide limits to the contractor to conduct crack sealing as per the Crack Sealing Pay Item~~

101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment. Existing asphalt pavements to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.

b. Repair joints and cracks in accordance with paragraph 101-3.2.

c. Remove oil or grease that has not penetrated the asphalt pavement by scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

d. Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

~~**101-3.8 Preparation of Joints in Rigid Pavement prior to resealing.** Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.~~

~~**101-3.8.1 Removal of Existing Joint Sealant.** All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch (2 mm) from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry.~~

~~**101-3.8.2 Cleaning prior to sealing.** Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.~~

~~**101-3.8.3 Joint sealant.** Joint material and installation will be in accordance with Item P-605.~~

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the pavement.

101-3.9.1 Preparation of Crack. Widen crack with router random by removing a minimum of 1/16 inch (2 mm) from each side of crack. Immediately before sealing, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

101-3.9.2 Removal of Existing Crack Sealant. Existing sealants will be removed by routing. Following routing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

101-3.9.3 Crack Sealant. Crack sealant material and installation will be in accordance with Item P-605.

~~**101-3.9.4 Removal of Pipe and other Buried Structures.**~~

~~**a. Removal of Existing Pipe Material.** Remove the types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 95% of ASTM D1557 D698.~~

~~**b. Removal of Inlets/Manholes.** Where indicated on the plans or as directed by the RPR, inlets and/or manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to 95% of ASTM D1557, when outside of paved areas must be compacted to 95% of ASTM D698.~~

Method of Measurement

101-4.1 Pavement removal. The unit of measurement for **full depth** pavement removal shall be the number of square yards (~~square meters~~) removed by the Contractor. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation shall be incidental to pavement removal.

101-4.6 Cold milling. The unit of measure for cold milling shall be **specified depth** ~~inches~~ of milling per square yard (~~square meter~~). The location and average depth of the cold milling shall be as shown on the plans **and confirmed in the field by the RPR prior to the work beginning**. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling. **At the completion of milling, the RPR and Engineer shall review the milled surface for scabbing or excessive smoothness. Such areas shall be re-mill to a slightly deeper depth to produce a sound and textured surface at no additional expense.**

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item. **Full depth pavement removal thicknesses shown on the plans range from 10" to 24". Actual thickness may vary. The Contractor shall account for varying full depths in the unit cost of the bid. No additional compensation shall be made to the Contractor for full depth pavement removal for pavements having thicknesses greater than shown on the plans. Electrical cans and conduit (with or without encasement) within the limits of full depth pavement removal shall be considered incidental. Pavement tie-ins as shown on the contract drawings are considered incidental to full depth pavement removal.**

101-5.2 Bituminous Pavement Cold Milling. Payment shall be made at contract unit price per square yard of bituminous pavement milling. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item including off-site disposal of materials.

An As-Built survey taken by a Professionally Licensed Surveyor of the milled surface must be provided after the milling is completed to receive payment for the milling.

The milling required for the installation and removal of temporary asphalt transitions ramps shall not be measured separately but shall be considered incidental to the overall paving operation.

101-5.4 Sawcutting. All sawcutting alongside areas to be milled or fully removed is to be considered incidental to those pay items. There will be no additional payment for sawcutting.

- Item P-101-5.1 Full Depth Asphalt Pavement Removal – per Square Yard***
- Item P-101-5.2 Bituminous Pavement Milling (VARIABLE DEPTH, MAX 2 INCHES) –
per Square Yard***
- Item P-101-5.3 Bituminous Pavement Milling (MAX 4 INCHES) – per Square Yard***

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5380-6 Guidelines and Procedures for Maintenance of Airport Pavements.

ASTM International (ASTM)

ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied,
for Concrete and Asphalt Pavements

END OF ITEM P-101

THIS PAGE WAS INTENTIONALLY LEFT BLANK

ITEM P-151 CLEARING AND GRUBBING

DESCRIPTION

151-1.1 This item shall consist of clearing or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the plans or as required by the Resident Project Representative (RPR).

~~a. Clearing shall consist of the cutting and removal of all trees, stumps, brush, logs, hedges, the removal of fences and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required.~~

b. Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures **not identified under P-101**, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the RPR is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, **electrical duct bank concrete encasement**, and the disposal from the project of all spoil materials resulting from clearing and grubbing.

~~c. Tree Removal. Tree Removal shall consist of the cutting and removal of isolated single trees or isolated groups of trees, and the grubbing of stumps and roots. The removal of all the trees of this classification shall be in accordance with the requirements for the particular area being cleared.~~

CONSTRUCTION METHODS

151-2.1 General. The areas denoted on the plans to be cleared and grubbed shall be staked on the ground by the Contractor as indicated on the plans.

The removal of existing structures and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a telephone pole, pipeline, conduit, sewer, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall advise the RPR who will notify the proper local authority or owner to secure prompt action.

151-2.1.1 Disposal. All materials removed by clearing or by clearing and grubbing shall be disposed of outside the Airport's limits at the Contractor's responsibility, except when otherwise directed by the RPR. As far as practicable, waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed in accordance with requirements for formation of embankments. Any broken concrete or masonry that cannot be used in construction and all other materials not considered suitable for use elsewhere, shall be disposed of by the Contractor. In no case, shall any discarded materials be left in windrows or piles adjacent to or within the airport limits. The manner and location of disposal of materials shall be subject to the approval of the RPR and shall not create an unsightly or objectionable view. When the Contractor is required to locate a

disposal area outside the airport property limits, the Contractor shall obtain and file with the RPR permission in writing from the property owner for the use of private property for this purpose.

151-2.1.2 Blasting. Blasting shall not be allowed.

~~**151-2.2 Clearing.** The Contractor shall clear the staked or indicated area of all materials as indicated on the plans. Trees unavoidably falling outside the specified clearing limits must be cut up, removed, and disposed of in a satisfactory manner. To minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared. The Contractor shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut flush with the original ground surface. The grubbing of stumps and roots will not be required.~~

~~Fences shall be removed and disposed of as directed by the RPR. Fence wire shall be neatly rolled and the wire and posts stored on the airport if they are to be used again, or stored at a location designated by the RPR if the fence is to remain the property of a local owner or authority.~~

151-2.3 Clearing and grubbing. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials as indicated on the plans, shall be removed, except where embankments exceeding 3-1/2 feet (405 cm) in depth will be constructed outside of paved areas. For embankments constructed outside of paved areas, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off flush with the original ground and allowed to remain. Tap roots and other projections over 1-1/2 inches (38 mm) in diameter shall be grubbed out to a depth of at least 18 inches (0.5 m) below the finished subgrade or slope elevation.

Any buildings and miscellaneous structures that are shown on the plans to be removed shall be demolished or removed, and all materials shall be disposed of by removal from the site. The cost of removal is incidental to this item. The remaining or existing foundations, wells, cesspools, and like structures shall be destroyed by breaking down the materials of which the foundations, wells, cesspools, etc., are built to a depth at least 2 feet (60 cm) below the existing surrounding ground. Any broken concrete, blocks, or other objectionable material that cannot be used in backfill shall be removed and disposed of at the Contractor's expense. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes in embankment areas remaining after the grubbing operation shall have the sides of the holes flattened to facilitate filling with acceptable material and compacting as required in Item P-152. The same procedure shall be applied to all holes remaining after grubbing in areas where the depth of holes exceeds the depth of the proposed excavation.

METHOD OF MEASUREMENT

151-3.1 *No separate measurement for payment shall be made for the quantity of Clearing and Grubbing.*

BASIS OF PAYMENT

151-4.1 No payment will be made separately or directly for the Clearing and Grubbing. Cost will be incidental to P-152 Excavation, Subgrade, and Embankment.

END OF ITEM P-151

THIS PAGE INTENTIONALLY LEFT BLANK

ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 *All suitable material taken from excavation areas located on site shall be used in the formation of embankment, subgrade, and for back filling of areas as indicated on the project plans or as directed by the Resident Project Representative (RPR). No suitable material shall be removed from the site without the written approval of the RPR.*

152.1.3 *When the volume of the excavation of suitable material, soil group A-3 or better, exceeds that required to construct the embankments to the grades indicated, the excess shall be hauled off site and disposed of in accordance with all local, state, and federal laws. ~~stockpiled on the airport in the contractor's staging area or as directed by the RPR at no additional cost.~~ If the volume of excavation is not sufficient for constructing the embankment to the grades indicated from material within the project limits, whether moved by equipment or not, the deficiency shall be supplied from ~~off-site borrow locations supplied by the Contractor~~ on-site borrow with locations supplied by the Airport and RPR.*

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

b. Borrow excavation. Borrow excavation shall consist of approved material required for the construction of embankments or for other portions of the work in excess of the quantity of usable material available from required excavations. Borrow material shall be obtained from areas designated by the Resident Project Representative (RPR) within the limits of the airport property but outside the normal limits of necessary grading, or from areas outside the airport boundaries.

152-1.3 Unsuitable excavation. Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material suitable for topsoil may be used on the embankment slope ***outside of paved areas when approved by the RPR, otherwise it shall be removed from the airport at no additional cost*** when approved by the RPR.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared or cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the RPR. All unsuitable material shall be disposed of as described above, in waste areas as shown on the plans. All waste areas shall be graded to allow positive drainage of the area and adjacent areas. The surface elevation of waste areas shall be specified on the plans or approved by the RPR.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the RPR notified per Section 70, paragraph 70-20. At the direction of the RPR, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches (~~400 mm~~), to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches (~~400 mm~~) in their greatest dimension will not be permitted in the top 6 inches (~~150 mm~~) of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the RPR, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

a. Blasting. Blasting shall not be allowed.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the RPR has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and RPR shall agree that the original ground lines shown on the original topographic mapping are accurate, or agree to any adjustments made to the original ground lines.

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the RPR. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes as shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

The grade shall be maintained so that the surface is well drained at all times.

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the RPR. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the RPR shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

~~**b. Undercutting.** Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches (300 mm) below the subgrade or to the depth specified by the RPR. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be [disposed of at locations shown on the plans.] [disposed off the airport. The cost is incidental to this item.] This excavated material shall be paid for at the contract unit price per cubic yard (per cubic meter) for []. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans. Undercutting will be paid as [unclassified excavation] [rock excavation].~~

~~**c. Over-break.** Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the RPR. All over-break shall be graded or removed by the Contractor and disposed of as directed by the RPR. The RPR shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the RPR determines as avoidable. Unavoidable over-break will be classified as "Unclassified Excavation."~~

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet (60 cm) below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the RPR. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

152-2.3 Borrow excavation. There are no borrow sources within the boundaries of the airport property. The Contractor shall locate and obtain borrow sources, subject to the approval of the RPR. The Contractor shall notify the RPR at least 15 days prior to beginning the excavation so necessary measurements and tests can be made by the RPR. All borrow pits shall be opened to expose the various strata of acceptable material to allow obtaining a uniform product. Borrow areas shall be drained and left in a neat, presentable condition with all slopes dressed uniformly. Borrow areas shall not create a hazardous wildlife attractant.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the RPR. All necessary work shall be performed true to final line, elevation, and cross-

section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 Preparation of cut areas or areas where existing pavement has been removed. In those areas on which a subbase or base course is to be placed, the top 12 inches of subgrade shall be compacted to not less than 100% of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

Payment for materials removed, manipulated, and replaced in order to obtain the required depth of density shall be paid for under Unclassified Excavation or Embankment.

The Contractor shall achieve in-place field densities, for subgrade and embankments outside of areas to be paved, of 85% of maximum dry density as determined by ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort. In addition, subgrade and embankments outside of areas to be paved shall be firm and unyielding under heavy vehicle traffic as demonstrated by proof-roll with a dual axle vehicle, such as a fully-loaded water truck.

152-2.6 Preparation of embankment area. All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (~~150-mm~~) and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (~~300-mm~~) and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.7 Control Strip. The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (~~300-mm~~) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

152-2.8 Formation of embankments. The material shall be constructed in lifts as established in the control strip, but not less than 6 inches (150 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the RPR. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within $\pm 2\%$ of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The RPR will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with ASTM D698 or D 1557. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the **Contractor for QC** ~~the RPR for~~ every 1,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the RPR. **The RPR will conduct density tests as needed for QA.**

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted per paragraph 152-2.5.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches (100 mm) which shall be prepared for **sod in accordance with T-904** ~~or a seedbed in accordance with S-906.~~

The in-place field density shall be determined in accordance with ASTM D1556 or ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Contractor's laboratory shall perform all density tests in the RPR's presence and provide the test results upon completion to the RPR for acceptance. If the

specified density is not attained, the area represented by the test or as designated by the RPR shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches (400 mm) in their greatest dimensions will not be allowed in the top 12 inches (300 mm) of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the RPR and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the RPR.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet (60 cm) in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift shall not be constructed above an elevation 4 feet (4.2 m) below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in lifts, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.9 Proof rolling. The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. After compaction is completed, the subgrade area shall be proof rolled with a 15 ton Proof Roller with tires spaced not more than 32 inches (0.8 m) on-center with tires inflated to 125 psi in the presence of the RPR. Apply a minimum of 50% coverage, or as specified by the RPR, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas is incidental to this item.

152-2.10 Compaction requirements.

The subgrade under areas to be paved shall be compacted to a depth of 12 inches (300 mm) and to a density of not less than 100 percent of the maximum dry density as determined by ASTM D1557. ***to the depths and percentages shown in the compaction schedule noted in the plans. Density will be determined in accordance with ASTM D1557.*** The subgrade in

areas outside the limits of the pavement areas shall be compacted to a depth of 12 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D1557.

The material to be compacted shall be within $\pm 2\%$ of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). When the material has greater than 30 percent retained on the $\frac{3}{4}$ inch (19.0 mm) sieve, follow the methods in ASTM D1557. Tests for moisture content and compaction will be taken at a minimum of **1,000** S.Y. of subgrade. All quality assurance testing shall be done by the RPR.

The in-place field density shall be determined in accordance with ASTM D1556 **or** ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 within 12 months prior to its use on this contract. The gage shall be field standardized daily.

Density tests will be taken by the **Contractor for QC RPR** ~~for every 1,000 square yards (meters)~~ of completed subgrade. If a nuclear gage is used for density determination, two random readings shall be made for each **2,000** square yards (meters). **The RPR to conduct density tests for QA as needed.**

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the RPR and the finished subgrade shall be maintained.

152-2.11 Finishing and protection of subgrade. Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the RPR.

152-2.12 Haul. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

152-2.13 Surface Tolerances. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (~~75 mm~~), reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

- a. **Smoothness.** The finished surface shall not vary more than $\pm \frac{1}{2}$ inch (~~12 mm~~) when tested with a 12-foot (~~3.7 m~~) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (~~3.7 m~~) straightedge for the full length of each line on a 50-foot (~~15 m~~) grid.
- b. **Grade.** The grade and crown shall be measured on a 50-foot (~~15 m~~) grid and shall be within ± 0.05 feet (~~15 mm~~) of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to be placed, grade shall not vary more than 0.10 feet (~~30 mm~~) from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.14 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. ***Topsoil shall be stripped and stockpiled on site until grading is complete. Topsoil shall be placed prior to sod installation. The sod mat is assumed to be 2 inches thick.*** Stockpiles shall be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the RPR, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

All work associated with the removal, stockpiling and rehandling of topsoil is considered incidental to Item P-152.

152-2.15 OFFSITE BORROW. ***When the amount of suitable on-site excavation is not sufficient to achieve the required embankment for the project, the Contractor will supply the material from offsite borrow sites. When required, off site borrow shall meet the following requirements. The offsite borrow sources will be the Contractor's responsibility to locate and to obtain any environmental permits, hauling fees or other required incidental items to satisfy the requirements of the project. The borrow site may be visited***

by the RPR and any unsuitable areas or materials marked not be used for the project. The Contractor shall notify the RPR and Engineer, at least 15 days prior to beginning the borrow excavation, so necessary tests can be made. The borrow pit shall have a vertical face available to define the strata to be used. All materials brought to the project as borrow shall meet the following criteria to be accepted:

Soil Group	A-3 or better
% Passing No. 200 Sieve	Less than 20% (By weight)
Liquid Limit	Less than 20
Plasticity Index	Less than 5
Organic Content	Less than 2% (By weight)

All materials to be used for the work must have laboratory tests on file with RPR and Engineer meeting these criteria before the material can be brought onto airport property for incorporation into the project.

Any change in the sources or composition of the material will be discussed with the RPR and Engineer and laboratory tests approved prior to any change of materials.

The Contractor will be allowed to remove organic material from the project stripping by sieving or other methods and use it as borrow material assuming it meets the above requirements.

METHOD OF MEASUREMENT

152-3.1 The quantity of unclassified excavation to be paid for shall be the number of cubic yards (cubic meters) measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed. ***No payment will be made for material "swelling".***

152-3.2 The quantity of embankment ***will not be measured and will be incidental to the installation of sod.*** in place shall be the number of cubic yards (cubic meters) measured in its final position. ~~Measurement shall not include the quantity of materials placed without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed. The Contractor is required to account, when determining project unit bid prices, that some of the existing excavated material will be "lost" during construction or may be unsuitable and will not be available for embankment construction. No payment will be made for material lost in clearing and grubbing, unsuitable material not able to be used, shrinkage of material or other reduction in material quantity.~~

152-3.3 Contractor will perform a detailed pre-construction survey with a professionally licensed surveyor before any clearing and grubbing or other work begins, after excavation has been completed, after embankment has been completed, and a post-construction survey once all work is completed and supply them to the RPR and Engineer. Survey will be submitted in digital terrain model (DTM) format. The survey is a requirement to receive payment for unclassified excavation or embankment.

BASIS OF PAYMENT

152-4.1 Unclassified excavation payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for **loading and hauling, soil shrinkage and swelling, rehandling of unclassified excavation, compaction**, furnishing all materials, labor, equipment, tools, **surveying**, and incidentals necessary to complete the item **to the grades and requirements shown on the plans**.

~~**152-4.2** For embankment, payment shall be made at the contract unit price per cubic yard (cubic meter). This price shall be full compensation for obtaining and using on-site and off-site sources, loading and hauling from borrow areas, soil shrinkage and swelling, rehandling, compaction, furnishing all materials, labor, equipment, tools, survey, and incidentals necessary to complete the item to the grades and requirements shown on the plans. No payment will be made for embankment as it will be incidental to the placement of sod.~~

Payment will be made under:

Item P-152-4.1 Unclassified Excavation – per Cubic Yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM International (ASTM)

ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))

ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2700 kN-m/m³))

ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2 Operational Safety on Airports During Construction Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

U.S. Department of Transportation

FAA RD-76-66 Design and Construction of Airport Pavements on Expansive Soils

END OF ITEM P-152

ITEM P-153 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Resident Project Representative (RPR).

MATERIALS

153-2.1 Materials.

a. Cement. Cement shall conform to the requirements of ASTM 150 Type I.

b. Fly ash. Fly ash shall conform to ASTM C618, Class C or F.

c. Fine aggregate (sand). Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces the specified performance characteristics of the CLSM and meets the following requirements, will be accepted.

Sieve Size	Percent Passing by weight
3/4 inch (19.0 mm)	100
No. 200 (75 µm)	0 - 12

d. Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

MIX DESIGN

153-3.1 Proportions. The Contractor shall submit, to the RPR, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the RPR has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed. Laboratory costs are incidental to this item.

a. Compressive strength. CLSM shall be designed to achieve a 28-day compressive strength of 100 to 200 psi (690 to 1379 kPa) when tested in accordance with ASTM D4832, with no significant strength gain after 28 days.

b. Consistency. Design CLSM to achieve a consistency that will produce an approximate 8-inch (200 mm) diameter circular-type spread without segregation. CLSM consistency shall be determined per ASTM D6103.

CONSTRUCTION METHODS

153-4.1 Placement.

a. Placement. CLSM may be placed by any reasonable means from the mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes are not displaced from their final position and intrusion of CLSM into unwanted areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the RPR. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one lift, the base lift shall be free of surface water and loose foreign material prior to placement of the next lift.

b. Contractor Quality Control. The Contractor shall collect all batch tickets to verify the CLSM delivered to the project conforms to the mix design. The Contractor shall verify daily that the CLSM is consistent with 153-3.1a and 153-3.1b. Adjustments shall be made as necessary to the proportions and materials as needed. The Contractor shall provide all batch tickets to the RPR.

c. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°F (2°C) and rising. Mixing and placement shall stop when the air temperature is 40°F (4°C) and falling or when the anticipated air or ground temperature will be 35°F (2°C) or less in the 24-hour period following proposed placement. At the time of placement, CLSM shall have a temperature of at least 40°F (4°C).

153-4.2 Curing and protection

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F (0°C), the material may be rejected by the RPR if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi (105 kPa) is obtained. The Contractor shall be responsible for providing evidence to the RPR that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 Quality Assurance (QA) Acceptance. CLSM QA acceptance shall be based upon batch tickets provided by the Contractor to the RPR to confirm that the delivered material conforms to the mix design.

METHOD OF MEASUREMENT

153-5.1 Measurement.

The CLSM used for concrete encasement of utility conduit is to be measured in the Electrical Specifications

BASIS OF PAYMENT

153-6.1 Payment.

The CLSM used for concrete encasement of utility conduit is to be paid for in the Electrical Specifications

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders
ASTM D6103	Flow Consistency of Controlled Low Strength Material (CLSM)

END OF ITEM P-153

THIS PAGE INTENTIONALLY LEFT BLANK

ITEM P-154 SUBBASE COURSE

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

MATERIALS

154-2.1 Materials. The subbase material shall consist of hard durable particles or fragments of granular aggregates. The material may be obtained from ***blending in situ materials with P-211 Lime Rock***, gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The material shall be free from vegetative matter, excessive amounts of clay, and other objectionable substances; uniformly blended; and be capable of being compacted into a dense, stable subbase.

The subbase material shall exhibit a California Bearing Ratio (CBR) value of at least 20 when tested in accordance with ASTM D1883. The subbase material shall meet the gradation specified in the table below.

Subbase Gradation Requirements

Sieve designation	Percentage by weight passing sieves		Contractor's Final Gradation	Job Control Grading Band Tolerances ¹ (Percent)
	Subbase Aggregate	Recycled pavement (RAP or RCO)		
3 inch (75 mm)	100			0
1 1/2 inch (37.5 mm)		100		0
3/4 inch (19.0 mm)	70-100	70-100		±10
No. 10 (2.00 mm)	20-100	20-100		±10
No. 40 (425 µm)	5-60	5-60		±5
No. 200 (75 µm)	0-15	[0-15]		±5

¹The "Job Control Grading Band Tolerances" shall be applied to "Contractor's Final Gradation" to establish the job control grading band.

The portion of the material passing the No. 40 (425 µm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D4318.

154-2.2 Sampling and testing.

a. Aggregate base materials. Samples shall be taken by the Contractor per ASTM D75 for initial aggregate subbase requirements and gradation. Material shall meet the requirements in paragraphs 154-2.1. The Contractor shall submit to the Resident Project Representative (RPR) certified test results showing that the aggregate meets the Material requirements of this section. Tests shall be representative of the material to be used for the project.

b. Gradation requirements. The Contractor shall take at least [one] aggregate subbase sample per day in the presence of the RPR to check the final gradation. Samples shall be taken from the in-place, un-compacted material at sampling locations determined by the RPR on a random basis per ASTM D3665. Sampling shall be per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the RPR by the Contractor each day during construction. Material shall meet the requirements in paragraph 154-2.1.

154-2.3 Separation Geotextile. Not used

154-2.4 Geogrid. Not used.

CONSTRUCTION METHODS

154-3.1 General. The subbase course shall be placed where designated on the plans or as directed by the RPR. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically modified to the depth necessary to provide stability as directed by the RPR. The mechanical modification shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic.

154-3.2 Preparing underlying course. Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances in accordance with Item P-152. Correct ruts, soft yielding spots in the underlying courses, and subgrade areas having inadequate compaction and/or deviations of the surface from the specified requirements, by loosening and removing soft or unsatisfactory material, adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course by mixing the overlying course material into the underlying course, and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements for the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The underlying course shall be checked and accepted by the RPR before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.3 Control Strip. The first half-day of subbase construction shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

154-3.4 Placement. The material shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted. The material shall not be placed when the underlying course is soft or yielding.

The material shall meet gradation and moisture requirements prior to compaction. Material may be free-draining and the minimum moisture content shall be established for placement and compaction of the material.

The material shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

154-3.5 Compaction. The subbase material shall be compacted, adjusting moisture as necessary, to be within $\pm 2\%$ of optimum moisture. The field density of the compacted material shall be at least 100% of the maximum density as specified in paragraph 154-3.9a. If the specified density is not attained, the area of the lift represented by the test shall be reworked and/or re-compact and additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

The compaction of the P-154 material alongside the P-211 material in the sections referenced in the narrow compaction detail is to be considered incidental to the P-154 for Stabilized Shoulders. The subsequent scarifying and addition of remaining P-154 required to complete the section of P-154 Stabilized Shoulders is also to be included in the cost of P-154 for Stabilized Shoulders.

154-3.6 Weather limitation. Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on subbase course shall not be conducted when the subgrade is wet or frozen or the subbase material contains frozen material.

154-3.7 Maintenance. No base or surface course shall be placed on the subbase until the subbase has been accepted by the RPR. The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, the Contractor shall verify that materials still meet all specification requirements before placement of additional material. Equipment may be routed over completed sections of subbase course, provided the equipment does not damage the subbase course and the equipment is routed over the full width of the completed subbase course. Any damage to the subbase course from routing equipment over the subbase course shall be repaired by the Contractor at their expense.

154-3.8 Surface tolerance. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and re-compact to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. Smoothness. The finished surface shall not vary more than $\pm \frac{1}{2}$ inch (12 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

b. Grade. The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +/-0.05 feet (15 mm) of the specified grade.

154-3.9 Acceptance sampling and testing. The aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each 1,200 square yards (~~4000 square meters~~). Sampling locations will be determined on a random basis per ASTM D3665.

a. Density. ~~The RPR shall perform all density tests~~ ***The RPR shall perform density tests as needed for QA. The Contractor shall perform density tests every 1,000 SY for QC.***

Each area shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM **D698 or D1557**. The in-place field density shall be determined per ASTM **D6938**. If the specified density is not attained, the area represented by the failed test shall be reworked and/or recompact and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

When the material has greater than 30 percent retained on the 3/4 inch (19.0 mm) sieve, use methods in ASTM D1557 and the procedures in AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles.

b. Thickness. The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompact to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

METHOD OF MEASUREMENT

154-4.1 Subbase course shall be measured by the number of square yards of subbase course material placed and compacted to specified density and plan thickness requirements in the completed course. The quantity of subbase course material shall be measured in final position based upon survey of the completed work computed from elevations to the nearest 0.01 foot. On individual depth measurements, thicknesses more than 1/2 inch (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch (12 mm) in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per square yard 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, **surveying**, and incidentals necessary to complete the item.

Payment will be made under:

Item P-154-5.1 Subbase Course, 12" Thick - per square yard

Item P-154-5.2 Subbase Course, 6" Thick - per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117	Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kN-m/m ³))
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4759	Practice for Determining the Specification Conformance of Geosynthetics
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

American Association of State Highway and Transportation Officials (AASHTO)

M 288	Geotextile Specification for Highway Applications
-------	---

END OF ITEM P-154

ITEM P-211 LIME ROCK BASE COURSE

DESCRIPTION

211-1.1 This item shall consist of a base course composed of lime rock constructed on the prepared underlying course per these specifications and shall conform to the dimensions and typical cross-section shown on the plans.

MATERIALS

211-2.1 Materials. The lime rock base course material shall consist of fossiliferous limestone of uniform quality. The material shall not contain hard or flinty pieces that will cause a rough surface containing pits and pockets. The rock shall show no tendency to “air slake” or undergo chemical change when exposed to the weather. ***Lime rock material shall not contain chert or other extremely hard pieces, or lumps, balls or pockets of sand or clay material in sufficient quantity as to be detrimental to the proper bonding, finishing or strength of the lime rock base course.*** The material when watered and rolled shall be capable of compacting to a dense and well-bonded base.

Lime Rock Base Course Material Properties²

	Lime Rock	Oolitic	Non-Oolitic
Carbonates of calcium and magnesium ¹	95% minimum	70% minimum	75% minimum
Oxides of iron and aluminum ¹	Less than or equal to 2%	Less than or equal to 2%	Less than or equal to 2%
Liquid limit	Not greater than 35	NA	Not greater than 35
Plasticity Index	Not greater than 6	NA	Not greater than 6
Organic or foreign matter	Not more than 0.5%	Not more than 0.5%	Not more than 0.5%
Lime Bearing Ratio (LBR) ³ at 0 to +1.5% optimum	125	125	125

¹ The combined amount of carbonates, oxides, and silica shall be at least 97%. The material shall be non-plastic.

² The chemical analysis of lime rock shall consist of determining the insoluble silica, iron oxide, and alumina by solution of the sample in hydrochloric (HCl) acid, evaporating, dehydrating, re-dissolving the residue, and neutralizing with ammonium hydroxide, filtering, washing, and igniting the residue lime rock. The difference between the percentage of insoluble matter and 100% is reported as carbonates of calcium and magnesium.

³ FM 5-515, Florida Method of Test for Lime Rock Bearing Ratio

Lime Rock Base Course Gradation

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
3-1/2 inch (87.5 mm)	100
3/4 inch (19.0 mm)	50-100

All fine material shall consist entirely of dust of fracture (fine portion passing the No. 10 (2.00 mm) sieve). ***The maximum individual dimension shall not exceed 6 inches. All crushing or break-up, which is necessary in order to meet these gradation requirements, shall be done before the lime rock is placed in the base course.***

211-2.2 Sampling and Testing.

a. Aggregate base materials. The Contractor shall take samples of the aggregate base in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 211-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

b. Gradation requirements. The Contractor shall take at least two aggregate base samples per day in the presence of the Resident Project Representative (RPR) to check the final gradation ***providing a consistent material source is used for that day.*** Sampling shall be per ASTM D75. Material shall meet the requirements in paragraph 209-2.1. The lot will be consistent with the lot size used for density. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the RPR.

c. Sampling shall be taken by the Contractor Quality Control (QC) technician in the presence of the RPR's Quality Assurance (QA) representative. Each sample shall be mixed and quartered by the QC Technician such that the QC technician and the QA representative will each possess adequate size sample for testing.

211-2.3 Separation Geotextile. Not used.

CONSTRUCTION METHODS

211-3.1 Control strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. Control strips that do not meet specification requirements shall be removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. Upon acceptance of the control strip by the RPR, the Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

211-3.2 Preparing underlying course. ***Before any rock base course material is placed, the underlying course shall be prepared and conditioned as specified.*** The RPR shall check and accept the underlying course before placing and spreading operations are started. Any ruts or soft yielding places caused by improper drainage conditions, hauling, or any other cause

shall be corrected at the Contractor's expense before the base course is placed. Material shall not be placed on frozen subgrade.

To protect the underlying course and to insure proper drainage the spreading of the limerock shall begin along the centerline of the pavement on a crowned section or on the high side of pavement with a one-way slope.

211-3.3 Placement. The material shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

The material shall meet gradation and moisture requirements prior to compaction. The layer shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

211-3.4 Compaction. Immediately upon completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade. The field density of each compacted lift of material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The moisture content of the material during placing operations shall be within ± 2 percentage points of the optimum moisture content as determined by ASTM 1557. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

Sufficient rollers of the designated types shall be furnished to adequately handle the compaction of the material that has been placed and spread. Blading and rolling shall be done alternately as required or directed to obtain a smooth, even surface and until the entire depth of base is compacted into a dense, unyielding mass. Re-rolling of 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

Along curbs, headers, and all areas inaccessible to the roller, the base course material shall be tamped thoroughly with mechanical or hand tampers.

In the areas of narrow full depth construction called out in the plans, refer to the typical detail for compaction methods.

211-3.5 Finishing. After the watering and rolling of the base course, the entire surface shall be scarified to a depth of at least 3 inches (75 mm) and shaped to the exact crown and cross-section with a blade grader. The scarified material shall be rewetted and thoroughly rolled. Rolling shall continue until the base is bonded and compacted to a dense, unyielding mass, true to grade and cross-section. Scarifying and rolling of the surface of the base shall follow the

initial rolling of the lime rock by not more than four (4) days. When the lime rock base is constructed in two layers, the scarifying of the surface shall be to a depth of 2 inches (~~50 mm~~).

If cracks or checks appear in the base before the surface course is laid, the Contractor shall rescarify, reshape, water, add lime rock where necessary, and recompact. If the underlying material becomes mixed with the base course material, the Contractor shall, without additional compensation, remove, reshape, and recompact the mixture.

211-3.6 Weather limitations. Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

211-3.7 Maintenance. The base course shall be maintained in a condition that will meet all specification requirements until the work is accepted by the RPR. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

211-3.8 Surface tolerance. After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (~~75 mm~~), reshaped and recompact to grade until the required smoothness and accuracy are obtained and approved by the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

a. Smoothness. The finished surface shall not vary more than 3/8-inch (~~9 mm~~) when tested with a 12-foot (~~3.7 m~~) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously at half the length of the 12-foot (~~3.7 m~~) straightedge for the full length of each line on a 50-foot (~~15 m~~) grid. **Straightedge shall be provided by the Contractor.**

b. Grade. The grade and crown shall be measured on a 50-foot (~~15 m~~) grid and shall be within +0 and -1/2 inch (12 mm) of the specified grade.

211-3.9 Acceptance sampling and testing. Lime rock base course shall be accepted for density on an area basis. Two tests shall be made for density and thickness for each 2400 square yds (~~1000 m²~~). Sampling locations will be determined on a random basis per ASTM D3665.

a. Density. The Contractor's laboratory shall perform all density tests in the RPR's presence and provide the test results upon completion to the RPR for acceptance. ***The Contractor shall perform density tests every 1,000 SY for QC. The RPR shall perform density tests as needed for QA.***

Each area shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM D1557. The in-place field density shall be determined per ASTM D1556 or ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture

content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the entire area shall be reworked and/or recompact and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. Depth tests shall be made by ~~survey~~ test holes or cores at least 3 inches (75 mm) in diameter that extend through the base ~~at intervals so each test shall represent 300 square yards in the presence of the RPR.~~ The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompact to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

211-3.10 Lime Rock Transition Wedges – *These are to be installed along drop-offs between airfield pavement and the work area or any condition as a result of the work that produces a drop off. Placement of these wedges is to be at the discretion of the Owner or RPR. The Unit Cost of these wedges shall cover both installation and removal of the limerock as per the Owner's instruction. The wedges may be placed in the same location more than once depending on the Phasing of the work in the area.*

211-3.11 Lime Rock Variable Thickness – *This base course is to be installed over existing limerock that has been scarified for 6"-8" below existing grade or whatever depth the RPR determines is sufficient to allow for cohesive installation and compaction of the new limerock. The Limerock will be placed in a variable thickness so that the planned grade is met as per these specifications. The contractor is to ensure that while scarifying the existing limerock, the material does not segregate and the condition is not damaged. If the existing limerock is damaged, the contractor will replace the damaged limerock at no cost to the Owner. The scarifying of existing limerock is considered incidental to this Pay Item.*

METHOD OF MEASUREMENT

211-4.1 The quantity of lime rock base course shall be the number of square yards (~~square meters~~) of base material placed, bonded, and accepted in the completed base course **at the specified thickness.** The quantity of base course material shall be measured in final position based upon depth tests **taken by the Contractor's Surveyor** as directed by the RPR. On individual depth measurements, thicknesses more than 1/2 inch (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch (12 mm) in computing the yardage for payment.

BASIS OF PAYMENT

211-5.1 Payment shall be made at the contract unit price per square yards (~~square meters~~) for lime rock base course. 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, **survey**, and incidentals necessary to complete the item.

The cost of removing cracks and checks including the labor, and the additional lime rock necessary for crack elimination, will not be paid for separately but shall be included in the contract price per square yard (square meter) for lime rock base course.

An As-Built survey taken by a Professionally Licensed Surveyor of the finished limerock surface must be provided after the installation of limerock is completed to receive payment for the limerock.

Payment will be made under:

Item P-211-5.1 Lime Rock Base Course, 9" Thick – per Square Yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2700 kN-m/m ³))
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4751	Standard Test Methods for Determining Apparent Opening Size of a Geotextile

American Association of State Highway and Transportation Officials (AASHTO)

M288	Standard Specification for Geosynthetic Specification for Highway Applications
------	--

END OF ITEM P-211

ITEM P-401 ASPHALT MIX PAVEMENT

DESCRIPTION

401-1.1 This item shall consist of pavement courses composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared base or stabilized course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, ~~crushed slag~~, screenings, natural sand, and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. ***The Contractor shall provide certification that aggregates are free of ferrous sulfides.*** Coarse aggregate is the material retained on the No. 4 (4.75 mm) sieve. Fine aggregate is the material passing the No. 4 (4.75 mm) sieve.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

(THIS AREA HAS BEEN LEFT INTENTIONALLY BLANK)

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	0.3% maximum	ASTM C142
Percentage of Fractured Particles	For pavements designed for aircraft gross weights of 60,000 pounds (27200 kg) or more: Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face ¹	ASTM D5821
	For pavements designed for aircraft gross weights less than 60,000 pounds (27200 kg): Minimum 50% by weight of particles with at least two fractured faces and 65% with at least one fractured face¹	
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 ²	ASTM D4791
Bulk density of slag ³	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

¹ The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

² A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

³ Only required if slag is specified.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the fine aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed in the table below.

Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	0.3% maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419
Natural Sand	0 to 15% maximum by weight of total aggregate	ASTM D1073

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate.

401-2.2 Mineral filler. Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

Mineral Filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

401-2.3 Asphalt binder. Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) 76-22 (PMA).

Asphalt Binder PG Plus Test Requirements

Material Test	Requirement	Standard
Elastic Recovery	75% minimum	ASTM D6084

401-2.4 Anti-stripping agent. Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

COMPOSITION

401-3.1 Composition of mixture(s). The asphalt mix shall be composed of a mixture of aggregates, filler and anti-strip agent if required, and asphalt binder. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 Job mix formula (JMF) laboratory. The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF; and be listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Resident Project Representative (RPR) prior to start of construction.

401-3.3 Job mix formula (JMF). No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.2. The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. Samples shall be prepared and compacted using the gyratory compactor in accordance with ASTM D6925.

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF

has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

The JMF shall be submitted in writing by the Contractor at least **30** days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

The JMF shall be dated, and stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

- a. Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 401-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- b. Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 401-2.4.
- c. Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 401-2.1.
- d. Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- e. Specific Gravity and absorption of each coarse and fine aggregate.
- f. Percent natural sand.
- g. Percent fractured faces.
- h. Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- i. Percent of asphalt.
- j. Number of blows or gyrations
- k. Laboratory mixing and compaction temperatures.
- l. Supplier-recommended field mixing and compaction temperatures.
- m. Plot of the combined gradation on a 0.45 power gradation curve.
- n. Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.
- o. Tensile Strength Ratio (TSR).
- p. Type and amount of Anti-strip agent when used.
- q. Asphalt Pavement Analyzer (APA) results.
- r. Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted. ***All material testing, for shop drawing submittals, will be performed by an engineer registered in the state of Florida.***

Material testing must be performed within 6 months of shop drawing submittal. Shop drawings with tests performed beyond 6 months will be rejected.

Table 1. Asphalt Design Criteria

Test Property	Value	Test Method
Number of blows or gyrations	75	
Air voids (%)	2.8 – 4.2	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
Tensile Strength Ratio (TSR) ¹	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA) ²	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

¹ Test specimens for TSR shall be compacted at 7 ± 1.0 % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

² AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

(THIS AREA HAS BEEN LEFT INTENTIONALLY BLANK)

Table 2. Aggregate - Asphalt Pavements

Sieve Size	Percentage by Weight Passing Sieves		
	Gradation 1	Gradation 2	Gradation 3
1 inch (25.0 mm)	100	--	--
3/4 inch (19.0 mm)	90-100	100	--
1/2 inch (12.5 mm)	68-88	90-100	100
3/8 inch (9.5 mm)	60-82	72-88	90-100
No. 4 (4.75 mm)	45-67	53-73	58-78
No. 8 (2.36 mm)	32-54	38-60	40-60
No. 16 (1.18 mm)	22-44	26-48	28-48
No. 30 (600 µm)	15-35	18-38	18-38
No. 50 (300 µm)	9-25	11-27	11-27
No. 100 (150 µm)	6-18	6-18	6-18
No. 200 (75 µm)	3-6	3-6	3-6
Minimum Voids in Mineral Aggregate (VMA) ¹	14.0	15.0	16.0
Asphalt percent by total weight of mixture:			
Stone or gravel	4.5-7.0	5.0-7.5	5.5-8.0
Slag	5.0-7.5	6.5-9.5	7.0-10.5
Recommended Minimum Construction Lift Thickness	3 inch	2 inch	1 1/2 inch

Gradation 2 for runways, taxiways and apron.

¹To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

401-3.4 Reclaimed asphalt pavement (RAP). RAP shall not be used.

401-3.5 Control Strip. Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR. The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 401-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons (~~227 metric tons~~) or 1/2 subplot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 401-4.14 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F (71°C). The equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 401-5.5a; and Mat density, air voids, and joint density meet the requirements specified in paragraphs 401-6.2.

If the control strip is unacceptable, necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made and another control strip shall be placed. Unacceptable control strips shall be removed at the Contractor's expense.

Payment will only be made for an acceptable control strip in accordance with paragraph 401-8.1 using a lot pay factor equal to 100.

CONSTRUCTION METHODS

401-4.1 Weather limitations. The asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the RPR, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)	
	°F	°C
3 inches (7.5 cm) or greater	40 ¹	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

401-4.2 Asphalt plant. Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items.

a. Inspection of plant. The RPR, or RPR's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

b. Storage bins and surge bins. The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in storage and/or surge bins for a period greater than twelve (12) hours. If the RPR determines there is an excessive heat loss, segregation, or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

401-4.3 Aggregate stockpile management. Aggregate stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the asphalt batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

401-4.4 Hauling equipment. Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.4.1 Material transfer vehicle (MTV). Material transfer vehicles used to transfer the material from the hauling equipment to the paver, shall use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

Any damage to airport infrastructure from MTV use will be repaired by the Contractor and at the Contractor's expense.

401-4.5 Asphalt pavers. Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If the spreading and finishing equipment in use leaves tracks or indented areas or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.12. ***For the full-strength section of the Runways, the preferred performance requirements will be placement of pavement performed with two pavers operating in echelon. See paragraph 401-4.12 for additional details.***

401-4.6 Rollers. The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, clean, and capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

401-4.7 Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production

paving. The Contractor shall supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.8 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F (175°C) when added to the aggregate.

401-4.9 Preparation of mineral aggregate. The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.10 Preparation of Asphalt mixture. The aggregates and the asphalt binder shall be weighed or metered and mixed in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

401-4.11 Application of Prime and Tack Coat. Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

A prime coat in accordance with Item P-602 shall be applied to aggregate base prior to placing the asphalt mixture.

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

401-4.12 Laydown plan, transporting, placing, and finishing. Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR. ***The laydown plan shall be submitted during the Mobilization Phase with the JMF.***

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2d before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat **to all surfaces** in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of 12.5 feet (≡) except **for the full-strength section of the runways and** where edge lanes require less width to complete the area. **For the full-strength section of the runways, the asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of 25 feet, placed in echelon, with two asphalt paving machines. Echelon paving is the preferred performance requirement of placing the asphalt material. However, the Contractor may request a substitution to reduce the number of asphalt paving machines to one at their discretion. This request must be submitted in writing during the Mobilization Phase and must provide a narrative explaining how the contractor will meet or exceed the performance requirements of echelon paving. Review of this request will be contingent on the Contractor demonstrating that the single paving machine will meet the performance requirements of echelon paving for width, volume, and rate of material placed.** Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least one foot (30-cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m). On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

401-4.13 Compaction of asphalt mixture. After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in

compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.14 Joints. The formation of all joints shall be made to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid asphalt except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh asphalt against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C); or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. Asphalt tack coat in accordance with P-603 shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

401-4.15 Saw-cut grooving. Saw-cut grooves shall be provided as specified in Item P-621.

401-4.16 Diamond grinding. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with a sufficient number of blades to create grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that cause ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

401-4.17 Nighttime paving requirements. The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

The lighting plan will address the following items:

- a. *All paving machines, rollers, distribution trucks (MTVs) and other vehicles required by the Contractor for his operations shall be equipped with artificial illumination sufficient to safely complete the work.*
- b. *Minimum illumination level shall be twenty (20) horizontal foot-candles and maintained in the following areas:*
 - (1) *An area of 30 feet (9-m) wide by 30 feet (9-m) long immediately behind the paving machines during the operations of the machines.*
 - (2) *An area 15 feet (4.5-m) wide by 30 feet (9-m) long immediately in front and back of all rolling equipment, during operation of the equipment.*
 - (3) *An area 15 feet (4.5-m) wide by 15 feet (4.5-m) long at any point where an area is being tack coated prior to the placement of pavement.*
- c. *As partial fulfillment of the above requirements, the Contractor shall furnish and use, complete artificial lighting units with a minimum capacity of 3,000 watt electric beam lights, affixed to all equipment in such a way to direct illumination on the area under construction.*
- d. *A lighting plan must be submitted by the Contractor and approved by the Engineer prior to the start of any nighttime work. This plan shall be submitted during the Mobilization Phase.*
- e. *The Contractor shall provide sufficient lighting, when requested by the RPR, to review the progression of the Work.*

If the Contractor places any out of specification mix in the project work area, the Contractor is required to remove it at its own expense, to the satisfaction of the RPR. If the Contractor has to continue placing non-payment HMA, as directed by the RPR, to make the surfaces safe for aircraft operations, the Contractor shall do so to the satisfaction of the RPR. It is the Contractor's responsibility to leave the facilities to be paved in a safe condition ready for aircraft operations. No consideration for extended closure time of the area being paved will be given. As a first order of work for the next paving shift, the Contractor shall remove all out of specification material and replace with approved material to the satisfaction of the Engineer. When the above situations occur, there will be no consideration given for additional construction time or payment for extra costs.

401-4.18 Stand-by Equipment.

- a. *The Contractor shall maintain stand-by equipment at the construction site for all construction work to be performed under this Contract. The specific number and type of equipment shall be that which is necessary to complete the work planned for that work period should any piece of equipment break down. At a minimum, at least one milling machine, one paving machine, one roller, and one sweeper will be required on stand-by whenever the runway is being worked on. The Contractor is advised that work during 24-hour per day closures, night closures, and weekend closures is more intensive than that performed at other times; therefore, additional stand-by equipment may need to be*

provided by the Contractor for the 24-hour per day closures, night closures, and weekend closure work. Standby equipment includes equipment such as paving machines, milling machines, rollers, trenching machines, core drills, backhoes, graders, and tack coat distributor trucks and any other equipment necessary to complete the proposed work. In addition, stand-by clean up equipment such as sweepers, brooms, vacuum trucks, water trucks, and air compressors with wands for blowing debris from cracks, shall be available to ensure timely re-opening of the pavement at the end of each work period.

b. Stand-by equipment may only be used to replace broken equipment during a work period. The Contractor shall properly repair or replace broken equipment before being allowed to proceed with the next work period. Broken equipment must be repaired or removed from the work area within 30 minutes and replaced with stand-by equipment.

c. The Contractor shall ensure arrangement for supply of an alternate source of P-401 and P-403 asphalt in case of breakdown of the asphalt production plant. This will include back-up plants, storage of a minimum quantity of material, as required by Items P-401 and P-403 of the Specifications, in storage bins at the start of each shift's work, as well as material in trucks.

d. The Contractor shall submit a listing and description of all regular and standby equipment that will be provided for production paving. The list shall include all equipment, by number, type, size, and manufacturer to the Engineer for acceptance. This submittal will be paid for under the mobilization pay item.

e. Should Contractor fail to have adequate standby equipment in place at beginning of each phase or daily shift, Owner may, at its sole discretion, refuse to allow Contractor access to the Runway. Said denial shall only be lifted when Contractor provides adequate standby equipment. Contractor shall not be entitled to additional time to compensate for lost time due to inadequate standby equipment being available.

CONTRACTOR QUALITY CONTROL (CQC)

401-5.1 General. The Contractor shall develop a Contractor Quality Control Program (CQCP) in accordance with Item C-100. No partial payment will be made for materials without an approved CQCP.

401-5.2 Contractor quality control (QC) facilities. The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

401-5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved CQCP. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field

compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the CQCP.

a. Asphalt content. A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per day from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per day in accordance with ASTM C566.

d. Moisture content of asphalt. The moisture content shall be determined once per day in accordance with AASHTO T329 or ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per day, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Smoothness for Contractor Quality Control.

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) "straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using the FAA profile program, ProFAA, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

(1) Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3). Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to and after the placement of the first lift and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically. The documentation will be provided by the Contractor to the RPR within 24 hours.

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 401-4.16.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus 1/2 inch and replacing with new material. Skin patching is not allowed.

401-5.4 Sampling. When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-5.5 Control charts. The Contractor shall maintain linear control charts for both individual measurements and range (i.e. difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day will be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the

Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits for Individual Measurements

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

b. Range. Control charts shall be established to control gradation process variability. The range shall be plotted as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of $n = 2$. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for $n = 3$ and by 1.27 for $n = 4$.

(THIS AREA HAS BEEN LEFT INTENTIONALLY BLANK)

Control Chart Limits Based on Range

Sieve	Suspension Limit
1/2 inch (12.5 mm)	11%
3/8 inch (9.5 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (300 µm)	6%
No. 200 (75 µm)	3.5%
Asphalt Content	0.8%

c. Corrective Action. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

401-5.6 QC reports. The Contractor shall maintain records and shall submit reports of QC activities daily, in accordance with Item C-100 .

MATERIAL ACCEPTANCE

401-6.1 Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor. ***Coring of the in-place pavement, which will be performed by the Contractor, will include patching of the hole and delivery of cores to the RPR or his agent for testing.***

a. Quality assurance (QA) testing laboratory. The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation.

b. Lot size. A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

Where more than one plant is simultaneously producing asphalt for the job, the lot sizes will apply separately for each plant.

c. Asphalt air voids. Plant-produced asphalt will be tested for air voids on a subplot basis.

(1) Sampling. Material from each subplot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and

placed in an oven for not less than 30 minutes nor more than 60 minutes to maintain the material at or above the compaction temperature as specified in the JMF. ***For mixtures containing aggregates with absorption values greater than 1.5%, the mixture shall be maintained at a temperature at or above the specified compaction temperature for a period of not less than 60 minutes nor more than 90 minutes to stabilize to compaction temperatures.***

(2) Testing. Air voids will be determined for each subplot in accordance with ASTM D3203 for a set of compacted specimens prepared in accordance with ASTM D6925.

d. In-place asphalt mat and joint density. Each subplot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

(1) Sampling. The Contractor will cut minimum 5 inch (125 mm) diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

(2) Bond. Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

(3) Thickness. Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

(4) Mat density. One core shall be taken from each subplot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the TMD for that subplot.

(5) Joint density. One core centered over the longitudinal joint shall be taken for each subplot that has a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

401-6.2 Acceptance criteria.

a. General. Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, grade and Profilograph roughness.

b. Air Voids and Mat density. Acceptance of each lot of plant produced material for mat density and air voids will be based on the percentage of material within specification limits

(PWL). If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment will be determined in accordance with paragraph 401-8.1.

c. Joint density. Acceptance of each lot of plant produced asphalt for joint density will be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot will be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint will be reduced by five (5) percentage points. This lot pay factor reduction will be incorporated and evaluated in accordance with paragraph 401-8.1.

d. Grade. The final finished surface of the pavement shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch (12 mm) vertically.

Cross-sections of the pavement shall be taken at a minimum 50-foot longitudinal spacing and at all longitudinal grade breaks. Minimum cross-section grade points shall include grade at centerline, ± 10 feet of centerline, and edge of runway or taxiway pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the subplot shall not be more than 95%.

All survey will be performed on the same grid pattern and spacing as shown on the Spot Elevation Plans.

e. Profilograph roughness for QA Acceptance. The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The Contractor, in the presence of the RPR shall perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hrs of profilograph roughness tests.

The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2-inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). Profilograph shall be performed one foot right and left of project centerline and 15 feet (4.5 m) right and left of project centerline. Any areas that indicate "must grind" shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing full depth of surface course, as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.

401-6.3 Percentage of material within specification limits (PWL). The PWL will be determined in accordance with procedures specified in Item C-110. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

Table 5. Acceptance Limits for Air Voids and Density

Test Property	Pavements Specification Tolerance Limits	
	L	U
Air Voids Total Mix (%)	2.0	5.0
Surface Course Mat Density (%)	92.8	-
Base Course Mat Density (%)	92.0	-
Joint density (%)	90.5	--

a. Outliers. All individual tests for mat density and air voids will be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded, and the PWL will be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 1.55.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 94.5% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 94.0% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 92.5% with 1.55% or less variability.

401-6.4 Resampling pavement for mat density.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-6.1d and 401-6.2b. Only one resampling per lot will be permitted.

(1) A redefined PWL will be calculated for the resampled lot. The number of tests used to calculate the redefined PWL will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined PWL for a resampled lot will be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

401-6.5 Leveling course. The leveling course is the first variable thickness lift placed to correct surface irregularities prior to placement of subsequent courses. The leveling course shall meet the aggregate gradation in Table 2, paragraph 401-3.3. The leveling course shall meet the requirements of paragraph 401-3.3, 401-6.2b for air voids, but shall not be subject to the density requirements of paragraph 401-6.2b for mat density and 401-6.2c for joint density. The leveling course shall be compacted with the same effort used to achieve density of the control strip. The leveling course shall not exceed the maximum lift thickness associated with each gradation in Table 2, paragraph 401-3.3.

METHOD OF MEASUREMENT

401-7.1 Measurement. Asphalt shall be measured by the number of tons ~~kg~~ of asphalt used in the accepted work. Batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

401-8.1 Payment. Payment for a lot of asphalt meeting all acceptance criteria as specified in paragraph 401-6.2 shall be made based on results of tests for mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1c for mat density and air voids; and paragraph 401-6.2c for joint density, subject to the limitation that:

a. The total project payment for plant mix asphalt pavement shall not exceed **100%** percent of the product of the contract unit price and the total number of tons (kg) of asphalt used in the accepted work.

b. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

c. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71% then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1a. Payment in excess of 100% for accepted lots of asphalt shall be used to offset payment for accepted lots of asphalt pavement that achieve a lot pay factor less than 100%.

Payment for sublots which do not meet grade in accordance with paragraph 401-6.2d after correction for over 25% of the subplot shall be reduced by 5%.

(THIS AREA HAS BEEN LEFT INTENTIONALLY BLANK)

Table 6. Price adjustment schedule¹

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject ²

¹ Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1a.

² The lot shall be removed and replaced. However, the RPR may decide to allow the rejected lot to remain. In that case, if the RPR and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

d. Profilograph Roughness. The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 401-6.2e. When the final average profile index for the entire length of pavement does not exceed 15 inches per mile per 1/10 mile, payment will be made at the contract unit price for the completed pavement.

e. Survey – The Contractor is to submit a survey from a professionally licensed surveyor after the completion of lift of asphalt. This is a requirement for P-401 payment.

f. Transition Wedges – Asphalt transition wedges (if required) between phases are to be paid for under this pay item per ton.

401-8.1 Payment.

Payment will be made under:

Item P-401-8.1 Hot Mixed Asphalt Pavement (Surface) – per Ton

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate

ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Asphalt Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
ASTM D1188	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Asphalt Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Asphalt Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5361	Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyratory Compactor.
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM D 6931	Indirect Tensile (IDT) Strength of Bituminous Mixtures
ASTM D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E950	Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference
ASTM E2133	Standard Test Method for Using a Rolling Inclinator to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
AASHTO T324	Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures
AASHTO T 340	Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)

Asphalt Institute (AI)

Asphalt Institute Handbook MS-26, Asphalt Binder
Asphalt Institute MS-2Mix Design Manual, 7th Edition
AI State Binder Specification Database

Federal Highway Administration (FHWA)

Long Term Pavement Performance Binder Program

Advisory Circulars (AC)

AC 150/5320-6 Airport Pavement Design and Evaluation

FAA Orders

5300.1 Modifications to Agency Airport Design, Construction, and Equipment Standards

Software

FAARFIELD

END OF ITEM P-401

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

ITEM P-403 ASPHALT MIX PAVEMENT COURSE

DESCRIPTION

403-1.1 This item shall consist of pavement courses composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

403-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, ~~crushed slag~~, screenings, natural sand and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. ***The Contractor shall provide certification that aggregates are free of ferrous sulfides.*** Coarse aggregate is the material retained on the No. 4 (4.75 mm) sieve. Fine aggregate is the material passing the No. 4 (4.75 mm) sieve.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

(THIS AREA HAS BEEN LEFT INTENTIONALLY BLANK)

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum for surface , asphalt binder, and leveling course Loss: 50% maximum for base course	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	0.3% maximum	ASTM C142
Percentage of Fractured Particles	For pavements designed for aircraft gross weights of 60,000 pounds (27200 kg) or more: Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face ¹	ASTM D5821
	For pavements designed for aircraft gross weights less than 60,000 pounds (27200 kg): Minimum 50% by weight of particles with at least two fractured faces and 65% with at least one fractured face⁴	
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles with a value of 5:1 ²	ASTM D4791
Bulk density of slag ³	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

¹ The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

² A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

³ Only required if slag is specified.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed in the table below.

Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	0.3% maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419
Natural Sand	0 to 15% maximum by weight of total aggregate	ASTM D1073

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

403-2.2 Mineral filler. Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

Mineral filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

403-2.3 Asphalt binder. Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) 76-22 (PMA)

Asphalt Binder PG Plus Test Requirements

Material Test	Requirement	Standard
Elastic Recovery	75% minimum	ASTM D6084

403-2.4 Anti-stripping agent. Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

COMPOSITION

403-3.1 Composition of mixture. The asphalt plant mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

403-3.2 Job mix formula (JMF) laboratory. The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF, and listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

403-3.3 Job mix formula (JMF). No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 403-3.2. The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition. Samples shall be prepared and compacted using a Marshall compactor in accordance with ASTM D6926.

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

The JMF shall be submitted in writing by the Contractor at least **30** days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

The submitted JMF shall be dated, and stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 403-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 403-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 403-2.1 and 403-2.2.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each course and fine aggregate.
- Percent natural sand.
- Percent fractured faces.

- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows or gyrations.
- Laboratory mixing and compaction temperatures.
- Supplier recommended mixing and compaction temperatures.
- Plot of the combined gradation on the 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.
- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted. ***All material testing, for shop drawing submittals, will be performed by an engineer registered in the state of Florida. Material testing must be performed within 6 months of shop drawing submittal. Shop drawings with tests performed beyond 6 months will be rejected.***

Table 1. Asphalt Design Criteria

Test Property	Value	Test Method
Number of blows/gyrations	75	
Air voids (%)	2.8 – 4.2	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
TSR ¹	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA) ²	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

¹ Test specimens for TSR shall be compacted at 7 ± 1.0 % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

² AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply, be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Table 2. Aggregate - Asphalt Pavements

Sieve Size	Percentage by Weight Passing Sieves		
	Gradation 1	Gradation 2	Gradation 3 ¹
1 inch (25.0 mm)	100	--	--
3/4 inch (19.0 mm)	90-100	100	--
1/2 inch (12.5 mm)	68-88	90-100	100
3/8 inch (9.5 mm)	60-82	72-88	90-100
No. 4 (4.75 mm)	45-67	53-73	58-78
No. 8 (2.36 mm)	32-54	38-60	40-60
No. 16 (1.18 mm)	22-44	26-48	28-48
No. 30 (600 µm)	15-35	18-38	18-38
No. 50 (300 µm)	9-25	11-27	11-27
No. 100 (150 µm)	6-18	6-18	6-18
No. 200 (75 µm)	3-6	3-6	3-6
Voids in Mineral Aggregate (VMA)	14	15	16
Asphalt percent by total weight of mixture:			
Stone or gravel	4.5-7.0	5.0-7.5	5.5-8.0
Slag	5.0-7.5	6.5-9.5	7.0-10.5
Recommended Minimum Construction Lift Thickness	3 inch	2 inch	1 1/2 inch

¹To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

¹Gradation 3 is intended for leveling courses. FAA approval is required for use in other locations.

403-3.5 Control strip. Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR. The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 403-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons (227 metric tons) or 1/2 subplot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 403-4.13 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F (71°C). The equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 403-6.1 and 403-6.2. The control strip shall be divided into equal sublots. As a minimum, the control strip shall consist of three (3) sublots.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 403-5.5a; and Mat density, air voids, and joint density meet the requirements specified in paragraphs 403-6.2.

If the control strip is unacceptable, necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made and another control strip shall be placed. Unacceptable control strips shall be removed at the Contractor's expense.

Payment will only be made for an acceptable control strip in accordance with paragraph 403-8.1.

CONSTRUCTION METHODS

403-4.1 Weather limitations. The asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the RPR, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)	
	Degrees F	Degrees C
3 inches (7.5 cm) or greater	40	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

403-4.2 Asphalt plant. Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items:

a. Inspection of plant. The RPR, or RPR's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

b. Storage bins and surge bins. The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in storage and/or surge bins for a period greater than twelve (12)

hours. If the RPR determines there is an excessive heat loss, segregation or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

403-4.3 Aggregate stockpile management. Aggregate stockpiles shall be constructed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

403-4.4 Hauling equipment. Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

403-4.4.1 Material transfer vehicle (MTV). A material transfer vehicle is not required.

403-4.5 Asphalt pavers. Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.11.

403-4.6 Rollers. The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

403-4.6.1 Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the density gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No payment will be made for supplying the density gauge and technician.

403-4.7 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of the unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F (175°C) when added to the aggregate.

403-4.8 Preparation of mineral aggregate. The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

403-4.9 Preparation of asphalt mixture. The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

403-4.10 Application of Prime and Tack Coat. Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

A prime coat in accordance with Item P-602 shall be applied to aggregate base prior to placing the asphalt mixture.

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

403-4.11 Laydown plan, transporting, placing, and finishing. Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2e before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of **10** feet (m) except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width

requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot (30 cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m). On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

403-4.12 Compaction of asphalt mixture. After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

403-4.13 Joints. The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid asphalt except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut

back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh asphalt against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C); or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. An asphalt tack coat or other product approved by the RPR shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

403-4.14 Saw-cut grooving. Saw-cut grooving is not required.

403-4.15 Diamond grinding. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with a minimum of 55 to 60 blades per 12 inches (300 mm) of cutting head width; grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

403-4.16 Nighttime Paving Requirements. The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

The lighting plan will address the following items:

- a. All paving machines, rollers, distribution trucks (MTVs) and other vehicles required by the Contractor for his operations shall be equipped with artificial illumination sufficient to safely complete the work.***
- b. Minimum illumination level shall be twenty (20) horizontal foot-candles and maintained in the following areas:***
 - (1) An area of 30 feet (9-m) wide by 30 feet (9-m) long immediately behind the paving machines during the operations of the machines.***
 - (2) An area 15 feet (4.5-m) wide by 30 feet (9-m) long immediately in front and back of all rolling equipment, during operation of the equipment.***
 - (3) An area 15 feet (4.5-m) wide by 15 feet (4.5-m) long at any point where an area is being tack coated prior to the placement of pavement.***
- c. As partial fulfillment of the above requirements, the Contractor shall furnish and use, complete artificial lighting units with a minimum capacity of 3,000 watt electric beam lights, affixed to all equipment in such a way to direct illumination on the area under construction.***

- d. A lighting plan must be submitted by the Contractor and approved by the Engineer prior to the start of any nighttime work. This plan shall be submitted during the Mobilization Phase.*
- e. The Contractor shall provide sufficient lighting, when requested by the RPR, to review the progression of the Work.*

If the Contractor places any out of specification mix in the project work area, the Contractor is required to remove it at its own expense, to the satisfaction of the RPR. If the Contractor has to continue placing non-payment HMA, as directed by the RPR, to make the surfaces safe for aircraft operations, the Contractor shall do so to the satisfaction of the RPR. It is the Contractor's responsibility to leave the facilities to be paved in a safe condition ready for aircraft operations. No consideration for extended closure time of the area being paved will be given. As a first order of work for the next paving shift, the Contractor shall remove all out of specification material and replace with approved material to the satisfaction of the Engineer. When the above situations occur, there will be no consideration given for additional construction time or payment for extra costs.

CONTRACTOR QUALITY CONTROL (CQC)

403-5.1 General. The Contractor shall develop a CQCP in accordance with Item C-100. No partial payment will be made for materials that are subject to specific QC requirements without an approved CQCP.

403-5.2 Contractor quality control (QC) facilities. The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

403-5.3 Quality Control (QC) testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved CQCP. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the CQCP.

a. Asphalt content. A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444 and ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

d. Moisture content of asphalt. The moisture content of the asphalt shall be determined once per lot in accordance with AASHTO T329 or ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Smoothness for Contractor Quality Control.

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) "straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using the FAA profile program, ProFAA, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

(1) Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements will be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 403-4.15 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3). Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant

areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to the placement of the first lift and then prior to and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically and 0.1 feet (30 mm) laterally. The documentation will be provided by the Contractor to the RPR within 24 hours.

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 403-4.15.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus 1/2 inch and replacing with new material. Skin patching is not allowed.

403-5.4 Sampling. When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

403-5.5 Control charts. The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day shall be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the JMF target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits for Individual Measurements

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

b. Range. Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of $n = 2$. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for $n = 3$ and by 1.27 for $n = 4$.

**Control Chart Limits Based on Range
($n = 2$)**

Sieve	Suspension Limit
1/2 inch (12.5 mm)	11%
3/8 inch (9.5 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (300 µm)	6%
No. 200 (75 µm)	3.5%
Asphalt Content	0.8%

c. Corrective action. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

- (1) One point falls outside the Suspension Limit line for individual measurements or range; or
- (2) Two points in a row fall outside the Action Limit line for individual measurements.

403-5.6 Quality control (QC) reports. The Contractor shall maintain records and shall submit reports of QC activities daily, in accordance with the CQCP described in Item C-100.

MATERIAL ACCEPTANCE

403-6.1. Quality Assurance Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

a. Quality Assurance (QA) testing laboratory. The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation.

b. Lot Size. A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

Where more than one plant is simultaneously producing asphalt for the job, the lot sizes will apply separately for each plant.

c. Asphalt air voids. Plant-produced asphalt will be tested for air voids on a subplot basis.

(1) Sampling. Material from each subplot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to maintain the material at or above the compaction temperature as specified in the JMF. ***For mixtures containing aggregates with absorption values greater than 1.5%, the mixture shall be maintained at a temperature at or above the specified compaction temperature for a period of not less than 60 minutes nor more than 90 minutes to stabilize to compaction temperatures.***

(2) Testing. Air voids will be determined for each subplot in accordance with ASTM D3203 for a set of compacted specimens prepared in accordance with [ASTM D6926.

d. In-place asphalt mat and joint density. Each subplot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

(1) Sampling. The RPR will cut minimum 5 inches (125 mm) diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

(2) Bond. Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

(3) Thickness. Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each subplot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or subplot shall be corrected by the Contractor at his expense by removing the deficient area and

replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

(4) Mat density. One core shall be taken from each subplot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot (30 cm) from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each subplot sample by the TMD for that subplot.

(5) Joint density. One core centered over the longitudinal joint shall be taken for each subplot which contains a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

403-6.2 Acceptance criteria.

a. General. Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, grade and Profilograph smoothness

b. Air voids. Acceptance of each lot of plant produced material for air voids will be based upon the average air void from the sublots. If the average air voids of the lot are equal to or greater than 2% and equal to or less than 5%, then the lot will be acceptable. If the average is below 2% or greater than 5%, the lot shall be removed and replaced at the Contractor's expense.

c. Mat density. Acceptance of each lot of plant produced material for mat density will be based on the average of all of the densities taken from the sublots. If the average mat density of the lot so established equals or exceeds 94%, the lot will be acceptable. If the average mat density of the lot is below 94%, the lot shall be removed and replaced at the Contractor's expense.

d. Joint density. Acceptance of each lot of plant produced asphalt for joint density will be based on the average of all of the joint densities taken from the sublots. If the average joint density of the lot so established equals or exceeds 92%, the lot will be acceptable. If the average joint density of the lot is less than 92%, the Contractor shall stop production and evaluate the method of compacting joints. Production may resume once the reason for poor compaction has been determined and appropriate measures have been taken to ensure proper compaction.

e. Grade. The final finished surface of the pavement of the completed project shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch (12 mm) vertically or 0.1 feet (30 mm) laterally.

Cross-sections of the pavement shall be taken at a minimum 50-foot (15-m) longitudinal spacing and at all longitudinal grade breaks. Minimum cross-section grade points shall include grade at centerline, \pm 10 feet of centerline and edge of taxiway pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the subplot shall not be more than 95%.

All survey will be performed on the same grid pattern and spacing as shown on the Spot Elevation Plans.

f. Profilograph roughness for QA Acceptance. The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The RPR will perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hrs of profilograph roughness tests.

The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2-inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). Profilograph shall be performed one foot right and left of project centerline and 15 feet (4.5 m) right and left of project centerline. Any areas that indicate "must grind" shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course, as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.

403-6.3 Resampling Pavement for Mat Density.

a. General. Resampling of a lot of pavement will only be allowed for mat density and then, only if the Contractor requests same in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 403-6.1. Only one resampling per lot will be permitted.

(1) A redefined mat density will be calculated for the resampled lot. The number of tests used to calculate the redefined mat density will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined mat density for a resampled lot will be used to evaluate the acceptance of that lot in accordance with paragraph 403-6.2.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and density determined using the remaining test values.

403-6.4 Leveling course. The leveling course is the first variable thickness lift placed to correct surface irregularities prior to placement of subsequent courses. The leveling course shall meet the aggregate gradation in Table 2, paragraph 403-3.3. The leveling course shall meet the requirements of paragraph 403-3.3, 403-6.1b for air voids, but shall not be subject to the density requirements of paragraph 403-6.1c. The leveling course shall be compacted with the same effort used to achieve density of the control strip. The leveling course shall not exceed the maximum lift thickness associated with each gradation in Table 2, paragraph 403-3.3.

METHOD OF MEASUREMENT

403-7.1 Measurement. Plant mix asphalt mix pavement shall be measured by the number of tons (kg) of asphalt pavement used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

403-8.1 Payment. Payment for a lot of asphalt mixture meeting all acceptance criteria as specified in paragraph 403-6.2 shall be made at the contract unit price per ton (~~kg~~) for asphalt. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

e. Survey – The contractor is to provide a survey from a professionally licensed surveyor after the completion of the asphalt installation. This is a requirement for payment for the leveling course of asphalt.

f. The overall amount of thickness of levelling course installed in a section shall not exceed the plan thickness (Max 2”). Excess levelling course installed without the approval of the Engineer or RPR will not be paid for.

Payment will be made under:

Item P-403-8.1 Hot Mix Asphalt Pavement (Leveling) - per ton (~~kg~~)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement

ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D1074	Standard Test Method for Compressive Strength of Bituminous Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4125	Standard Test Methods for Asphalt Content of Bituminous mixtures by the Nuclear Method
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5581	Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen)
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6307	Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyratory Compactor
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E2133	Standard Test Method for Using a Rolling Inclinator to Measure Longitudinal and Transverse Profiles of a Traveled Surface
American Association of State Highway and Transportation Officials (AASHTO)	
AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
AASHTO T 340	Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)
Asphalt Institute (AI)	
MS-2	Mix Design Manual, 7th Edition
MS-26	Asphalt Binder Handbook AI State Binder Specification Database

FAA Orders

5300.1

Modifications to Agency Airport Design, Construction, and
Equipment Standards

Federal Highway Administration (FHWA)

Long Term Pavement Performance Binder program

Software

FAARFIELD

END OF ITEM P-403

ITEM P-602 EMULSIFIED ASPHALT PRIME COAT

DESCRIPTION

602-1.1 This item shall consist of an application of emulsified asphalt material on the prepared base course in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

602-2.1 Emulsified Asphalt material. The emulsified asphalt material shall be as specified in ASTM D3628 for use as a prime coat appropriate to local conditions. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the emulsified asphalt material. The COA shall be provided to and approved by the Resident Project Representative (RPR) before the emulsified asphalt material is applied. The furnishing of the COA for the emulsified asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project. ***The designated material for this project is Emulsified Asphalt, SS-1h or SS-1.***

THE USE OF "TRACKLESS OR NO-TRACKING" AND "ECO OR ECO-FRIENDLY" MATERIAL WILL NOT BE PERMITTED ON THIS PROJECT. THESE PRODUCTS INCLUDE BUT ARE NOT LIMITED TO NTSS-1HM, NTQS1, NTCRS-1HM, EPRIME, SPMS, SP-MS, ETC... ANY MATERIAL OTHER THAN THOSE COMPLIANT WITH ASTM D3628, WILL BE REJECTED.

CONSTRUCTION METHODS

602-3.1 Weather limitations. The emulsified asphalt prime coat shall be applied only when the existing surface is dry; the atmospheric temperature is 50°F (10°C) or above, and the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

602-3.2 Equipment. The equipment shall include a self-powered pressure asphalt material distributor and equipment for heating asphalt material.

Provide a distributor with pneumatic tires of such size and number that the load produced on the base surface does not exceed 65.0 psi (~~4.5 kg/sq cm~~) of tire width to prevent rutting, shoving or otherwise damaging the base, surface or other layers in the pavement structure. Design and equip the distributor to spray the asphalt material in a uniform coverage at the specified temperature, at readily determined and controlled rates from 0.05 to 1.0 gallons per square yard (~~0.23 to 4.5 L/square meter~~), with a pressure range of 25 to 75 psi (~~172.4 to 517.1 kPa~~) and with an allowable variation from the specified rate of not more than ±5%, and at variable widths. Include with the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying

asphalt material manually to areas inaccessible to the distributor. Equip the distributor to circulate and agitate the asphalt material during the heating process. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

A power broom and power blower suitable for cleaning the surfaces to which the asphalt coat is to be applied shall be provided.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

602-3.3 Application of emulsified asphalt material. Immediately before applying the prime coat, the full width of the surface to be primed shall be swept with a power broom to remove all loose dirt and other objectionable material.

The asphalt emulsion material shall be uniformly applied with an asphalt distributor at the rate of 0.15 to 0.30 gallons per square yard (~~0.68 to 1.36 liters per square meter~~) depending on the base course surface texture. The type of asphalt material and application rate shall be approved by the RPR prior to application.

Following application of the emulsified asphalt material and prior to application of the succeeding layer of pavement, allow the asphalt coat to cure and to obtain evaporation of any volatiles or moisture. Maintain the coated surface until the succeeding layer of pavement is placed, by protecting the surface against damage and by repairing and recoating deficient areas. Allow the prime coat to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course. Furnish and spread sand to effectively blot up and cure excess asphalt material. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the Owner. Keep traffic off surfaces freshly treated with asphalt material. Provide sufficient warning signs and barricades so that traffic will not travel over freshly treated surfaces.

602-3.4 Trial application rates. The Contractor shall apply a minimum of three lengths of at least 100 feet (30 m) for the full width of the distributor bar to evaluate the amount of emulsified asphalt material that can be satisfactorily applied with the equipment. Apply three different application rates of emulsified asphalt materials within the application range specified in paragraph 602-3.3. Other trial applications can be made using various amounts of material as directed by the RPR. The trial application is to demonstrate the equipment can uniformly apply the emulsified asphalt material within the rates specified and determine the application rate for the project.

602-3.5 Freight and waybills. The Contractor shall submit waybills and delivery tickets during the progress of the work. Before the final estimate is allowed, file with the RPR certified waybills and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken. ***Waybills and delivery tickets must be submitted prior to the delivery truck's departure. No waybills and delivery tickets will be accepted after the fact. Any delivery trucks departing prior to submitting their waybill and delivery ticket will not be measured for payment.***

METHOD OF MEASUREMENT

602-4.1 The emulsified asphalt material for prime coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D4311. The emulsified asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of emulsified asphalt material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

602-5.1 Payment shall be made at the contract unit price per gallon for emulsified asphalt prime coat. This price shall be full compensation for furnishing all materials and for all preparation, delivering, and applying the materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item P-602-5.1 Emulsified Asphalt Prime Coat - per gallon

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D2995 Standard Practice for Estimating Application Rate and Residual
Application Rate of Bituminous Distributors

ASTM D3628 Standard Practice for Selection and Use of Emulsified Asphalts

END OF ITEM P-602

THIS PAGE INTENTIONALLY LEFT BLANK

ITEM P-603 EMULSIFIED ASPHALT TACK COAT

DESCRIPTION

603-1.1 This item shall consist of preparing and treating an asphalt or concrete surface with asphalt material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 Asphalt materials. The asphalt material shall be an emulsified asphalt as specified in ASTM D3628 as an asphalt application for tack coat appropriate to local conditions. The emulsified asphalt shall not be diluted. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Resident Project Representative (RPR) before the asphalt material is applied for review and acceptance. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project. ***The designated material for this project is Emulsified Asphalt, SS-1h, or RS-1 or approved equivalent. If RS-1 is used, application temperature must be between 140°F-180°F. To use RS-1 at night, the Contractor must demonstrate, at time of use, that emulsion will break to allow paving in a timely manner.***

THE USE OF "TRACKLESS OR NO-TRACKING" AND "ECO OR ECO-FRIENDLY" MATERIAL WILL NOT BE PERMITTED ON THIS PROJECT. THESE PRODUCTS INCLUDE BUT ARE NOT LIMITED TO NTSS-1HM, NTQS1, NTCRS-1HM, EPRIME, SPMS, SP-MS, ETC... ANY MATERIAL OTHER THAN THOSE COMPLIANT WITH ASTM D3628, WILL BE REJECTED.

CONSTRUCTION METHODS

603-3.1 Weather limitations. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F (10°C) or above; the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

603-3.2 Equipment. The Contractor shall provide equipment for heating and applying the emulsified asphalt material. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven (700) feet per minute (213 m per minute).

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate

for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot (3.7-m) spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

A power broom and/or power blower suitable for cleaning the surfaces to which the asphalt tack coat is to be applied shall be provided.

603-3.3 Application of emulsified asphalt material. The emulsified asphalt shall not be diluted. Immediately before applying the emulsified asphalt tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

The emulsified asphalt material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in the table below. The type of asphalt material and application rate shall be approved by the RPR prior to application.

Emulsified Asphalt

Surface Type	Residual Rate, gal/SY (L/square meter)	Emulsion Application Bar Rate, gal/SY (L/square meter)
New asphalt	0.02-0.05 (0.09-0.23)	0.03-0.07 (0.13-0.32)
Existing asphalt	0.04-0.07 (0.18-0.32)	0.06-0.11 (0.27-0.50)
Milled Surface	0.04-0.08 (0.18-0.36)	0.06-0.12 (0.27-0.54)
Concrete	0.03-0.05 (0.13-0.23)	0.05-0.08 (0.23-0.36)

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the RPR. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

603-3.4 Freight and waybills The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the RPR certified waybills

and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken. ***Waybills and delivery tickets must be submitted prior to the delivery truck's departure. No waybills and delivery tickets will be accepted after the fact. Any delivery trucks departing prior to submitting their waybill and delivery ticket will not be measured for payment.***

METHOD OF MEASUREMENT

603-4.1 The emulsified asphalt material for tack coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D1250. The emulsified asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of emulsified asphalt material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603.5-1 Payment shall be made at the contract unit price per gallon of emulsified asphalt material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603-5.1	Emulsified Asphalt Tack Coat – per gallon
----------------	---

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2995	Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

END ITEM P-603

THIS PAGE INTENTIONALLY LEFT BLANK

ITEM P-608 EMULSIFIED ASPHALT SEAL COAT

DESCRIPTION

608-1.1 This item shall consist of the application of a emulsified asphalt surface treatment composed of an emulsion of natural and refined asphalt materials, water and a polymer additive, for taxiways and runways with the application of a suitable aggregate to maintain adequate surface friction; and airfield secondary and tertiary pavements including low-speed taxiways, shoulders, overruns, roads, parking areas, and other general applications with or without aggregate applied as designated on the plans. ***The Blast Pad will be applied without aggregate.*** The terms seal coat, asphalt sealer, and asphalt material are interchangeable throughout this specification. The term emulsified asphalt means an emulsion of natural and refined asphalt materials.

MATERIALS

608-2.1 Aggregate. The aggregate material shall be a dry, clean, dust and dirt free, sound, durable, angular shaped manufactured specialty sand, such as that used as an abrasive, with a Mohs hardness of 6 to 8. The Contractor shall submit the specialty sand manufacturer's technical data and a manufacturer's Certificate of Analysis (COA) indicating that the specialty sand meets the requirements of the specification to the RPR prior to start of construction. The sand must be approved for use by the RPR and shall meet the following gradation limits when tested in accordance with ASTM C136 and ASTM C117:

Aggregate Material Gradation Requirements¹

Sieve Designation (square openings)	Individual Percentage Retained by Weight
No. 10 (2.00 mm)	0
No. 14 (1.41 mm)	0-4
No. 16 (1.18 mm)	0-8
No. 20 (850 µm)	0-35
No. 30 (600 µm)	20-50
No. 40 (425 µm)	10-45
No. 50 (300 µm)	0-20
No. 70 (212 µm)	0-5
No. 100 (150 µm)	0-2
No. 200 (75 µm)	0-2

¹ Locally available sand or abrasive material that is slightly outside of the gradation requirements may be approved by the RPR with concurrence by the seal coat manufacturer for the use of locally available sand or abrasive material. The RPR and manufacturer's field representative should verify acceptance during application of Control strips indicated under paragraph 608-3.2.

The Contractor shall provide a certification showing particle size analysis and properties of the material delivered for use on the project. The Contractor's certification may be subject to verification by testing the material delivered for use on the project.

608-2.2 Asphalt Emulsion. The asphalt emulsion shall meet the properties in the following table:

Concentrated Asphalt Emulsion Properties

Properties	Specification	Limits
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	20 – 100 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	57% minimum
Sieve Test	ASTM D6933	0.1% maximum
24-hour Stability	ASTM D6930	1% maximum
5-day Settlement Test	ASTM D6930	5.0% maximum
Particle Charge ¹	ASTM D7402	Positive 6.5 maximum pH

¹ pH may be used in lieu of the particle charge test which is sometimes inconclusive in slow setting, asphalt emulsions.

The asphalt material base residue shall contain not less than 20% gilsonite, or uintaite and shall not contain any tall oil pitch or coal tar material and shall contain no less than one percent (1%) polymer.

Tests on Residue from Distillation or Evaporation

Properties	Specification	Limits
Viscosity at 275°F (135°C)	ASTM D4402	1750 cts maximum
Solubility in 1, 1, 1 trichloroethylene	ASTM D2042	97.5% minimum
Penetration	ASTM D5	50 dmm maximum
Asphaltenes	ASTM D2007	15% minimum
Saturates	ASTM D2007	15% maximum
Polar Compounds	ASTM D2007	25% minimum
Aromatics	ASTM D2007	15% minimum

The asphalt emulsion, when diluted in the volumetric proportion of one part concentrated asphalt material to one part hot water shall have the following properties:

One-to-One Dilution Emulsion Properties

Properties	Specification	Limits
In Ready-to-Apply Form, one part concentrate to one part water, by volume		
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	28.5% minimum
Pumping Stability ¹		Pass

¹ Pumping stability is tested by pumping one pint (475 ml) of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F (25°C), through a 1/4-inch (6 mm) gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

Two-to-One Dilution Emulsion Properties

Properties	Specification	Limits
In Ready-to-Apply Form, two parts concentrate to one part water, by volume		
Viscosity, Saybolt Furol at 77°F (25°C)	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	38% minimum
Pumping Stability ¹		Pass

¹ Pumping stability is tested by pumping one pint (475 ml) of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F (25°C), through a 1/4-inch (6 mm) gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the emulsified asphalt delivered to the project. If the asphalt emulsion is diluted at other than the manufacturer's facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties.

The COA shall be provided to and approved by the RPR before the emulsified asphalt is applied. The furnishing of the vendor's certified test report for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

The asphalt material storage and handling temperature shall be between 50°F - 160°F (10°C - 70°C) and the material shall be protected from freezing, or whenever outside temperature drops below 40°F (4°C) for prolonged time periods.

Contractor shall provide a list of airport pavement projects, exposed to similar climate conditions, where this product has been successfully applied within at least 5 years of the project.

608-2.3 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use. Water used in making and diluting the emulsion shall be potable, with a maximum hardness of 90ppm calcium and 15ppm magnesium; deleterious iron, sulfates, and phosphates maximum 7ppm, and less than 1ppm of organic byproducts. Water shall be a minimum of 140°F (60°C) prior to adding to emulsion.

608-2.4 Polymer. The polymer shall meet the properties in the following table:

Polymer Properties

Properties	Limits
Solids Content	47% to 65%, Percent by Weight
Weight	8.0 to 9.0 pounds/gallon (1.07 to 1.17 kg/L)
pH	3.0 to 8.0
Particle Charge	Nonionic/Cationic
Mechanical Stability	Excellent
Film Forming Temperature, °C	+5°C, minimum
Tg, °C	22°C, maximum

The manufacturer shall provide a copy of the Certificate of Analysis (COA) for the polymer used in the seal coat; and the Contractor shall include the COA with the emulsified asphalt COA when submitting to the RPR.

608-2.5 Seal Coat with Aggregate. The Contractor shall submit friction test data from no less than one of the airport projects identified under 608-2.2. The test data must be from the same project and include technical details on application rates, aggregate rates, and point of contact at the airport to confirm use and success of sealer with aggregate.

Friction test data in accordance with AC 150/5320-12, at 40 or 60 mph (65 or 95 km/h) wet, must include as a minimum; the friction value prior to sealant application; two values, between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value between 180 days and 360 days after the application. The results of the tests between 24 and 96 hours shall indicate friction is increasing at a rate to obtain similar friction value of the pavement surface prior to application, and the long-term test shall indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

Seal coat material submittal without required friction performance will not be approved. Friction tests performed on this project cannot be used as a substitute of this requirement.

COMPOSITION AND APPLICATION RATE

608-3.1 Application Rate. The approximate amounts of materials per square yard (square meter) for the asphalt surface treatment shall be as provided in the table for the treatment area(s) at the specified dilution rate(s) as noted on the plans. The actual application rates will vary within the range specified to suit field conditions and will be recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation.

Application Rate

Dilution Rate	Quantity of Emulsion gal/yd ² (l/m ²)	Quantity of Aggregate lb/yd ² (kg/m ²)
1:1	0.10-0.17 (0.45-0.77)	0.20-0.50 (0.11-0.27)

608-3.2 Control areas and control strips. Prior to full application, the control strip must be accepted by the RPR. The surface preparation, personnel, equipment, and method of operation used on the test area(s) and control strip(s) shall be the same as used on the remainder of the work.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying control areas and/or control strips to determine the appropriate application rate of both emulsion and aggregate to be approved by the RPR.

A test area(s) and control strip(s) shall be applied for each differing asphalt pavement surface identified in the project. The test area(s) and control strip(s) shall be used to determine the material application rate(s) of both emulsion and sand prior to full production.

a. For taxiway, taxilane and apron surfaces. Prior to full application, the Contractor shall place test areas at varying application rates as recommended by the Contractor's manufacturer's representative to determine appropriate application rate(s). The test areas will be located on representative section(s) of the pavement to receive the asphalt surface treatment designated by the RPR.

b. For runway and high-speed exit taxiway surfaces. Prior to full application, the Contractor shall place a series of control strips a minimum of 300 feet (90 m) long by 12 feet (3.6 m) wide, or width of anticipated application, whichever is greater, at varying application rates as recommended by the manufacturer's representative and acceptable to the RPR to determine appropriate application rate(s). The control strips should be separated by a minimum of 200 feet between control strips. The area to be tested will be located on a representative section of the pavement to receive the asphalt surface treatment designated by the RPR. The control strips should be placed under similar field conditions as anticipated for the actual application. The skid resistance of the existing pavement shall be determined for each control strip with a continuous friction measuring equipment (CFME). The skid resistance of existing pavement can be immediately adjacent to the control strip or at the same location as the control strip if testing prior to application. The Contractor may begin testing the skid resistance of runway and high-speed exit taxiway control strips after application of the asphalt surface treatment has fully cured, generally 8 to 36 hours after application of the control strips depending on site and environmental conditions. Aircraft shall not be permitted on the runway or high speed exit taxiway control strips until such time as the Contractor validates that its surface friction meets the maintenance planning friction levels in AC 150/5320-12, Table 3-2 when tested at speeds of 40 and 60 mph (65 and 95 km/h) wet with approved CFME.

If the control strip should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment shall be made. Additional control strips shall be placed and additional skid resistance tests performed and evaluated. Full production shall not begin without the RPR's approval of an appropriate application rate(s). Acceptable control strips shall be paid for in accordance with paragraph 608-8.1.

CONSTRUCTION METHODS

608-4.1 Worker safety. The Contractor shall obtain a Safety Data Sheet (SDS) for both the asphalt emulsion product and sand and require workmen to follow the manufacturer's recommended safety precautions.

608-4.2 Weather limitations. The asphalt emulsion shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. No material shall be applied in strong winds that interfere with the uniform application of the material(s), or when dust or sand is blowing or when rain is anticipated within eight (8) hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be at, or above 60°F (16°C) and rising. Seal coat shall not be applied when pavement temperatures are expected to exceed 130°F within the subsequent 72 hours if traffic will be opened on pavement within those 72 hours. During application, account for wind drift. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the emulsion. Should emulsion get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the RPR, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

608-4.3 Equipment and tools. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Pressure distributor. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven hundred (700) feet per minute (213 m per minute). The equipment will be tested under pressure for leaks and to ensure proper set-up before use. The Contractor will provide verification of truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application per nozzle manufacturer, spray-bar height and pressure and pump speed appropriate for the viscosity and temperature of sealer material, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a 12-foot (3.7-m), minimum, spray bar with individual nozzle control. The distributor truck shall be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard (0.15 to 0.80 liters per square meter). These rates shall be computer-controlled rather than mechanical. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy.

The distributor truck shall effectively heat and mix the material to the required temperature prior to application in accordance with the manufacturer's recommendations.

The distributor shall be equipped with a hand sprayer to spray the emulsion in areas not accessible to the distributor truck.

b. Aggregate spreader. The asphalt distributor truck will be equipped with an aggregate spreader mounted to the distributor truck that can apply sand to the emulsion in a single pass operation without driving through wet emulsion. The aggregate spreader shall be equipped with

a variable control system capable of uniformly distributing the sand at the specified rate at varying application widths and speeds. The aggregate spreader must be adjusted to produce an even and accurate application of specified aggregate. Prior to any seal coat application, the aggregate spreader will be calibrated onsite to ensure acceptable uniformity of spread. The RPR will observe the calibration and verify the results. The aggregate spreader will be re-calibrated each time the aggregate rate is changed either during the application of test strips or production. The Contractor may consult the seal coat manufacturer representative for procedure and guidance. The sander shall have a minimum hopper capacity of 3,000 pounds (1361 kg) of sand. Push-type hand sanders will be allowed for use around lights, signs and other obstructions, if necessary.

c. Power broom/blower. A power broom and/or blower shall be provided for removing loose material from the surface to be treated.

d. Equipment calibration. Asphalt distributors must be calibrated within the same construction season in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

608-4.4 Preparation of asphalt pavement surfaces. Clean pavement surface immediately prior to placing the seal coat so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease from the asphalt pavement by scrubbing with a detergent, washing thoroughly with clean water, and then treat these areas with a spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with Item P-101, paragraph 101-3.6.

a. New asphalt pavement surfaces. Allow new asphalt pavement surfaces to cure so that there is no concentration of oils on the surface.

Perform a water-break-free test to confirm that the surface oils have degraded and dissipated. (Cast approximately one gallon (4 liters) of clean water out over the surface. The water should sheet out and wet the surface uniformly without crawling or showing oil rings.) If signs of crawling or oil rings are apparent on the pavement surface, additional time must be allowed for additional curing and retesting of the pavement surface prior to treatment.

608-4.5 Emulsion mixing. The application emulsion shall be obtained by blending asphalt material concentrate, water and polymer, if specified. Always add heated water to the asphalt material concentrate, never add asphalt material concentrate to heated water. Mix one part heated water to **one part** asphalt material concentrate, by volume.

Add 1% polymer, by volume, to the emulsion mix. If the polymer is added to the emulsion mix at the plant, submit weight scale tickets to the RPR. As an option, the polymer may be added to the emulsion mix at the job site provided the polymer is added slowly while the asphalt distributor truck circulating pump is running. The mix must be agitated for a minimum of 15 minutes or until the polymer is mixed to the satisfaction of the RPR.

608-4.6 Application of asphalt emulsion. The asphalt emulsion shall be applied using a pressure distributor upon the properly prepared, clean and dry surface at the application rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated treatment area. The asphalt emulsion should be applied at a temperature between 130°F (54°C) and 160°F (70°C) or in accordance with the manufacturer's recommendation.

Pavement with excessive surface grade may need to be treated in two applications to achieve the specified application rate, consult with the manufacturer and coordinate any modification to specification with local FAA.

If low spots and depressions greater than 1/2 inch (12 mm) in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be lightly broomed with a broom or brush type squeegee until the pavement surface is free of any pools of excess material.

During all applications, the surfaces of adjacent structures shall be protected to prevent their being splattered or marred.

608-4.7 Application of aggregate material. Immediately following the application of the asphalt emulsion, friction sand at the rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated application area, shall be spread uniformly over the asphalt emulsion in a single-pass operation simultaneous with the sealer application. The aggregate shall be spread to the same width of application as the asphalt material and shall not be applied in such thickness as to cause blanketing.

Sprinkling of additional aggregate material, and spraying additional asphalt material over areas that show up having insufficient cover or bitumen, shall be done by hand whenever necessary. In areas where hand work is necessitated, the sand shall be applied before the sealant begins to break.

Minimize aggregate from being broadcast and accumulating on the untreated pavement adjacent to an application pass. Prior to the next application pass, the Contractor shall clean areas of excess or loose aggregate and remove from project site.

QUALITY CONTROL (QC)

608-5.1 Manufacturer's representation. The manufacturer's representative knowledgeable of the material, procedures, and equipment described in the specification is responsible to assist the Contractor and RPR in determining the appropriate application rates of the emulsion and aggregate, as well as recommendations for proper preparation and start-up of seal coat application. Documentation of the manufacturer representative's experience and knowledge for applying the seal coat product shall be furnished to the RPR a minimum of 10 work days prior to placement of the control strips. The cost of the manufacturer's representative shall be included in the Contractor's bid price.

608-5.2 Contractor qualifications. The Contractor shall provide documentation to the RPR that the seal coat Contractor is qualified to apply the seal coat, including personnel, and equipment, and has made at least three (3) applications similar to this project in the past two (2) years.

MATERIAL ACCEPTANCE

608-6.1 Application rate. The rate of application of the asphalt emulsion shall be verified at least twice per day.

608-6.2 Friction tests. Friction tests in accordance with AC 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces, shall be performed on all runway and high-speed taxiways that received a seal coat. Each test includes performing friction tests at 40 mph and 60 mph (65 or 95 km/h) both wet, 15 feet (4.5 m) to each side of runway centerline with approved continuous friction measuring equipment (CFME). The Contractor shall coordinate testing with the RPR and provide the RPR a written report of friction test results. The RPR shall be present for testing.

METHOD OF MEASUREMENT

608-7.1 Asphalt surface treatment. The quantity of asphalt surface treatment shall be measured by the square yards of material applied in accordance with the plans and specifications and accepted by the RPR.

The Contractor must furnish the RPR with the certified weigh bills when materials are received for the asphalt material used under this contract. The Contractor must not remove material from the tank car or storage tank until initial amounts and temperature measurements have been verified.

BASIS OF PAYMENT

608-8.1 Payment shall be made at the contract unit price per square yard for the asphalt surface treatment applied and accepted by the RPR. Runway friction testing, if required, will be incidental to asphalt surface treatment. This price shall be full compensation for all surface preparation, furnishing all materials, delivery and application of these materials, for all labor, equipment, tools, and incidentals necessary to complete the item, including the friction testing and all work required to meet AC 150/5320-12, and any costs associated with furnishing a qualified manufacturer's representative to assist with control strips.

Payment will be made under:

Item P-608-8.1	Asphalt Surface Treatment – per square yard
----------------	---

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D5	Standard Test Method for Penetration of Asphalt Materials
ASTM D244	Standard Test Methods and Practices for Emulsified Asphalts

ASTM D2007	Standard Test Method for Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method
ASTM D2042	Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
ASTM D2995	Standard Practice for Estimating Application Rate of Bituminous Distributors
ASTM D4402	Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D5340	Standard Test Method for Airport Pavement Condition Index Surveys
Advisory Circulars (AC)	
AC 150/5320-12	Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces
AC 150/5320-17	Airfield Pavement Surface Evaluation and Rating (PASER) Manuals
AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements

END OF ITEM P-608

ITEM P-610 CONCRETE FOR MISCELLANEOUS STRUCTURES

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

Coarse Aggregate Grading Requirements

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch (37.5 mm)	467 or 4 and 67
1 inch (25 mm)	57
3/4 inch (19 mm)	67
1/2 inch (12.5 mm)	7

610-2.2.1 Coarse Aggregate susceptibility to durability (D) cracking. *Aggregates that have a history of D-cracking shall not be used.*

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

610-2.4 Cement. Cement shall conform to the requirements of ASTM C150 - Type I

The chemical requirements for all cement types specified should meet suitable criteria for deleterious activity. Low alkali cements (less than 0.6% equivalent alkalies).

Total Alkalies (Na₂O and K₂O) of the cement secured for the production of concrete shall be independently verified in accordance with ASTM C114 or ASTM C1365.

610-2.5 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 13% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

610-2.6 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM 1752.

610-2.9 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.10 Steel reinforcement. *Reinforcing shall consist of Grade 60 deformed bars conforming to the requirements of ASTM A615, ASTM A706, ASTM A775 & ASTM A934 and/or welded steel wire fabric conforming to the requirements of ASTM A1064.* Reinforcing shall consist of conforming to the requirements of .

610-2.11 Materials for curing concrete. *Curing materials shall conform to one or more of the following specifications:* Curing materials shall conform to .

Materials for Curing

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

610-3.2 Concrete Mixture. The concrete shall develop a compressive strength of 4000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard (~~280 kg per cubic meter~~). The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches (100 mm) as determined by ASTM C143.

Concrete produced by a reputable local supplier of ready-mix or transit mix concrete designed for a minimum compressive strength of 4,000 psi or as given in the project

plans, may be used when approved by the Engineer. The Contractor shall submit the ready mix or transit mix design to the Engineer at least 30-days prior to use of concrete on the project.

610-3.3 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F (10°C) nor more than 100°F (38°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.6 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 Concrete Consistency. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

610-3.8 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall

avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet (1.5 m). Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 Joints. Joints shall be constructed as indicated on the plans.

610-3.11 Finishing. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 Curing and protection. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 Cold weather placing. When concrete is placed at temperatures below 40°F (4°C), follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 Hot weather placing. When concrete is placed in hot weather greater than 85°F (30 °C), follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

QUALITY ASSURANCE (QA)

610-4.1 Quality Assurance sampling and testing. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The **Contractor RPR** will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall prepare six test specimens for each day's pour. The Contractor shall provide adequate facilities for the initial curing of cylinders. ***The Contractor shall retain the specimens for quality control (QC) testing and deliver to the QA laboratory three specimens. QC and QA testing of the specimens shall occur at 3 days, 7 days and 28 days.***

610-4.2 Defective work. Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 P-610 concrete for the Blast Fence Foundation and Concrete Collar for Fiber Optic Pull Box shall be measured in CY.

BASIS OF PAYMENT

610-6.1 ~~This price shall be full compensation for furnishing all materials including reinforcement and embedded items and for all preparation, delivery, installation, and curing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.~~

There shall be no separate payment for the Concrete for all Miscellaneous Structures. All costs including furnishing all materials including reinforcement and embedded items and for all preparation, delivery, installation, and curing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete these other items shall be incidental to the items requiring Concrete for Miscellaneous Structures.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for
Concrete Paving and Structural Construction (Nonextruding and
Resilient Asphalt Types)

ASTM D1752 Standard Specification for Preformed Sponge Rubber Cork and
Recycled PVC Expansion Joint Fillers for Concrete Paving and
Structural Construction

American Concrete Institute (ACI)

ACI 305R Hot Weather Concreting

ACI 306R Cold Weather Concreting

ACI 308R Guide to External Curing of Concrete

ACI 309R Guide for Consolidation of Concrete

END OF ITEM P-610

ITEM P-620 RUNWAY AND TAXIWAY MARKING

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification. ***Where applicable, The Contractor will comply with best practices as published by the Innovative Pavement Research Foundation Report 01-G-002-05-1 title Airfield Markings Handbook, September 2008 unless otherwise approved by the Engineer.***

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer's certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer's surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint ¹				Glass Beads ²	
Type	Color	Fed Std. 595 Number	Application Rate Maximum	Type	Application Rate Minimum
II	White (Final)	37925	115 ft ² /gal	III	10 lb/gal
II	White (Temp)	37925	57.5 ft ² /gal	I	7 lb/gal
II	Red (Final)	31136	115 ft ² /gal	I	5 lb/gal
II	Red (Temp)	31136	57.5 ft ² /gal	-	-
II	Yellow (Final)	33538 or 33655	115 ft ² /gal	III	10 lb/gal
II	Yellow (Temp)	33538 or 33655	57.5 ft ² /gal	I	7 lb/gal
II	Black	37038	115 ft ² /gal	-	-

¹ See paragraph 620-2.2a

² See paragraph 620-2.2b

a. Paint. Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595.

Black outlining is required for this project unless shown otherwise by the Project Plans.

Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952F, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

b. Reflective media. Glass beads for ***all permanent*** white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type III, Gradation A. Glass beads for permanent red and pink paint shall meet the requirements for Type I, Gradation A, ***except for zipper markings, which shall receive Type III glass beads. Glass beads for temporary white and yellow paint shall meet the requirements of Federal Specification TT-B-1325D Type I, Gradation A.***

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Type III glass beads shall not be used in red and pink paint.

~~**620-2.3 Biocide Additive.** A biocide additive will be required to be included at the time of manufacture that resists algae growth on the coating. Biocide shall meet or exceed that of Safety Coatings of Foley, Alabama. The Contractor shall submit biocide data to the Engineer for prior approval. Mixing concentrations shall be in accordance with the paint manufacturer's recommendations and shall not, in any way, diminish the warranty of the paint.~~

CONSTRUCTION METHODS

620-3.1 Weather limitations. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall ***be designed so as to*** apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. ***spattering, without over***

spray, and within the limits for straightness set forth herein. Refer to paragraph 620-3.5 for application. The marking equipment for both paint and beads shall be calibrated daily.

Suitable adjustments shall be provided on the sprayer(s) of a single machine or by furnishing additional equipment for painting the width required.

The Contractor shall provide the necessary airfield stencils that have been approved by the Owner to paint the surface painted signs and taxiway location signs as indicated in the plans.

620-3.3 Preparation of surfaces. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminants that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

a. Preparation of new pavement surfaces. *Extreme care shall be taken not to damage the pavement.* The area to be painted shall be cleaned by broom, blower, ~~water blasting~~, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, ~~water blasting~~, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings. ***Coatings will be incidental to this work.***

c. Preparation of pavement markings prior to remarking. Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufacturers application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

New pavement markings should never be painted over the top of existing, permanent pavement markings.

Markings to be removed and repainted shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the new paint and the existing paint. The areas to be painted shall be cleaned by pressure washing or by other methods approved by the Engineer, as required to remove all dirt, laitance, and loose materials.

Prior to each working day, the Contractor shall calibrate the application equipment and provide evidence of that calibration to the RPR. Twice daily, or as directed by the RPR, the Contractor shall test the day's production for thickness and reflectivity. All testing results shall be provided to the RPR/Engineer at the end of each day's production.

620-3.4 Layout of markings. The proposed markings shall be laid out **by the Contractor with a licensed land surveyor registered in the state of Florida** in advance of the paint application. **The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the paint. Prior to the markings being laid out in the field, the Contractor and marking Subcontractor shall attend a pre-activity meeting with the Airport, RPR and Engineer.** The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 Application. A period of **30** days shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout **has been performed by a licensed surveyor** and **the** condition of the surface has been approved by the RPR.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

Marking Dimensions and Spacing Tolerance

Dimension and Spacing	Tolerance
36 inch (910 mm) or less	±1/2 inch (12 mm)
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch (25 mm)
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch (50 mm)
greater than 60 feet (18.3 m)	±3 inch (76 mm)

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. **Subject to the overall scheduling requirements, the Contractor shall allow the maximum time to elapse after paving to allow the asphalt to oxidize prior to any permanent painting.**

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

A layer (one coat) of temporary paint, with glass beads as noted in Table 1, shall be applied twenty-four (24) hours after placement of bituminous pavements to allow the prompt re-opening of pavements to aircraft traffic. However, the paint shall not bleed, curl, or discolor when applied. A permanent layer of paint with glass beads shall be applied at the end of the project on top of the temporary markings layer. Black outline shall not be applied for temporary paint.

At no point should any paint be applied to the grass adjacent to the pavement edge.

620-3.6 Application--preformed thermoplastic airport pavement markings. Preformed thermoplastic pavement markings not used.

620-3.7 Control strip. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance. ***Thickness shall be in the range of 12-18 mil and reflectivity measurement shall comply with paragraph 620-2.2***

620-3.8 Retro-reflectance. Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 reading shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

Minimum Retro-Reflectance Values

Material	Retro-reflectance mcd/m ² /lux		
	White	Yellow	Red
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than ¹	100	75	10

¹ Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance

620-3.9 Protection and cleanup. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations. ***Any excess paint outside the limits of markings, including splatters, splashes, spillage, or drippings of paint shall be removed through grinding. Any existing markings to remain that are damaged from Contractor's operations shall be re-painted at the Contractor's expense.***

620-3.10 Stencils. ***In advance of any marking operations, the Contractor shall submit for review by the Engineer the stencils to be employed for the installation of surface painted signs.***

620-3.11 Surfaces to receive new markings. ***The Contractor shall not apply new markings over newly applied paint. For example, black borders shall not be applied the full width of the marking, then apply yellow markings to achieve black border requirements.***

620-3.12 As-Built Survey. ***At the completion of each work area, the Contractor shall provide as-built evidence prepared by a State of Florida licensed land surveyor***

demonstrating that newly installed markings comply with the dimensions provided in the Contract Documents. Additionally, the Contractor shall produce testing results for applied thickness and reflectivity. No payment to the Contractor shall be made until such documentation is produced and provided to the Engineer for approval newly installed markings that do not satisfy the required dimensions, thickness or reflectivity shall be removed and reinstalled by the Contractor. Such removal and reinstallation shall be at the expense of the Contractor.

METHOD OF MEASUREMENT

620-4.1 The quantity of runway and taxiway markings to be paid for shall be the number of square feet of painting including reflective media performed and installed in accordance with the specifications and accepted by the RPR. The quantity of runway and taxiway paint removal shall be paid for by the number of square feet removed and accepted by the RPR. Measurement of markings removed and installed shall occur in the presence of both the Contractor and RPR.

BASIS OF PAYMENT

620-5.1 Payment shall be made at the respective contract price per square foot for runway and taxiway painting. Payment shall be made at the respective contract price per square feet for runway and taxiway paint removal. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, reflective media, testing, layout, surface cleaning and incidentals necessary to complete the item.

Payment will be made under:

- | | |
|----------------|--|
| Item P-620-5.1 | Permanent Airfield Painting with Type III Glass Beads (Yellow, White) - per Square Foot |
| Item P-620-5.3 | Permanent Airfield Painting with No Glass Beads (Black) – per Square Foot |
| Item P-620-5.4 | Temporary Airfield Painting with Type I Glass Beads (Yellow and White) – per Square Foot |
| Item P-620-5.5 | Paint removal per Square Foot |

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

Code of Federal Regulations (CFR)

40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
---	--

29 CFR Part 1910.1200 Hazard Communication

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
FED STD 595	Colors used in Government Procurement

Commercial Item Description

A-A-2886B Paint, Traffic, Solvent Based

Advisory Circulars (AC)

AC 150/5340-1 Standards for Airport Markings

AC 150/5320-12 Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

END OF ITEM P-620

ITEM P-621 SAW-CUT GROOVES

DESCRIPTION

621-1.1 This item consists of constructing saw-cut grooves to minimize hydroplaning during wet weather, providing a skid resistant surface in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR).

CONSTRUCTION METHODS

621-2.1 Procedures. The Contractor shall submit to the RPR the grooving sequence and method of placing guide lines to control grooving operation. Transverse grooves saw-cut in the pavement must form a 1/4 inch (+1/16 inch, -0 inch) wide by 1/4 inch ($\pm 1/16$ inch) deep by 1-1/2 inch (-1/8 inch, +0 inch) center-to-center configuration. The grooves must be continuous for the entire runway length. They must be saw-cut transversely (perpendicular to centerline) in the runway and high-speed taxiway pavement to not less than 10 feet (3 m) from the runway pavement edge to allow adequate space for equipment operation.

The saw-cut grooves must meet the following tolerances. The tolerances apply to each day's production and to each piece of grooving equipment used for production. The Contractor is responsible for all controls and process adjustments necessary to meet these tolerances. The Contractor shall routinely spot check for compliance each time the equipment aligns for a grooving pass.

a. Alignment tolerance. The grooves shall not vary more than $\pm 1\text{-}1/2$ inch (38 mm) in alignment for 75 feet (23 m) along the runway length, allowing for realignment every 500 feet (150 m) along the runway length.

b. Groove tolerance.

(1) Depth. The standard depth is 1/4 inch (6 mm). At least 90% of the grooves must be at least 3/16 inch (5 mm), at least 60% of the grooves must be at least 1/4 inch (6 mm), and not more than 10% of the grooves may exceed 5/16 inch (8 mm).

(2) Width. The standard width is 1/4 inch (6 mm). At least 90% of the grooves must be at least 3/16 inch (5 mm), at least 60% of the grooves must be at least 1/4 inch (6 mm), and not more than 10% of the grooves may exceed 5/16 inch (8 mm).

(3) Center-to-center spacing. The standard spacing is 1-1/2 inch (38 mm). Minimum spacing 1-3/8 inch (34 mm). Maximum spacing 1-1/2 inch (38 mm).

Saw-cut grooves must not be closer than 3 inches (8 cm) or more than 9 inches (23 cm) from transverse joints in concrete pavements. Grooves must not be closer than 6 inches (150 mm) and no more than 18 inches (0.5 m) from in-pavement light fixtures. Grooves may be continued through longitudinal construction joints. Where neoprene compression seals have been installed and the compression seals are recessed sufficiently to prevent damage from the grooving operation, grooves may be continued through the longitudinal joints. Where neoprene compression seals have been installed and the compression seals are not recessed sufficiently to prevent damage from the grooving operation, grooves must not be closer than 3 inches (8 cm) or more than 5 inches (125 mm) from the longitudinal joints. Where lighting cables are installed, grooving through longitudinal or diagonal saw kerfs shall not be allowed.

621-2.2 Environmental requirements. Grooving operations will not be permitted when freezing conditions prevent the immediate removal of debris and/or drainage of water from the grooved area. Discharge and disposal of waste slurry shall be the Contractor's responsibility.

621-2.3 Control strip. Groove a control strip in an area of the pavement ~~outside of the trafficked area~~, as approved by the RPR. The area shall be **80** feet long by two lanes wide. Demonstrate the setup and alignment process, the grooving operation, and the waste slurry disposal.

621-2.4 Existing pavements. Bumps, depressed areas, bad or faulted joints, and badly cracked and/or spalled areas in the pavement shall not be grooved until such areas are adequately repaired or replaced.

621-2.5 New pavements. New asphalt and Portland cement concrete pavements shall be allowed to cure for a minimum of 30 days before grooving, to allow the material to become stable enough to prevent closing of the grooves under normal use. If it can be demonstrated that grooves are stable, and can be installed with no spalling, tearing or raveling of the groove edge, grooving may occur sooner than 30 days with approval of the RPR. All grade corrections must be completed prior to grooving. Spalling along or tearing or raveling of the groove edges shall not be allowed.

621-2.6 Grooving machine. Provide a grooving machine that is power driven, self-propelled, specifically designed and manufactured for pavement grooving, and has a self-contained and integrated continuous slurry vacuum system as the primary method for removing waste slurry. The grooving machine shall be equipped with diamond-saw cutting blades, and capable of making at least 18 inches (0.5 m) in width of multiple parallel grooves in one pass of the machine. Thickness of the cutting blades shall be capable of making the required width and depth of grooves in one pass of the machine. The cutting head shall not contain a mixture of new and worn blades or blades of unequal wear or diameter. Match the blade type and configuration with the hardness of the existing airfield pavement. The wheels on the grooving machine shall be of a design that will not scar or spall the pavement. Provide the machine with devices to control depth of groove and alignment.

621-2.7 Water supply. Water for the grooving operation shall be provided by the Contractor.

621-2.8 Clean-up. During and after installation of saw-cut grooves, the Contractor must remove from the pavement all debris, waste, and by-products generated by the operations to the satisfaction of the RPR. Cleanup of waste material must be continuous during the grooving operation. Flush debris produced by the machine to the edge of the grooved area or pick it up as it forms. The dust coating remaining shall be picked up or flushed to the edge of the area if the resultant accumulation is not detrimental to the vegetation or storm drainage system. Accomplish all flushing operations in a manner to prevent erosion on the shoulders or damage to vegetation. Waste material must be disposed of in an approved manner. Waste material must not be allowed to enter the airport storm sewer system. The Contractor must dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

621-2.9 Repair of damaged pavement. Grooving must be stopped and damaged pavement repaired at the Contractor's expense when directed by the RPR.

621-2.10 Production rate. The Contractor must furnish sufficient equipment to groove **700** square yards of pavement per hour.

ACCEPTANCE

621-3.1 Acceptance testing. Grooves will be accepted based on results of zone testing. All acceptance testing necessary to determine conformance with the groove tolerances specified will be performed by the RPR.

Instruments for measuring groove width and depth must have a range of at least 0.5 inch (12 mm) and a resolution of at least 0.005 inch (0.13 mm). Gauge blocks or gauges machined to standard grooves width, depth, and spacing may be used.

Instruments for measuring center-to-center spacing must have a range of at least 3 inches (8 cm) and a resolution of at least 0.02 inch (0.5 mm).

The RPR will measure grooves in five zones across the pavement width. Measurements will be made at least three times during each day's production. Measurements in all zones will be made for each cutting head on each piece of grooving equipment used for each day's production.

The five zones are as follows:

- Zone 1 Centerline to 5 feet (1.5 m) left or right of the centerline.
- Zone 2 5 feet (1.5 m) to 25 feet (7.5 m) left of the centerline.
- Zone 3 5 feet (1.5 m) 25 feet (7.5 m) right of the centerline.
- Zone 4 25 feet (7.5 m) to edge of grooving left of the centerline.
- Zone 5 25 feet (7.5 m) to edge of grooving right of the centerline.

At a random location within each zone, five consecutive grooves sawed by each cutting head on each piece of grooving equipment will be measured for width, depth, and spacing. The five consecutive measurements must be located about the middle blade of each cutting head ± 4 inches (100 mm). Measurements will be made along a line perpendicular to the grooves.

- Width or depth measurements less than 0.170 inch (4 mm) shall be considered less than 3/16 inch (5 mm).
- Width or depth measurements more than 0.330 inch (8 mm) shall be considered more than 5/16 inch (8 mm).
- Width or depth measurements more than 0.235 inch (6 mm) shall be considered more than 1/4 inch (6 mm).

Production must be adjusted when more than one groove on a cutting head fails to meet the standard depth, width, or spacing in more than one zone.

METHOD OF MEASUREMENT

621-4.1 The quantity of grooving to be paid for shall be the number of square yards (square meters) of grooving performed in accordance with the specifications and accepted by the RPR per paragraph 621-3.1.

BASIS OF PAYMENT

621-5.1 Payment for saw-cut grooving. Payment for saw-cut grooving will be made at the contract unit price per square yard (square meter) for saw-cut grooving. This price shall be full compensation for furnishing all materials, and for all preparation, delivering, and application of

these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-621-5.1 Grooving, unit price per square yard (~~square meter~~)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5320-12 Measurement, Construction, and Maintenance of Skid Resistant
Airport Pavement Surfaces

END OF ITEM P-621

ITEM T-904 SODDING

DESCRIPTION

904-1.1 This item shall consist of furnishing, hauling, and placing approved live sod on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the RPR. ***Any haul routes or other disturbances by the Contractor will be repaired at the Contractor's expense.***

MATERIALS

904-2.1 Sod. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. At least 70% of the plants in the cut sod shall be composed of the species stated in the special provisions, and any vegetation more than 6 inches (150 mm) in height shall be mowed to a height of 3 inches (75 mm) or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than **2" include ¾" thick layer of roots with soil.** ~~that stated in the special provisions.~~

904-2.2 Lime. Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 (850 µm) mesh sieve and 50% will pass through a No. 100 (150 µm) mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. Lime shall be applied at the rate of 500 lbs/acre. All liming materials shall conform to the requirements of ASTM C602.

904-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of ***Federal Spec A-A-1909 and*** applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

- a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
- b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
- c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be **10-10-10** commercial fertilizer and shall be spread at the rate of **500 lbs/acre**.

904-2.4 Water. The water shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass.

904-2.5 Soil for repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the RPR before being placed.

CONSTRUCTION METHODS

904-3.1 General. Areas to be solid, strip, or spot sodded shall be shown on the plans. Areas requiring special ground surface preparation such as tilling and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the RPR before the various operations are started. The Contractor shall demonstrate to the RPR before starting the various operations that the application of required materials will be made at the specified rates.

904-3.2 Preparing the ground surface. After grading of areas has been completed and before applying fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

In areas where sod is specified to be placed against existing pavements, the Contractor shall shape the receiving ground surface to achieve a 1-1/2" drop-off from the existing pavement edge to the top of the sod mat. Sod mat is assumed to be 2 inches thick. No separate payment shall be made for the reshaping of the receiving surface. All work associated with the reshaping of the receiving surface to achieve the 1-1/2" drop-off is considered incidental to item T-904-1.

904-3.3 Applying fertilizer and ground limestone. Following ground surface preparation, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient, as stated in the special provisions. If use of ground limestone is required, it shall then be spread at a rate that will provide not less than the minimum quantity stated in the special provisions. These materials shall be incorporated into the soil to a depth of not less than 2 inches (50 mm) by discing, raking, or other suitable methods. Any stones larger than 2 inches (50 mm) in any diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 Obtaining and delivering sod. After inspection and approval of the source of sod by the RPR, the sod shall be cut with approved sod cutters to such a thickness that after it has

been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches (50 mm). Sod sections or strips shall be cut in uniform widths, not less than 10 inches (250 mm), and in lengths of not less than 18 inches (0.5 m), but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, approval to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

904-3.5 Laying sod. Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the RPR, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches (100 mm) immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen, when replacing it, shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately one inch (25 mm) below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than one (1) vertical to 2-1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches (300 mm) in length and have a cross-sectional area of not less than 3/4 sq inch (18 sq mm). The pegs shall be driven flush with the surface of the sod.

904-3.6 Watering. Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface. ***The Contractor will be required to water sodded areas a minimum of three (3) times per week until sod is well established as determined by the RPR. All cost for watering, including supplying the water, shall be included in the unit bid price for the sod. Depending on weather conditions, the need for watering may be waived by the RPR.***

904-3.7 Establishing turf. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue until final inspection and acceptance of the work. All sodded areas shall be protected against traffic or other use by warning signs or barricades approved by the RPR. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. Weeds or other undesirable vegetation shall be mowed and the clippings raked and removed from the area.

904-3.8 Repairing. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the RPR, and shall then be sodded as specified in paragraph 904-3.5.

904-3.9 ELEVATION OF SOD. *The top elevation of the sod when placed next to new or existing asphalt or concrete pavement shall have a 1-1/2" drop from the pavement edge. When sod is placed adjacent to new or existing concrete sign bases, light can bases, junction cans, manholes, other concrete slabs, etc., the drop shall be from zero to 1" maximum. When sod is placed around new or existing inlets or other drainage structures, sod is to be flush with the concrete of the structure, so drainage flow is not blocked. The top of the sod mat is assumed to be the top of the root mass.*

METHOD OF MEASUREMENT

904-4.1 This item shall be measured on the basis of the area in square yards (~~square meters~~) of the surface covered with sod and accepted.

BASIS OF PAYMENT

904-5.1 This item will be paid for on the basis of the contract unit price per square yard (~~square meter~~) for sodding, which price shall be full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item T-904-5.1 Sodding - per square yard (~~square meter~~)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C602 Standard Specification for Agricultural Liming Materials

Advisory Circulars (AC)

AC 150/5200-33 Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-904

ITEM T-905 TOPSOIL

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the RPR.

MATERIALS

905-2.1 Topsoil. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches (50 mm) or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by disking or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh (75 μ m) sieve as determined by the wash test in accordance with ASTM C117.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 Inspection and tests. Within 10 days following acceptance of the bid, the RPR shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 General. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the RPR before the various operations are started.

905-3.2 Preparing the ground surface. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other

means approved by the RPR, to a minimum depth of 2 inches (50 mm) to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm) in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 Obtaining topsoil. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the RPR. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the RPR. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the RPR. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoil purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the RPR. The Contractor shall notify the RPR sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 Placing topsoil. The topsoil shall be evenly spread on the prepared areas to a uniform depth of 2 inches (50 mm) after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turving operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches (50 mm) or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the RPR. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

~~905-4.1~~ Topsoil obtained on the site shall be measured by the number of cubic yards (cubic meters) of topsoil measured in its original position and stripped or excavated. Topsoil stockpiled by others and removed for topsoil by the Contractor shall be measured by the number of cubic yards (cubic meters) of topsoil measured in the stockpile. Topsoil shall be measured by volume in cubic yards (cubic meters) computed by the method of end areas.

~~905-4.2~~ Topsoil obtained off the site shall be measured by the number of cubic yards (cubic meters) of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards (meters) computed by the method of end areas.

Topsoil will be incidental to the installation of sod. No additional payment for the procurement or installation of topsoil will be provided.

BASIS OF PAYMENT

~~905-5.1~~ Payment will be made at the contract unit price per cubic yard for topsoil (obtained on the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

~~905-5.2~~ Payment will be made at the contract unit price per cubic yard for topsoil (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-905-5.1 ——— Topsoil, 2" — per cubic yard

Topsoil will be incidental to the installation of sod. No additional payment for the procurement or installation of topsoil will be provided.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117 Materials Finer than 75 μ m (No. 200) Sieve in Mineral Aggregates
by Washing

Advisory Circulars (AC)

AC 150/5200-33 Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-905

THIS PAGE INTENTIONALLY LEFT BLANK

ITEM L-108 UNDERGROUND POWER CABLES FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

EQUIPMENT AND MATERIALS

108-2.1 General.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the RPR.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

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

e. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format. The RPR reserves the right to reject any and all equipment, materials,

or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation Resistance Test.

108-2.2 Cable. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation.

Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 , Type C 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

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

108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare tinned copper wire per ASTM B33. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be sectional copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet long and 3/4 inch in diameter.

108-2.4 Cable connections. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The cast splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable.

b. The field-attached plug-in splice. Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

c. The factory-molded plug-in splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The taped or heat-shrink splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 Splicer qualifications. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

108-2.7 Flowable backfill. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 Cable identification tags. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 Tape. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 Existing circuits. Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

CONSTRUCTION METHODS

108-3.1 General. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light

bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 Installation in duct banks or conduits. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the RPR, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 Installation of direct-buried cable in trenches. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

- When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.
- Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill material may alternatively be used.

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

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

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

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

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall encompass all cables ; be 3 inches (75 mm) deep, loose measurement; and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25.0 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent material. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfilled with controlled low strength material (CLSM) in accordance with P-153.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the RPR. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inches (200 mm) minimum below finished grade.

c. Restoration. Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfilled with controlled low strength material (CLSM) in accordance with P-153. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 Cable markers for direct-buried cable. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word "CABLE" and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep. Stencils shall be used for cable marker lettering; no hand lettering shall be permitted.

At the location of each underground cable connection/splice, except at lighting units, or isolation transformers, a concrete marker slab shall be installed to mark the location of the connection/splice. The Contractor shall impress the word "SPLICE" on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the RPR. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the RPR. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 Splicing. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the RPR.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint or (3) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) Wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint. (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint. or (3) On connector kits so equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner: Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped

connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping, wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. The manufacturer's recommendation for stretching tape during splicing shall be followed. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminants prior to application.

e. Assembly. Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 Bare counterpoise wire installation for lightning protection and grounding. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

a. Equipotential. The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches (300 mm) maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

b. Isolation – Not Used

c. Common Installation requirements. When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

d. Parallel Voltage Systems. Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

108-3.7 Counterpoise installation above multiple conduits and duct banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

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

108-3.8 Counterpoise installation at existing duct banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being

protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 Exothermic bonding. Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

- a. All slag shall be removed from welds.
- b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.
- c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

- a. Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.
- b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

- c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.
- d. That all affected circuits (existing and new) are free from unspecified grounds.
- e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms. Verify continuity of all series airfield lighting circuits prior to energization.
- f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.
- g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

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

METHOD OF MEASUREMENT

108-4.1 Trenching shall be measured by the linear feet (meters) of trench, including the excavation, backfill, and restoration, completed, measured as excavated, and accepted as satisfactory. When specified, separate measurement shall be made for trenches of various specified widths.

The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack. Cable and counterpoise slack is considered incidental to this item and is included in the contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack.

108-4.3 Ground rods shall be measured by each 10-foot section installed.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the RPR. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	Hand excavate minimum 8" Wide x 28" Deep in earth. Includes all labor, hand excavation, backfill and sod restoration, complete in place. - Price per linear foot.
----------------	---

Item L-108-5.2	Saw cut and hand excavate minimum 8" Wide x 28" Deep in existing full strength pavement. Includes all labor, hand excavation, saw cutting, backfill, concrete, pavement repair, complete in place. - Price per linear foot.
Item L-108-5.3	3/4" x 20' ground rods connected to counterpoise. Includes all labor, ground rods, excavation, splice kits, testing, backfill, connections, exothermic welds, and etc., complete in place. - Price per each.
Item L-108-5.4	Additional 10' ground rod sections. Includes all labor, ground rods, excavation, splice kits, testing, backfill, connections, exothermic welds and etc., complete in place - Price per each.
Item L-108-5.5	#6 bare solid AWG counterpoise conductor installed over conduit system. Includes all labor, conductors, splice kits, exothermic welds, testing, excavation, backfill, and etc. complete in place. - Price per linear foot.
Item L-108-5.6	#8, 5KV, L-824 conductor installed in new and existing conduit/ductbank system. Includes all labor, conductors, testing, cleaning and dewatering, removal and disposal of existing conductors, pull string, pulling compound, identification, connector kits, and etc., complete in place. - Price per linear foot.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

ASTM B33 Standard Specification for Tin-Coated Soft or Annealed Copper
Wire for Electrical Purposes

ASTM D4388 Standard Specification for Nonmetallic Semi-Conducting and
Electrically Insulating Rubber Tapes

Mil Spec

MIL-PRF-23586F Performance Specification: Sealing Compound (with Accelerator),
Silicone Rubber, Electrical

MIL-I-24391 Insulation Tape, Electrical, Plastic, Pressure Sensitive

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

NFPA-780 Standard for the Installation of Lightning Protection Systems

American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers
(IEEE)

ANSI/IEEE STD 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance,
and Earth Surface Potentials of a Ground System

Federal Aviation Administration Standard

FAA STD-019E Lightning and Surge Protection, Grounding Bonding and Shielding
Requirements for Facilities and Electronic Equipment

TESTING REPORT
CIRCUIT MEASURING TEST DATA

Airport _____ Date _____
Location _____ Job# _____
Project ID _____

Item Under Test	Cable Length	Duct _____ Buried _____
Number of Conductor	Conductor Size	Type Class Insulation
Voltage Rating	Age	Type of Test Performed

Circuit	Test Time	Test V	Leakage / Ohms Res A-GND

Remarks _____

TESTING REPORT
GROUND RESISTANCE MEASURING TEST DATA

Airport _____ Date _____
Type of Testing Equipment _____ Job# _____
Project ID _____

Location	Length and Diameter of Ground Rod	Ohms Resistance to Ground

Remarks _____

END OF ITEM L-108

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

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

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12)

months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

110-2.3 Plastic conduit. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10. ^L_{SEP}
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I—Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II—Schedule 40 PVC suitable for either above ground or underground use.
- c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
- d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 Flowable backfill. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

110-2.9 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

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

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways,

taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill may alternatively be used.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

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

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

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

110-3.2 Duct banks. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be

notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

110-3.3 Conduits without concrete encasement. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6.3 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

110-3.4 Markers. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches (100 mm) high and 3

inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 Backfilling for conduits. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD) and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

110-3.8 Ownership of removed cable. The Contractor is to take possession of the removed cable and dispose of off-site.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, and for drain lines, the termination at the drainage

structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

- | | |
|----------------|--|
| Item L-110-5.1 | One 2" schedule 40 PVC conduit non-encased direct buried in earth, 24-inch minimum cover, complete in place. Includes conduits, connectors, warning tape, excavation, labor, backfill and etc., complete in place. – Price per linear foot |
| Item L-110-5.2 | One 2" schedule 40 PVC conduit concrete encased and installed in existing full-strength pavement, 24-inch minimum cover, complete in place. Includes conduits, connectors, saw cutting, excavation, warning tape, concrete, labor, backfill and etc., complete in place. – Price per linear foot |
| Item L-110-5.3 | Intercept existing conduit system and connect to new conduit system. Includes excavation, chipping back of concrete encasement, sawcutting, backfill, sod/pavement restoration, concrete, labor and etc., complete in place. – Price per each |

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circular (AC)

- | | |
|----------------|---|
| AC 150/5340-30 | Design and Installation Details for Airport Visual Aids |
| AC 150/5345-53 | Airport Lighting Equipment Certification Program |

ASTM International (ASTM)

- | | |
|-----------|--|
| ASTM A615 | Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement |
|-----------|--|

National Fire Protection Association (NFPA)

- | | |
|---------|--------------------------------|
| NFPA-70 | National Electrical Code (NEC) |
|---------|--------------------------------|

Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

Page Intentionally Left Blank

ITEM L-115 ELECTRICAL MANHOLES AND JUNCTION STRUCTURES

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the RPR. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the RPR including removal of existing manholes and junction structures as shown on the plans.

EQUIPMENT AND MATERIALS

115-2.1 General.

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

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

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

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 Concrete structures. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures. Cast-in-place concrete structures shall be as shown on the plans.

115-2.3 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program. Provide precast concrete structures where shown on the plans.

Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb aircraft loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown on the plans.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings design calculations, and other information requested by the RPR shall be submitted by the Contractor to allow for a full evaluation by the RPR. The RPR shall review per the process defined in the General Provisions.

115-2.4 Junction boxes. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a L-894 blank cover, gasket, and stainless-steel hardware. All bolts, studs, nuts, lock washers, and other similar fasteners used for the light fixture assemblies must be fabricated from 316L (equivalent to EN 1.4404), 18-8, 410, or 416 stainless steel. If 18-8, 410, or 416 stainless steel is utilized it shall be passivated and be free from any discoloration. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868. All junction boxes shall be provided with both internal and external ground lugs.

115-2.5 Mortar. The mortar shall be composed of one part of cement and two parts of mortar sand, by volume. The cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C206. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.6 Concrete. All concrete used in structures shall conform to the requirements of Item P-610, Concrete for Miscellaneous Structures.

115-2.7 Frames and covers. The frames shall conform to one of the following requirements:

- a. ASTM A48 Gray iron castings
- b. ASTM A47 Malleable iron castings
- c. ASTM A27 Steel castings
- d. ASTM A283, Grade D Structural steel for grates and frames
- e. ASTM A536 Ductile iron castings
- f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum load of 300,000 pounds.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

115-2.8 Ladders. Ladders, if specified, shall be galvanized steel or as shown on the plans.

115-2.9 Reinforcing steel. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.10 Bedding/special backfill. Bedding or special backfill shall be as shown on the plans.

115-2.11 Flowable backfill. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.12 Cable trays. Cable trays shall be plastic. Cable trays shall be located as shown on the plans.

115-2.13 Plastic conduit. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.14 Conduit terminators. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.15 Pulling-in irons. Pulling-in irons shall be manufactured with 7/8-inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2-inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 MPa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.16 Ground rods. Ground rods shall be one piece, copper clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 Unclassified excavation. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the RPR without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the RPR. The excavation shall be of

sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to Item L-115. Dewatering necessary for structure installation and erosion per federal, state, and local requirements is incidental to Item L-115.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the RPR. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the RPR. Structures shall be placed after the RPR has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the RPR as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 Concrete structures. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

115-3.3 Precast unit installations. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 Placement and treatment of castings, frames and fittings. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the RPR and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written approval is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the RPR

and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

115-3.5 Installation of ladders. Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.

115-3.6 Removal of sheeting and bracing. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The RPR may direct the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 Backfilling. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

Backfill shall not be placed against any structure until approval is given by the RPR. In the case of concrete, such approval shall not be given until tests made by the laboratory under supervision of the RPR establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the RPR may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 Connection of duct banks. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 Grounding. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing

the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 Cleanup and repair. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 Restoration. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective Item L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 Inspection. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 Manhole elevation adjustments. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise or lower the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or

shall cut the existing manhole walls to shorten the existing structure, as required by final grades. The Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 Duct extension to existing ducts. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and dewatering;; sheeting and bracing; all required backfilling with on-site materials; restoration of all surfaces and finished grading and turfing; all required connections; temporary cables and connections; and ground rod testing

115-4.2 Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the RPR.

Payment will be made under:

- | | |
|----------------|---|
| Item L-115-5.1 | Intercept existing light base can in earth/existing pavement and connect to conduit system. Includes sawcutting, excavation, core drilling, can repair, backfill, concrete, sod/pavement restoration, dewatering, labor and etc., complete in place. – Price per each |
| Item L-115-5.2 | Adjust existing elevation of existing L-867 junction can, complete. Includes core drill of pavement, excavation, temporary cover, L-867 extension ring, spacers, concrete, drilling and tapping of bolt holes, |

carbon steel coated bolts, identification, connector kits, P-605, P-606, sealant, labor and etc., complete in place. – Price per each

Item L-115-5.3 Removal of existing junction can/light base can in existing pavement, complete. Includes backfill, labor, concrete, saw cutting, disposal, removal of base can, protection of fixture, connector kits, disconnection of existing circuit, removal of circuit conductors, reconnection of existing circuit, reconnection of existing conduits, conduits, temporary conduits and conductors, pavement restoration and etc. complete in place. – Price per each

Item L-115-5.4 Removal of existing junction can/light base can in earth, complete. Includes backfill, labor, disposal, removal of base can, protection of fixture, connector kits, disconnection of existing circuit, removal of circuit conductors, reconnection of existing circuit, reconnection of existing conduits, conduits, temporary conduits and conductors, sod restoration and etc. complete in place. – Price per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

ANSI/IEEE STD 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Advisory Circular (AC)

AC 150/5345-7 Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits

AC 150/5345-26 Specification for L-823 Plug and Receptacle, Cable Connectors

AC 150/5345-42 Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories

AC 150/5340-30 Design and Installation Details for Airport Visual Aids

AC 150/5345-53 Airport Lighting Equipment Certification Program

Commercial Item Description (CID)

A-A 59544 Cable and Wire, Electrical (Power, Fixed Installation)

ASTM International (ASTM)

ASTM A27 Standard Specification for Steel Castings, Carbon, for General Application

ASTM A47 Standard Specification for Ferritic Malleable Iron Castings

ASTM A48 Standard Specification for Gray Iron Castings

ASTM A123 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products

ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime
FAA Engineering Brief (EB)	
EB #83	In Pavement Light Fixture Bolts
Mil Spec	
MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair
National Fire Protection Association (NFPA)	
NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

Page Intentionally Left Blank

ITEM L-125 INSTALLATION OF AIRPORT LIGHTING SYSTEMS

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished, and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

EQUIPMENT AND MATERIALS

125-2.1 General.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not perform as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

b. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. All LED light fixtures, with the exception of obstruction lighting (AC 150/5345-43) must be warranted by

the manufacturer for a minimum of 4 years after date of installation inclusive of all electronics. Obstruction lighting warranty is set by the individual manufacturer.

EQUIPMENT AND MATERIALS

125-2.2 Conduit/Duct. Conduit shall conform to Specification Item L-110 Airport Underground Electrical Duct Banks and Conduits.

125-2.3 Cable and counterpoise. Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

125-2.4 Tape. Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

125-2.5 Cable connections. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.6 Retroreflective markers. Not required.

125-2.7 Runway and taxiway lights. Runway and taxiway lights shall conform to the requirements of AC 150/5345-46. Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

Lights

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Basis of Design CCR Loads	Notes (light source and height)
L-861T(L)	2	1	N/A	4 (Base Mounted)	See Plans	Blue	Per Manufacturer	15VA	Taxiway Edge Light (LED and 14" high)
L-804(L)	N/A	1	N/A	59 VA	L-867	Yellow	Per Manufacturer		26" Mounting Height
L-852G(L)	2	1	3	34 VA	L-868	Yellow	Per Manufacturer		Runway Inpavement Guard Light (LED)

125-2.8 Runway and taxiway signs. Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44.

Type	Size	Style	Class	Mode	Basis of Design CCR Loads	Notes
L-858Y, R, L, C	1	2, 3,5	1	2	85VA	1 module/1-2 characters
					95VA	2 module/3-4 characters
					95VA	3 module/5-6 characters
					95VA	4 module/7-8 characters

125-2.9 Runway end identifier light (REIL). The REIL fixtures shall meet the requirements of AC 150/5345-51, Type L-849(L)I, Style E.

125-2.10 Precision approach path indicator (PAPI). The light units for the PAPI shall meet the requirements of AC 150/5345-28, Type L-881, Style B, Class I.

125-2.11 Circuit Selector Cabinet. The circuit selector cabinet shall meet the requirements of AC 150/5345-5, Type L-847, four circuit control, Class B, outdoor, Rating 1 (6.6 amperes).

125-2.12 Light base and transformer housings. Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Light bases shall be Type L-867 and L-868, Class 1A, Size B and C shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.13 Isolation transformers. Isolation Transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47.

INSTALLATION

125-3.1 Installation. The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

A slack of 3 ft (0.9 m), minimum, must be provided in the primary cable at each transformer/connector termination.

Plastic lighting fixture components, such as lamp heads, stems, frangible couplings, base covers, brackets, stakes, are not acceptable.

The tolerance for the height of runway/taxiway edge lights must be ± 1 inch (25 mm). For stake-mounted lights, the specified lighting fixture height must be measured between the top of the stake and the top of the lens. For base-mounted lights, the specified lighting fixture height must be measured between the top of the base flange and the top of the lens, and includes the base cover, the frangible coupling, the stem, the lamp housing and the lens.

Cable/splice/duct markers must be pre-cast concrete of the size shown on plans.

Letters/numbers/arrows for the legend to be impressed into the tops of the markers must be

pre-assembled and secured in the mold before the concrete is poured. Legends inscribed by hand in wet concrete are not acceptable.

Stencil horizontal and vertical aiming angles on each REIL flash head or equipment enclosure. The numerals must be black and one inch (25 mm) minimum height.

Stencil vertical aiming angles on the outside of each PAPI lamp housing. The numerals must be black and one inch (25 mm) minimum height.

Apply a corrosion inhibiting, anti-seize compound to all screws, nuts and frangible coupling threads. If coated bolts are used per EB #83, do not apply anti-seize compound.

125-3.2 Testing. All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

125-3.3 Shipping and storage. Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the RPR, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer's recommendations.

125-3.4 Elevated and in-pavement lights. Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

METHOD OF MEASUREMENT

125-4.1 Reflective markers will be measured by the number installed as completed units in place, ready for operation, and accepted by the RPR. Runway and taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR. Guidance signs will be measured by the number of each type and size installed as completed units, in place, ready for operation, and accepted by the RPR. Runway End Identifier Lights shall be measured by each system installed as a completed unit in place, ready for operation, and accepted by the RPR.

Precision Approach Path Indicator shall be measured by each system installed as a completed unit, in place, ready for operation, and accepted by the RPR. Abbreviated Precision Approach Path Indicator shall be measured by each system installed as a completed unit, in place, ready for operation, and accepted by the RPR.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete runway or taxiway light, guidance sign, reflective marker, runway end identification light, precision approach path indicator, or abbreviated precision approach path indicator installed by the Contractor and

accepted by the RPR. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

- | | |
|----------------|--|
| Item L-125-5.1 | New L-861T(L), LED taxiway elevated edge light installed on existing base can. Includes survey, coring of pavement, temporary cover, removal and disposal of old fixture, drilling and tapping of bolt holes, new fixture, extension rings, spacers, carbon steel coated bolts, grounding stud, grounding strap, safety ground, P-606, P-605, identification, connector kits, transformer, labor, testing and etc. complete in place. – Price per each |
| Item L-125-5.2 | New L-862(L), LED runway elevated edge light installed on existing base can. Includes survey, coring of pavement, temporary cover, removal and disposal of old fixture, drilling and tapping of bolt holes, new fixture, extension rings, spacers, carbon steel coated bolts, grounding stud, grounding strap, safety ground, P-606, P-605, identification, connector kits, transformer, labor, testing and etc. complete in place. – Price per each |
| Item L-125-5.3 | New L-850C(L), LED, style 3, bi-directional flush mounted runway edge light installed on existing base can. Includes survey, coring of pavement, temporary cover, mud plate, removal and disposal of old fixture, drilling and tapping of bolt holes, coring of pavement, new fixture, top section, spacers, dam ring, carbon steel coated bolts, grounding stud, grounding strap, safety ground, P-606, P-605, identification, transformer, connector kits, labor, testing and etc. complete in place. – Price per each |
| Item L-125-5.4 | Install existing runway elevated edge light on existing base can. Includes survey, coring of pavement, temporary cover, removal and disposal of old top section, drilling and tapping of bolt holes, installation of existing fixture, new cord kits and connectors, extension rings, spacers, carbon steel coated bolts, P-606, P-605, identification, connector kits, new transformer, labor, testing and etc. complete in place. – Price per each |
| Item L-125-5.5 | Install existing runway flush mounted runway edge light on existing base can. Includes survey, coring of pavement, temporary cover, mud plate, removal and disposal of old top section, drilling and tapping of bolt holes, coring of pavement, installation of existing fixture, new top section, new cord kits and connectors, spacers, dam ring, carbon steel coated bolts, P-606, P-605, identification, new transformer, connector kits, labor, testing and etc. complete in place. – Price per each |
| Item L-125-5.6 | Adjust elevation of existing FAA MALS Threshold Fixture, complete. Includes survey, coring of pavement, temporary cover, |

removal and disposal of old top section, drilling and tapping of bolt holes, installation of existing fixture, extension rings, spacers, carbon steel coated bolts, P-606, P-605, identification, labor, testing and etc. complete in place. – Price per each

Item L-125-5.7 New L-861T(L), LED taxiway elevated edge light and new base can installed in earth. Includes excavation, L-867 base can, concrete, conduit, carbon steel coated bolts, fixture, grounding, ground rods, safety ground, circuit identification, transformer, connector kits, backfill, sod restoration, rock, labor, testing, and etc. complete in place. – Price per each

Item L-125-5.8 New L-861T(L), LED taxiway elevated edge light and new base can installed in existing shoulder pavement. Includes excavation, coring of pavement, saw cutting, new fixture, L-867 telescopic base can, concrete, conduit, carbon steel coated bolts, backfill, grounding, ground rods, safety ground, circuit identification, transformer, rock, labor, testing, and etc. complete in place. – Price per each

Item L-125-5.9 Relocate existing L-858(L), size 1, guidance sign with precast new concrete base installed in paved shoulder. Includes excavation, concrete, WWF/rebar, junction can, steel cover, tethers, relocation of sign, new transformer, hardware, carbon steel bolts, anchor bolts, conduits, conductors, counterpoise, grounding, testing, wiring, splice kits, backfill, sod restoration, identification, labor and etc. for a complete working system in place. – Price per each

Item L-125-5.10 Removal of existing guidance sign and concrete base/abandoned concrete base from existing pavement, complete. Includes backfill, saw cutting, concrete, pavement restoration, removal and disposal, splice kits, disconnection and removal of existing circuit conductors, reconnection of existing circuit, capping of conduits, temporary conduit and conductors, labor and etc., complete in place. – Price per each

Item L-125-5.11 Intercept existing circuit conductors in existing base can/ manhole /junction can and extend circuits accordingly. Includes drilling and tapping, carbon steel coated bolts, transformer, dewatering, identification, splice kits, labor, and etc. complete in place. – Price per each

REFERENCES

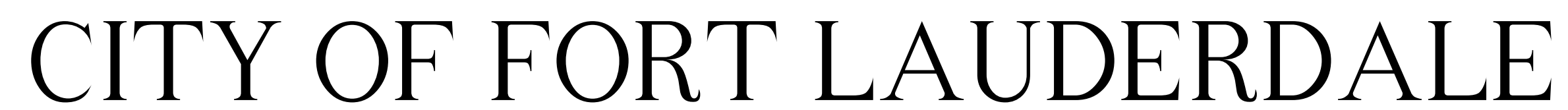
The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series to Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program
Engineering Brief (EB)	
EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures

END OF ITEM L-125

[illegible]

RUNWAY 9-27

6000 NW 21st Avenue

FAA AIP No. 03-12-0024-40-2024

FDOT Fin Proj No. 451503-94-1



CYPRESS CREEK ROAD (NW 62nd ST.)

FT. LAUDERDALE
EXECUTIVE AIRPORT

PROJECT
LOCATION

W. COMMERCIAL BLVD. (SR 870)



6000 NW 21st Avenue, Fort lauderdale, Florida



100 North Andrews Avenue, Fort Lauderdale, Florida 33301

DEAN J. TRANTALIS	MAYOR
JOHN C. HERBST	COMMISSIONER - DISTRICT I
	VICE MAYOR/
STEVEN GLASSMAN	COMMISSIONER - DISTRICT II
PAMELA BEASLEY-PITTMAN	COMMISSIONER - DISTRICT III
WARREN STURMAN	COMMISSIONER - DISTRICT IV

PROJECT MANAGER	JOB TITLE	PHONE NO.
KHANT MYAT P.E	AIRPORT ENGINEER	(954) 828-5061
THOMAS F. O'DONNELL P.E	CIVIL ENGINEER	(561) 840-0825
AMY CHAMPAGNE-BAKER P.E	ELECTRICAL ENGINEER	(561) 210-9224
JOHN E. PHILLIPS, P.E.	SURVEYOR	(561) 615-3988
RAJ KRISHNASAMY, P.L.S	GEOTECHNICAL SERVICES	(561) 687-8536

DRAWING FILE No.:

BID SET

3. THE CONTRACTOR SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY REGULATIONS.
2. THE CONTRACTOR SHALL COMPLY WITH ALL CITY, COUNTY AND STATE TRAFFIC REGULATIONS CONCERNING THE USE OF STREETS AND ROADWAYS FOR DELIVERIES AND HAULING. ANY DAMAGE DONE TO THE ROADWAYS DUE TO THE CONTRACTOR'S EQUIPMENT OR HAULING OPERATIONS SHALL BE REPAIRED TO THE OWNER'S SATISFACTION, AT NO COST TO THE OWNER. ALL HAULING UNITS TRANSPORTING LOOSE MATERIALS (SOIL, LIMEROCK, ETC.) SHALL BE FULLY COVERED.
3. THE CONTRACTOR SHALL COOPERATE WITH AIRPORT AUTHORITIES, USERS, TENANTS AND FIRE DEPARTMENT WHILE WORKING ON THIS PROJECT.
4. THE CONTRACTOR'S SUPERINTENDENT SHALL BE ON THE CONSTRUCTION SITE AT ALL TIMES DURING WORKING HOURS WHILE THIS PROJECT IS IN PROGRESS. THE CONTRACTOR'S SUPERINTENDENT SHALL BE THE DESIGNATED RESPONSIBLE CONTRACTOR REPRESENTATIVE, AND SHALL BE AVAILABLE IN CASE OF EMERGENCIES ON A 24-HOUR BASIS AND SHALL BE FLUENT IN SPOKEN ENGLISH.
5. NO FIELD CHANGES OR DEVIATIONS FROM DESIGN ARE TO BE MADE WITHOUT PRIOR WRITTEN APPROVAL OF THE ENGINEER.
6. CONTRACTOR SHALL PROVIDE MAINTENANCE OF TRAFFIC DURING CONSTRUCTION IN ACCORDANCE WITH THESE PLANS AND ALL STATE, COUNTY AND LOCAL REQUIREMENTS.
7. BARRICADES ARE TO REMAIN UNTIL ALL PROJECT CONSTRUCTION IS COMPLETED UNLESS NOTED OTHERWISE BY THE RPR.
8. THE CONTRACTOR SHALL CONDUCT THE FINAL CLEANING OF AFFECTED AIRPORT PAVEMENTS PRIOR TO REOPENING THE PAVEMENTS TO AIRPORT TRAFFIC. THE CONTRACTOR IS RESPONSIBLE FOR CONTINUOUS DAILY CLEAN UP OF THE WORK AREA. THE CONTRACTOR SHALL CONDUCT VACUUM CLEANING OF AFFECTED AIRPORT PAVEMENTS PRIOR TO REOPENING EACH PHASE OF THE PAVEMENTS TO AIR TRAFFIC. CONTRACTOR SHALL CONDUCT VACUUM CLEANING OF ACTIVE AIRPORT PAVEMENTS IMMEDIATELY FOLLOWING ANY ACCESS ONTO OR CROSSING THE PAVEMENT BY CONSTRUCTION TRAFFIC.
9. ALL LOCATIONS, DIMENSIONS AND ELEVATIONS MUST BE VERIFIED BY THE CONTRACTOR IN THE FIELD BEFORE COMMENCING WORK. ANY DISCREPANCY MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
10. CONTRACTOR SHALL NOTE IN THE RECORD DRAWINGS ANY AND ALL PIPES, DUCTS AND CABLES FOUND DURING EXCAVATION, INDICATE EXACT POSITION, ELEVATION, DIRECTION, SIZE, MATERIAL, PURPOSE AND ACTIVE STATUS IF KNOWN.
11. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES TO PROTECT EXISTING ABOVE GROUND IMPROVEMENTS THAT ARE TO REMAIN IN PLACE. ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR RECONSTRUCTED SATISFACTORY TO THE OWNER, AT THE EXPENSE OF THE CONTRACTOR.
12. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY AND CONFIRM THE LOCATION OF ALL UNDERGROUND UTILITIES WITHIN LIMITS OF CONSTRUCTION. ALL EXISTING UTILITIES, CABLES, EQUIPMENT, DEVICES, ETC., DESIGNATED TO REMAIN IN SERVICE WHICH ARE DAMAGED IN THE COURSE OF THE CONTRACT SHALL BE IMMEDIATELY REPAIRED AT THE EXPENSE OF THE CONTRACTOR. AT LEAST FORTY-EIGHT (48) HOURS PRIOR TO BEGINNING CONSTRUCTION THE CONTRACTOR SHALL CONTACT:

CAM #24-0954
Exhibit 1B
Page 196 of 417

K:\FTL\AVIATION\044693151_FYE_RW_9-27_REHAB\CADD\PLANSHEETS\12764-C02-QUAN.DWG

BASE BID				
ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	
			CONTRACT	AS-BUILT
C-100-14.1	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1	
C-102-5.1	TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL	LS	1	
C-105-6.1	MOBILIZATION	LS	1	
S-102-5.1	AIRPORT SAFETY AND MAINTENANCE OF TRAFFIC	LS	1	
S-103-5.1	PROJECT SURVEY	LS	1	
P-101-5.2	BITUMINOUS PAVEMENT MILLING (VARIABLE DEPTH, MAX 2 INCHES)	SY	92,704	
P-101-5.3	TEXTURING EXISTING ASPHALT (SHOULDERS ON RW)	SY	24,486	
P-401-8.1	HOT MIXED ASPHALT (SURFACE)	TON	22,690	
P-403-8.1	HOT MIXED ASPHALT (LEVELING)	TON	790	
P-603-5.1	EMULSIFIED ASPHALT TACK COAT	GAL	19,552	
P-608-8.1	ASPHALT SURFACE TREATMENT	SY	6,915	
P-620-5.1	PERMANENT AIRFIELD PAINTING WITH TYPE III GLASS BEADS (YELLOW AND WHITE)	SF	120,821	
P-620-5.3	PERMANENT AIRFIELD PAINTING WITH NO GLASS BEADS (BLACK)	SF	41,492	
P-620-5.4	TEMPORARY AIRFIELD PAINTING WITH TYPE I GLASS BEADs (YELLOW AND WHITE)	SF	120,821	
P-620-5.5	PAVEMENT MARKING REMOVAL	SF	7,311	
P-621-5.1	GROOVING	SY	55,993	
T-904-5.1	SODDING	SY	211	
L-108-5.1	HAND EXCAVATE MINIMUM 8 INCH x 28 INCH DEEP IN EARTH	LF	20	
L-108-5.2	SAW CUT AND HAND EXCAVATE MINIMUM 8 INCH x 28 INCH DEEP	LF	20	
L-108-5.5	NO. 6 BARE SOLID COUNTERPOISE CONDUCTOR	LF	150	
L-108-5.6	NO. 8 L-824 CONDUCTOR INSTALLED IN NEW AND EXISTING CONDUIT	LF	31,000	
L-110-5.2	2 INCH SCHEDULE 40 PVC CONDUIT IN EARTH IN EXISTING PAVEMENT	LF	150	
L-110-5.3	INTERCEPT EXISTING CONDUIT SYSTEM	LF	6	
L-115-5.1	INTERCEPT EXISTING LIGHT BASE CAN	EA	4	
L-115-5.2	ADJUST ELEVATION OF EXISTING BASE CAN	EA	40	
L-115-5.3	REMOVE EXISTING JUNCTION CAN/LIGHT BASE IN EXISTING PAVEMENT	EA	30	
L-125-5.1	L-861T(L) LED TAXIWAY ELEVATED EDGE LIGHT ON EXISTING CAN	EA	55	
L-125-5.2	L-862(L) LED RUNWAY ELEVATED EDGE LIGHT ON EXISTING CAN	EA	63	
L-125-5.3	L-850C(L) LED RUNWAY EDGE LIGHT AND TOP SECTION ON EXISTING CAN	EA	10	
L-125-5.4	INSTALL EXISTING ELEVATED RUNWAY EDGE LIGHT ON EXISTING CAN	EA	12	
L-125-5.5	INSTALL EXISTING FLUSH RUNWAY LIGHT AND TOP SECTION ON EXISTING CAN	EA	2	
L-125-5.6	ADJUST ELEVATION OF EXISTING FAA MALs THRESHOLD FIXTURE	EA	18	
L-125-5.9	RELOCATE L-858 GUIDANCE SIGN WITH NEW BASE IN EXISTING PAVEMENT	EA	4	
L-125-5.10	REMOVAL OF EXISTING GUIDANCE SIGN	EA	16	
L-125-5.11	INTERCEPT AND CONNECT TO EXISTING CIRCUIT CONDUCTORS	EA	12	
RUNWAY 9-27 PAVEMENT REHABILITATION				

ALTENATIVE BID				
ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	
			CONTRACT	AS-BUILT
C-100-14.1	CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)	LS	1	
C-102-5.1	TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL	LS	1	
C-105-6.1	MOBILIZATION	LS	1	
S-102-5.1	AIRPORT SAFETY AND MAINTENANCE OF TRAFFIC	LS	1	
S-103-5.1	PROJECT SURVEY	LS	1	
P-101-5.2	BITUMINOUS PAVEMENT MILLING (VARIABLE DEPTH, MAX 2 INCHES)	SY	745	
P-152-4.1	UNCLASSIFIED EXCAVATION	CY	409	
P-154-5.1	SUBBASE COURSE, 12 INCHES THICKNESS	SY	196	
P-154-5.2	SUBBASE COURSE, 6 INCHES THICKNESS	SY	344	
P-211-5.1	LIME ROCK BASE COURSE, 9 INCHES THICKNESS	SY	178	
P-401-8.1	HOT MIXED ASPHALT (SURFACE)	TON	137	
P-602-5.1	EMULSIFIED ASPHALT PRIME COAT	GAL	49	
P-603-5.1	EMULSIFIED ASPHALT TACK COAT	GAL	91	
P-620-5.1	PERMANENT AIRFIELD PAINTING WITH TYPE III GLASS BEADS (YELLOW AND WHITE)	SF	442	
P-620-5.3	PERMANENT AIRFIELD PAINTING WITH NO GLASS BEADS (BLACK)	SF	706	
P-620-5.4	TEMPORARY AIRFIELD PAINTING WITH TYPE I GLASS BEADs (YELLOW AND WHITE)	SF	442	
T-904-5.1	SODDING	SY	344	
L-108-5.1	HAND EXCAVATE MINIMUM 8 INCH x 28 INCH DEEP IN EARTH	LF	20	
L-108-5.2	SAW CUT AND HAND EXCAVATE MINIMUM 8 INCH x 28 INCH DEEP	LF	20	
L-108-5.3	3 QUARTER INCH X 20 FOOT GROUND RODS	EA	2	
L-108-5.4	ADDITIONAL 10 FOOT GROUND ROD SECTIONS	EA	2	
L-108-5.5	NO. 6 BARE SOLID COUNTERPOISE CONDUCTOR	LF	1,000	
L-108-5.6	NO. 8 L-824 CONDUCTOR INSTALLED IN NEW AND EXISTING CONDUIT	LF	3,000	
L-110-5.1	2 INCH SCHEDULE 40 PVC CONDUIT IN EARTH	LF	900	
L-110-5.2	2 INCH SCHEDULE 40 PVC CONDUIT IN EARTH IN EXISTING PAVEMENT	LF	50	
L-110-5.3	INTERCEPT EXISTING CONDUIT SYSTEM	EA	6	
L-115-5.1	INTERCEPT EXISTING LIGHT BASE CAN	EA	4	
L-115-5.3	REMOVE EXISTING JUNCTION CAN/LIGHT BASE IN EXISTING PAVEMENT	EA	2	
L-115-5.4	REMOVE EXISTING JUNCTION CAN/LIGHT BASE IN EARTH	EA	7	
L-125-5.7	L-861T(L) LED TAXIWAY ELEVATED LIGHT AND CAN IN EARTH	EA	7	
L-125-5.8	L-861T(L) LED TAXIWAY ELEVATED LIGHT AND CAN IN EXISTING PAVEMENT	EA	2	
L-125-5.11	INTERCEPT AND CONNECT TO EXISTING CIRCUIT CONDUCTORS	EA	6	
RUNWAY 9-27 PAVEMENT REHABILITATION				

CALL 48 HOURS BEFORE YOU DIG

IT'S THE LAW! DIAL 811

SUNSHINE STATE ONE CALL OF FLORIDA, INC.

CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212

811

Know what's below.
Call before you dig.

Kimley»Horn

© 2024 KIMLEY-HORN AND ASSOCIATES, INC.
6000 PINEVIEW ROAD, SUITE 2000, PALM BEACH, FL 33411
PHONE: 561-942-1000 FAX: 561-738-2252
WWW.KIMLEY-HORN.COM REGISTRY NO. 20160

QUANTUM

Electrical Engineering, Inc.
2755 VISTA PARKWAY SUITE 114
WEST PALM BEACH, FL 33411
941-319-9224
LICENSE NO. CA18805

BID SET

ENGINEER:
THOMAS F. O'DONNELL
DATE: 06/07/2024
DRAWING NO.: 02476

DATE: 06/07/2024
DRAWN BY: ALB
DESIGNED BY: SCALE:
KAS AS NOTED
CHECKED BY: TFO
FIELD BOOK:

TEL: 561-840-0825
FAX:

CITY of FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

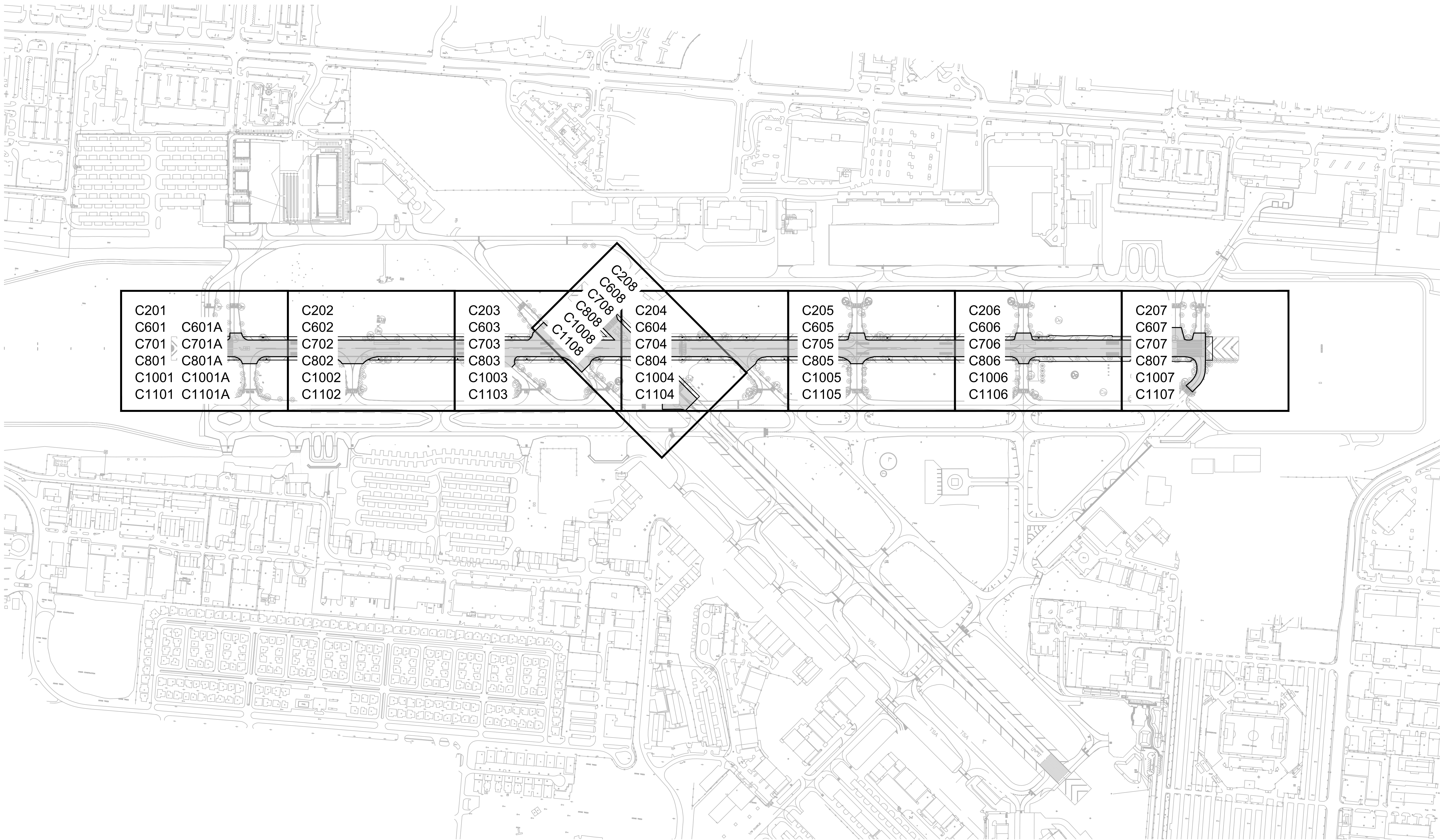
NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
SUMMARY OF QUANTITIES

SHEET NO.	OF
C02	
TOTAL:	110
CAD FILE:	12764-C02-QUAN
DRAWING FILE NO.	

CAM #24-0854
Exhibit 1B
Page 197 of 417

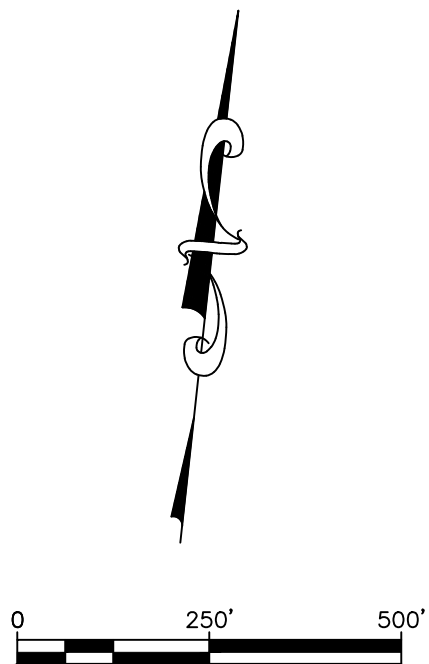
K:\FTL AVIATION\044693151_FYE_RW_9-27_REHAB\CADD\PLANSHEETS\12764-C03-KMAP.DWG



C201	C202	C203	C204	C205	C206	C207
C601 C601A	C602	C603	C604	C605	C606	C607
C701 C701A	C702	C703	C704	C705	C706	C707
C801 C801A	C802	C803	C804	C805	C806	C807
C1001 C1001A	C1002	C1003	C1004	C1005	C1006	C1007
C1101 C1101A	C1102	C1103	C1104	C1105	C1106	C1107

LEGEND

- C201 – C208EXISTING CONDITIONS
- C601 – C608DEMOLITION PLANS
- C701 – C708PAVEMENT GEOMETRY PLANS
- C801 – C808GRADING PLANS
- C1001 – C1008SPOT ELEVATION PLANS
- C1101 – C1108PAVEMENT MARKING PLANS



CALL 48 HOURS
BEFORE YOU DIG


IT'S THE LAW!
DIAL 811

Know what's below.
Call before you dig.

SUNSHINE STATE ONE CALL OF FLORIDA, INC.

CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212



© 2024 KIMLEY-HORN AND ASSOCIATES, INC.
600 PETERS ROAD, SUITE 200, PALM BEACH, FL 33411
PHONE: 561-991-0101 FAX: 561-739-2200
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

2765 VISTA FAIRWAY, SUITE 1-14
WEST PALM BEACH, FL 33411
TEL: 335-9324
LICENSE NO. CA38805


BID SET

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
KEYMAP

SHEET NO.	OF
C03	
TOTAL:	110
CAD FILE:	12764-C03-KMAP
DRAWING FILE NO.	

DRAWN BY:	ALB	DATE:	06/07/2024
DESIGNED BY:	KAS	SCALE:	AS NOTED
CHECKED BY:	TFO		
FIELD BOOK:			

CITY OF FORT LAUDERDALE



PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE




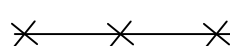



100 North Andrews Avenue, Fort Lauderdale, Florida 33301

ENGINEER:
THOMAS F. O'DONNELL
PROJ. NO.: 12764
DATE:

TEL: 561-840-0825
FAX:

K:\FLT\AVIATION\044693151_FXE_RW_9-27_REHAB\CADD\PLANSHEETS\12764-C04-STAG.DWG

LEGEND

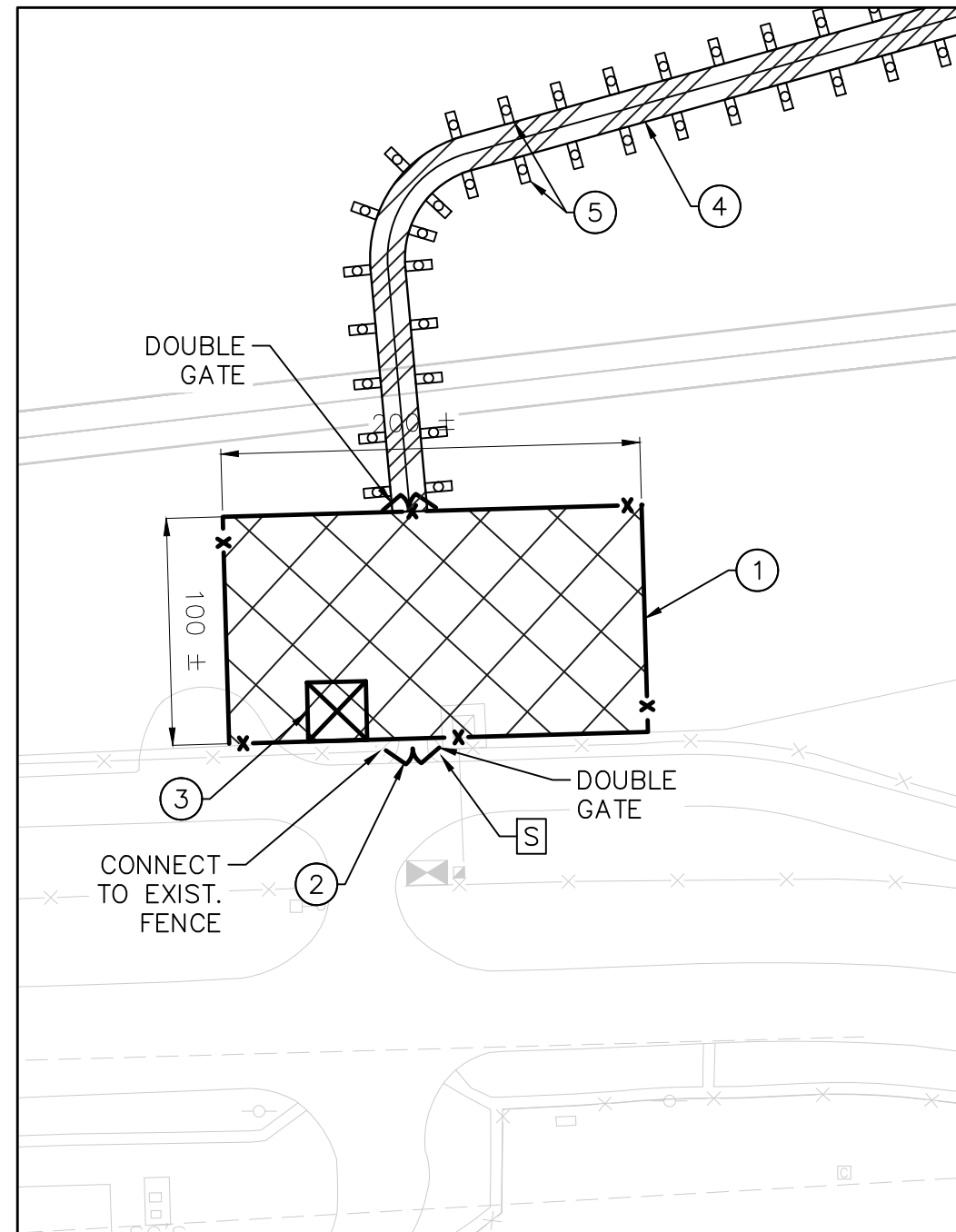
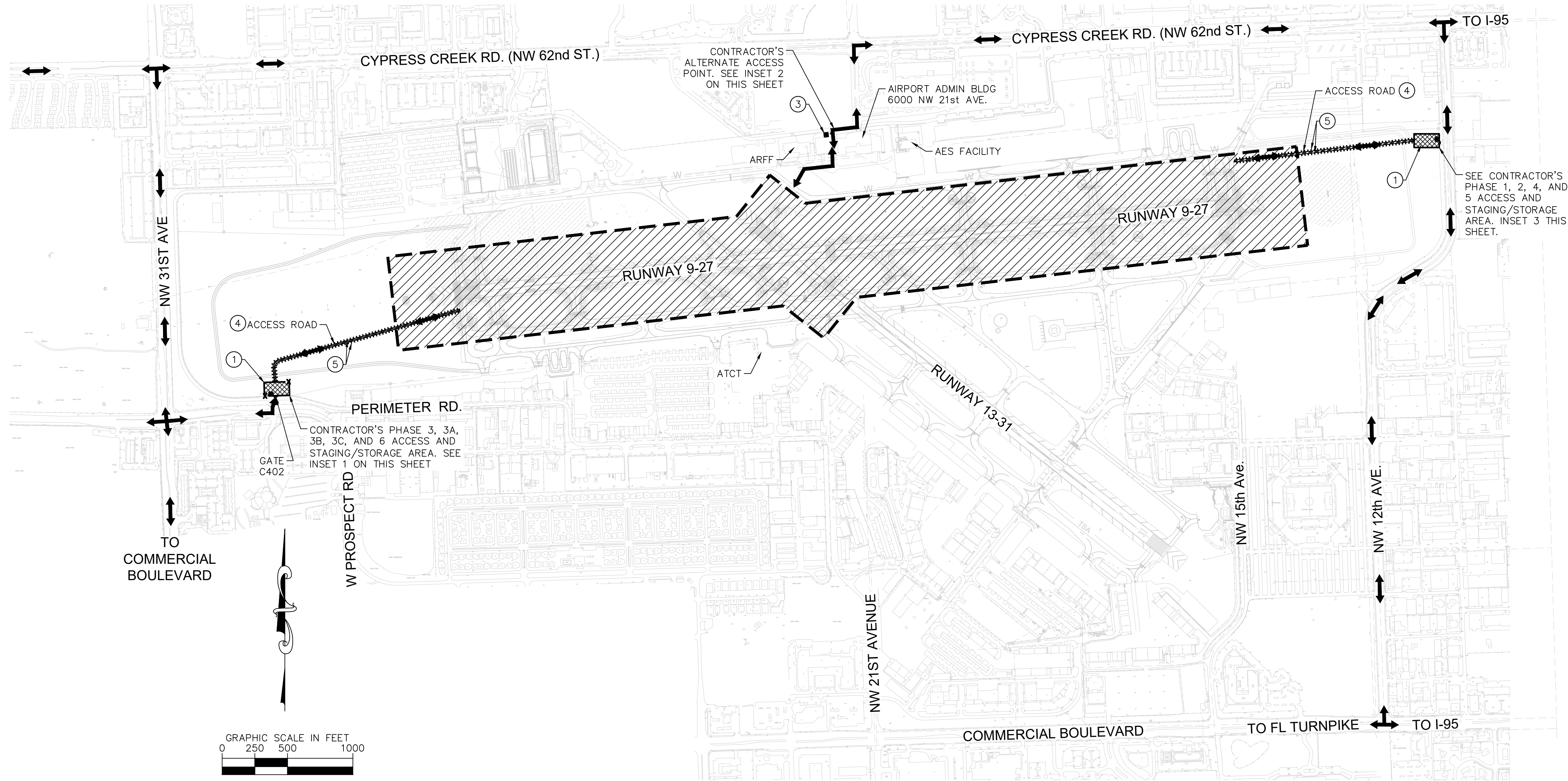
-  ACCESS / HAUL ROUTE
-  CONTRACTOR'S STAGING AND STORAGE AREA. MAXIMUM EQUIPMENT HEIGHT = 20'
-  PROJECT WORK AREA
-  TEMPORARY SECURITY FENCE.
-  TYPE II BARRICADE WITH FLASHING LIGHT AT 30' SPACING. SEE DETAIL SHEET C05.
-  RSA RUNWAY SAFETY AREA
- ① CONTRACTOR'S STAGING AND STORAGE AREA. CONTRACTOR TO CONSTRUCT SO AS TO AVOID BURROWING OWL/GOPHER TORTOISE BURROWS. SEE SHEET C05 FOR WORK ACTIVITY SEPARATION AND DETAILS. EMPLOYEE VEHICLES SHALL NOT GO BEYOND CONTRACTOR'S FENCED STAGING AREA.
- ② CONTRACTOR'S ACCESS GATE. CONTRACTOR TO REMOVE EXISTING GATES PRIOR TO CONSTRUCTION. TEMPORARY DOUBLE GATES TO BE INSTALLED. TEMPORARY GATES TO BE REMOVED AND ORIGINAL GATES RESTORED AFTER CONSTRUCTION IS COMPLETE. INSTALLATION AND REMOVAL OF TEMPORARY GATES TO BE INCLUDED IN MOBILIZATION PAY ITEM.
- ③ CONTRACTOR'S SECURITY GUARD SHACK LOCATION.
- ④ APPROXIMATE LOCATION OF TEMPORARY ACCESS ROAD. LOCATION TO BE FIELD ADJUSTED TO AVOID EXISTING OWL/GOPHER TORTOISE BURROWS AND AS DIRECTED BY OWNER. REMOVE AND SOD WHEN CONSTRUCTION IS COMPLETE. SEE DETAILS ON SHEET C05.
- ⑤ TYPE II BARRICADES WITH FLASHING LIGHT AT 30' SPACING SEE DETAIL SHEET C05
-  CONTRACTOR TRAFFIC SIGN

CONTRACTOR STAGING AREA NOTES:

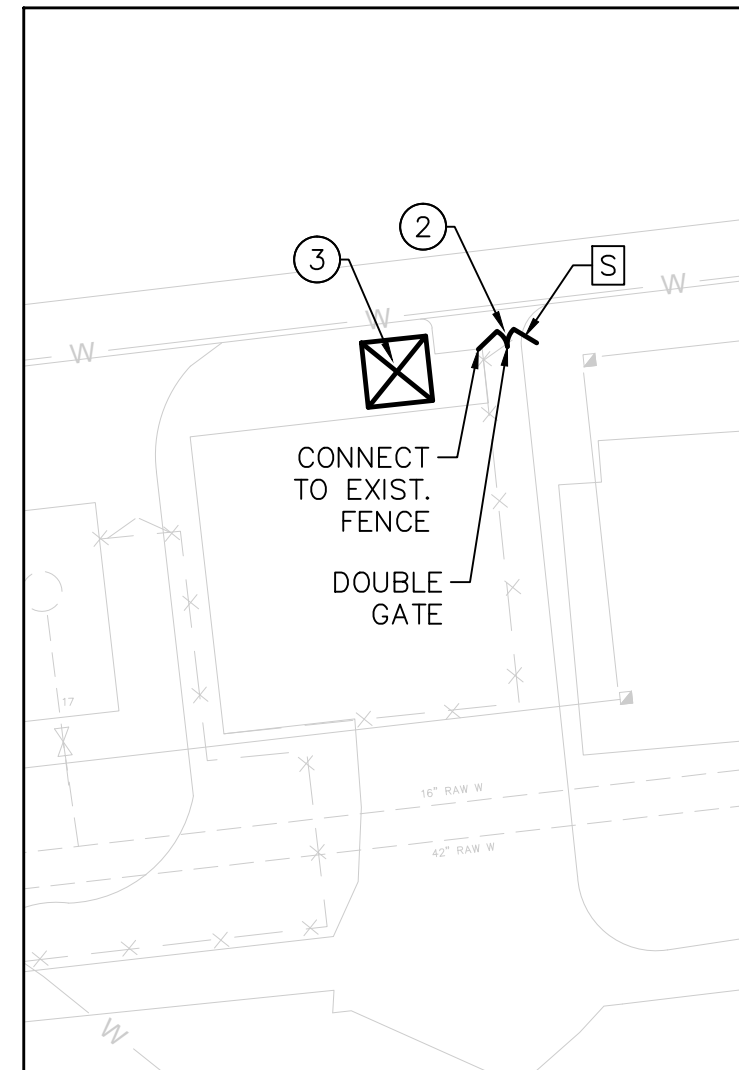
1. THE EXACT LIMITS, LIGHTING AND SECURITY REQUIREMENTS OF THE CONTRACTOR'S STAGING AND STORAGE AREA SHALL BE ESTABLISHED BY THE CONTRACTOR WITH THE APPROVAL OF THE OWNER IN THE AREAS GENERALLY AS SHOWN ON THE PLANS. ANY AND ALL REQUIRED UTILITIES FOR THE CONTRACTOR'S OPERATIONS SHALL BE ARRANGED FOR AND PAID FOR BY THE CONTRACTOR WITH THE APPROPRIATE UTILITY AGENCIES. UTILITY ARRANGEMENTS SHALL BE SUBJECT TO THE APPROVAL OF THE OWNER. THE CONTRACTOR SHALL USE THE STORAGE AND STAGING AREA SHOWN ON THE PLANS FOR ITS FIELD OFFICE, SHOP, MATERIAL AND EQUIPMENT STORAGE, AND OTHER PROJECT RELATED ACTIVITIES, INCLUDING EMPLOYEE PARKING. ALL COSTS ASSOCIATED WITH PREPARING THE STORAGE AND STAGING AREA SITE SHALL BE BORNE BY THE CONTRACTOR. THIS INCLUDES BUT IS NOT LIMITED TO, CLEARING, GRADING AND STABILIZING OF THE SITE, CONSTRUCTION OF ALL TEMPORARY UTILITIES, ACCESS ROADS, AND SECURITY FENCING, CLEAN-UP AND RESTORATION OF SITE TO ORIGINAL CONDITION.
2. CONSTRUCTION EQUIPMENT SHALL BE PARKED ONLY WITHIN CONTRACTOR'S STAGING AND STORAGE AREA OUTSIDE OF ESTABLISHED HOURS OF CONSTRUCTION.

ACCESS AND HAUL ROAD NOTES:

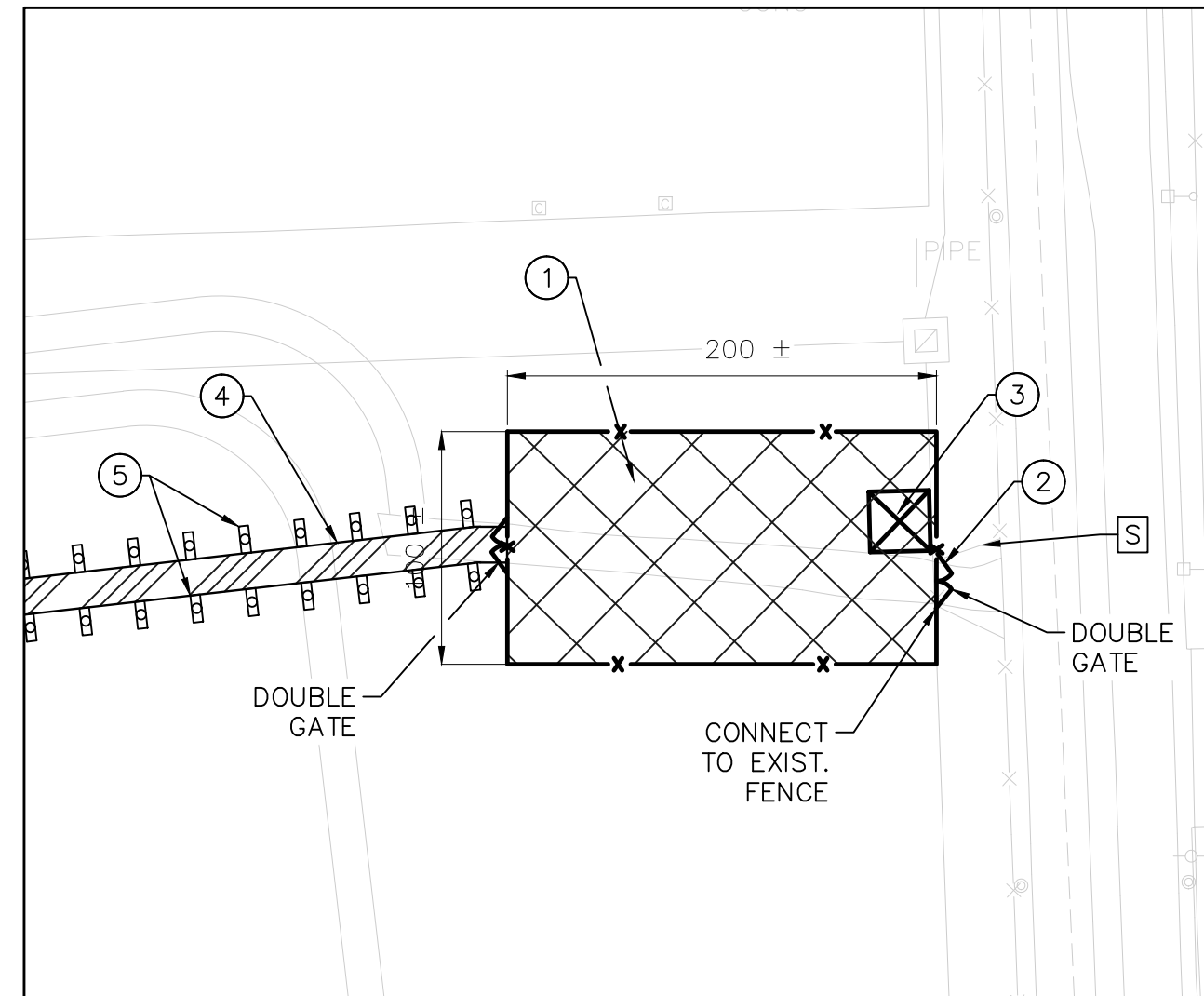
1. HAUL ROADS TO BE USED UNDER THIS PROJECT SHALL BE THOSE INDICATED ON THE DRAWINGS OR OTHERWISE SPECIFICALLY AUTHORIZED BY THE OWNER. IN GENERAL, THE CONTRACTOR SHALL CONFINE EQUIPMENT AND HAULING TO THE AREAS UNDER CONSTRUCTION. NO DEBRIS SHALL BE ALLOWED ON THE ROADWAYS OR AIRPORT PAVED SURFACES. ACTIVE AREAS OF THE AIRPORT SHALL BE KEPT FREE OF DEBRIS AT ALL TIMES. CONTRACTOR SHALL MAINTAIN VACUUM SWEEPERS ON SITE FOR THAT USE. OTHER PAVEMENTS SHALL BE CLEANED BY THE CONTRACTOR DAILY, AND AS REQUIRED, USING VACUUM SWEEPERS TO KEEP ALL ACCESS AND CONSTRUCTION AREAS CLEAR OF SOILS, CLODS OR OTHER DEBRIS.
2. THE ACCESS POINTS TO THE PROJECT SITE ARE SHOWN ON THE PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ALL AIRPORT SERVICE ROADS TO THEIR PRECONSTRUCTION CONDITION WHERE SUCH ROADS ARE USED BY THE CONTRACTOR FOR HAULING OPERATIONS.
4. THE CONTRACTOR SHALL RESTORE ALL TURFED AND PAVED AREAS USED FOR HAUL ROADS TO THEIR ORIGINAL CONDITION, INCLUDING THE ESTABLISHMENT OF TURF. ALL COSTS FOR CONSTRUCTING, REMOVING AND RESTORING OF HAUL ROADS REQUIRED FOR THE COMPLETION OF THE WORK SHALL BE BORNE BY THE CONTRACTOR.
5. THE CONTRACTOR SHALL NOT PERMIT ANY UNAUTHORIZED CONSTRUCTION PERSONNEL OR TRAFFIC ON THE SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRAFFIC CONTROL TO AND FROM THE VARIOUS CONSTRUCTION AREAS ON THE SITE. THE CONTRACTOR IS RESPONSIBLE FOR THE IMMEDIATE CLEAN-UP OF ANY DEBRIS DEPOSITED AT THE PROJECT SITE AND ALONG ANY ROAD AS A RESULT OF HIS/HER CONSTRUCTION TRAFFIC. DIRECTIONAL SIGNAGE AT THE ACCESS GATE AND ALONG THE DELIVERY ROUTE TO THE STORAGE AREA OR WORK SITE SHALL BE APPROVED BY THE OWNER. ALL CONTRACTOR'S MATERIAL ORDERS FOR DELIVERY TO THE SITE SHALL BE DIRECTED TO THE ACCESS POINTS IDENTIFIED. THE AIRPORTS STAFF WILL NOT RECEIVE ANY DELIVERIES.
6. RUBBER Tired VEHICLES ONLY SHALL BE ALLOWED ON EXISTING AIRPORT PAVEMENT WHICH IS TO REMAIN.
7. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE OFF-SITE ROUTES (STATE HIGHWAYS, COUNTY ROADS OR CITY STREETS) WITH THE APPROPRIATE OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE.
8. ALL CONTRACTOR VEHICLES AND TRAFFIC SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION AREAS, STAGING AREAS OR HAUL ROUTES.



INSET 1 - CONTRACTOR'S PHASE 3, 3A, 3B, 3C, AND 6 ACCESS AND STAGING / STORAGE AREA



INSET 2 - CONTRACTOR'S ALTERNATE ACCESS POINT



INSET 3 - CONTRACTOR'S PHASE 1, 2, 4 AND 5 ACCESS AND STAGING / STORAGE AREA

Kimley»Horn QUANTUM

2751 VISTA PALMVIEW SUITE 100
WEST PALM BEACH, FL 33411
TEL: 561-924-1234 FAX: 561-924-1235
WWW.KIMLEY-HORN.COM REGISTRY NO. 30306

2751 VISTA PALMVIEW SUITE 100
WEST PALM BEACH, FL 33411
TEL: 561-924-1234 FAX: 561-924-1235
WWW.KIMLEY-HORN.COM REGISTRY NO. 30306

ENGINEER:
THOMAS F. O'DONNELL
PROJ. No: 62476
DATE:

DRAWN BY:
ALB
DATE: 06/07/2024

DESIGNED BY:
KAS
SCALE: AS NOTED

CHECKED BY:
TFO

FIELD BOOK:

TEL: 561-640-0825
FAX:

CITY of FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE

100 North Andrews Avenue, Fort Lauderdale, Florida 33301

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
ACCESS AND STAGING AREA

SHEET NO. OF
C04

TOTAL: 110

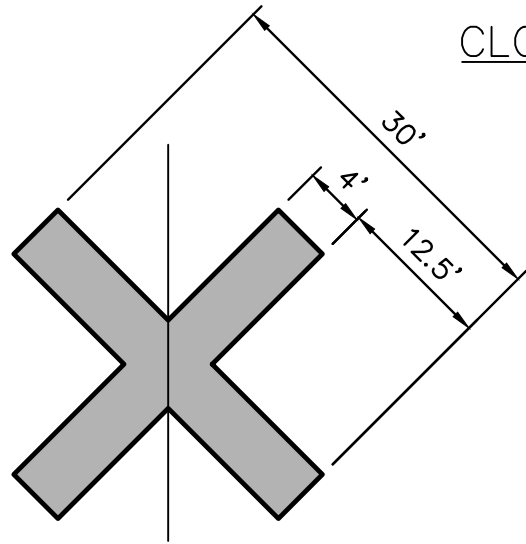
CAD FILE:
12764-C04-STAG

DRAWING FILE NO.

BID SET

CONSTRUCTION SAFETY NOTES:

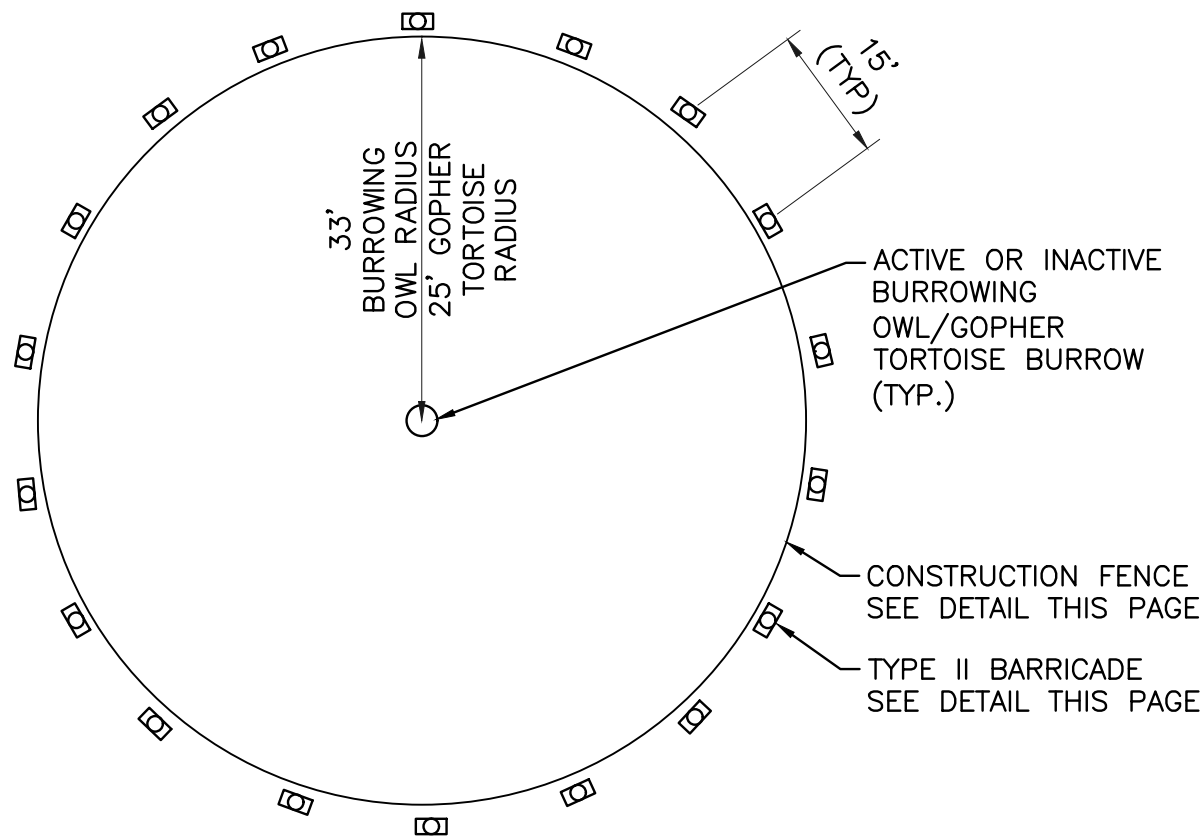
- ALL CONSTRUCTION FOR THIS PROJECT SHALL CONFORM TO THE GUIDELINES SET FORTH IN FEDERAL AVIATION ADMINISTRATION (FAA) AC150/5370-2G "OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION", AND THESE PLANS AND SPECIFICATIONS.
- CONSTRUCTION ACTIVITIES ARE NOT PERMITTED WITHIN THE RUNWAY SAFETY AREA (RSA) OF ANY RUNWAY THAT IS OPEN FOR AIRCRAFT OPERATIONS. (SEE SECTION 2.22, AC 150/5370-2G, CHAPTER 2)
- CONSTRUCTION ACTIVITIES ARE NOT PERMITTED WITHIN TAXIWAY OBJECT FREE AREA (TOFA) OF AN ACTIVE TAXIWAY. (SEE SECTION 2.22, AC No. 150/5370-2G, CHAPTER 2)
- NO CONSTRUCTION TRAFFIC SHALL ENTER OR CROSS ANY ACTIVE AIRPORT OPERATIONAL AREA EXCEPT UPON AUTHORIZATION BY THE OWNER. THIS SPECIFICALLY INCLUDES THE RUNWAY PROTECTION ZONES AND THE RUNWAY AND TAXIWAY CONSTRUCTION SAFETY LIMITS IDENTIFIED IN CONSTRUCTION NOTES 2 AND 3 ABOVE.
- NO CONSTRUCTION TRAFFIC SHALL ENTER OR CROSS ANY LOCALIZER OR GLIDE SLOPE CRITICAL AREA EXCEPT UPON AUTHORIZATION BY THE OWNER.
- IN ORDER FOR THE CONTRACTOR TO OPERATE WITHIN THE AIR OPERATIONS AREA, APPROPRIATE NOTICE TO AIR MISSIONS (NOTAMS) MUST BE ISSUED BY THE OWNER THROUGH THE FAA FLIGHT SERVICE STATION. THESE NOTICES PROVIDE INFORMATION ON CLOSED, LIMITED, OR HAZARDOUS CONDITIONS TO AIRMEN AND USERS OF THE AIRPORT. A 72-HOUR NOTICE IS REQUIRED FOR ISSUANCE OF THE NOTAM. ALL CONSTRUCTION OPERATIONS MUST BE CLOSELY COORDINATED WITH THE OWNER FOR NOTAM ISSUANCE.
- AIRCRAFT OPERATIONS SHALL AT ALL TIMES HAVE PRIORITY OVER ALL VEHICLES, EQUIPMENT AND PERSONNEL. THE CONTRACTOR SHALL EMPLOY STRICT MEASURES TO PREVENT ANY CONFLICT BETWEEN ITS PERSONNEL AND AIRCRAFT ON ANY ACTIVE AIRFIELD PAVEMENT. THE CONTRACTOR SHALL REMAIN CLEAR OF ACTIVE RUNWAYS AND TAXIWAYS.
- ALL CONTRACTOR VEHICLES, INCLUDING HAULING VEHICLES, THAT ARE AUTHORIZED TO OPERATE WITHIN THE SECURITY FENCE ON THE AIRPORT WITHIN THE DESIGNATED LIMITS OF CONSTRUCTION OR HAUL ROUTES AS DEFINED HEREIN, SHALL DISPLAY IN FULL VIEW ABOVE THE VEHICLE A 3'x3' OR LARGER ORANGE AND WHITE CHECKERBOARD FLAG, EACH CHECKERBOARD COLOR BEING 1' SQUARE. WHEN OPERATING DURING PERIODS OF DARKNESS OR LIMITED VISIBILITY, CONTRACTOR'S VEHICLES SHALL BE EQUIPPED WITH ROTATING OR FLASHING AMBER LIGHTS. DURING SUCH PERIODS, HAULING VEHICLES NOT SO EQUIPPED SHALL BE ESCORTED BY A VEHICLE SO EQUIPPED.
- CONTRACTOR SHALL CONTROL THE ON-AIRPORT MOVEMENT AND ACTIVITIES OF ITS EMPLOYEES AND SUBCONTRACTORS.
- OPEN-FLAME WELDING OR TORCH-CUTTING OPERATIONS ARE PROHIBITED UNLESS ADEQUATE FIRE AND SAFETY PRECAUTIONS ARE PROVIDED AND HAVE BEEN APPROVED BY THE OWNER.



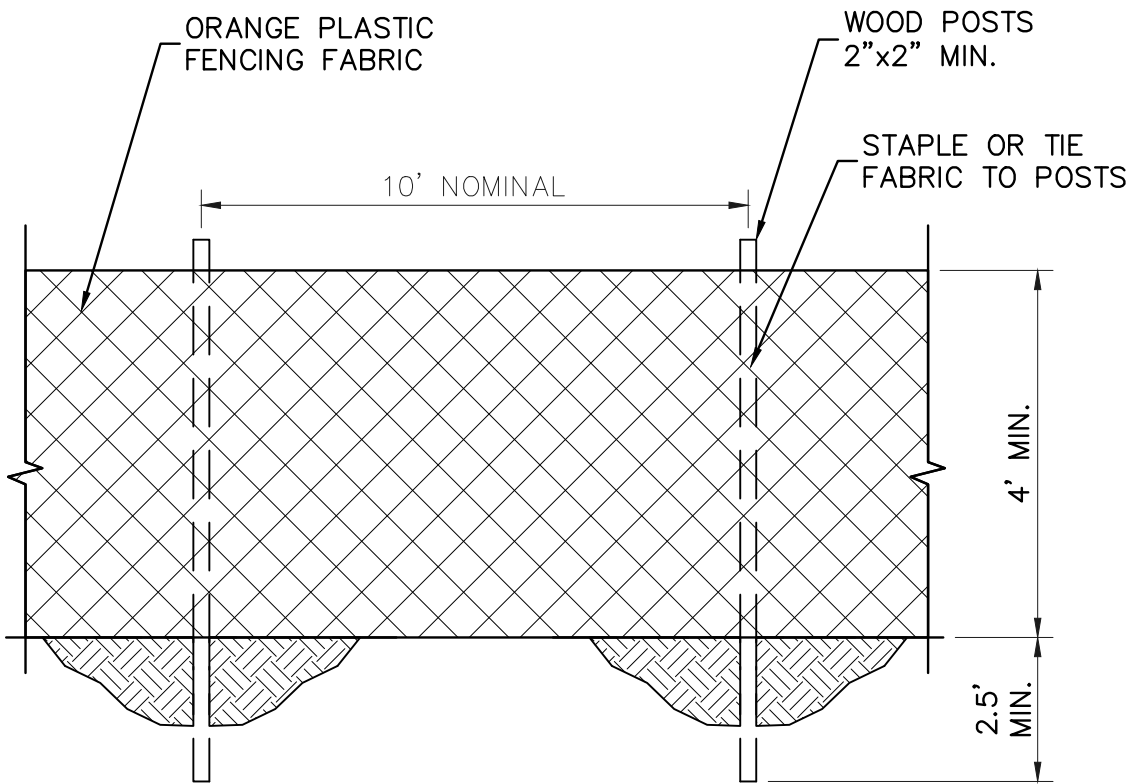
CLOSED TAXIWAY MARKER NOTES:

- TEMPORARY CLOSED TAXIWAY MARKER SHALL BE CONSTRUCTED OF AN EASILY REMOVABLE MATERIAL, SUCH AS PLYWOOD OR FABRIC, AND HELD IN PLACE WITH SAND BAGS PAINTED YELLOW. TEMPORARY CLOSED TAXIWAY MARKER SHALL BE YELLOW IN COLOR.
- THE CONTRACTOR SHALL PLACE TEMPORARY CLOSED TAXIWAY MARKER ON THE CENTERLINE OF THE FACILITY TO BE CLOSED AS SHOWN ON PLANS OR AS DIRECTED BY THE OWNER.
- NO PAYMENT WILL BE MADE FOR RELOCATIONS OF TEMPORARY CLOSED TAXIWAY MARKER.
- PAYMENT FOR ITEM IS INCLUDED IN S-102. NO SEPARATE PAYMENT SHALL BE MADE FOR THIS ITEM.

TEMPORARY TAXIWAY CLOSURE MARKER



BURROWING OWL AND GOPHER TORTOISE FENCING PROTECTION DETAIL N.T.S.

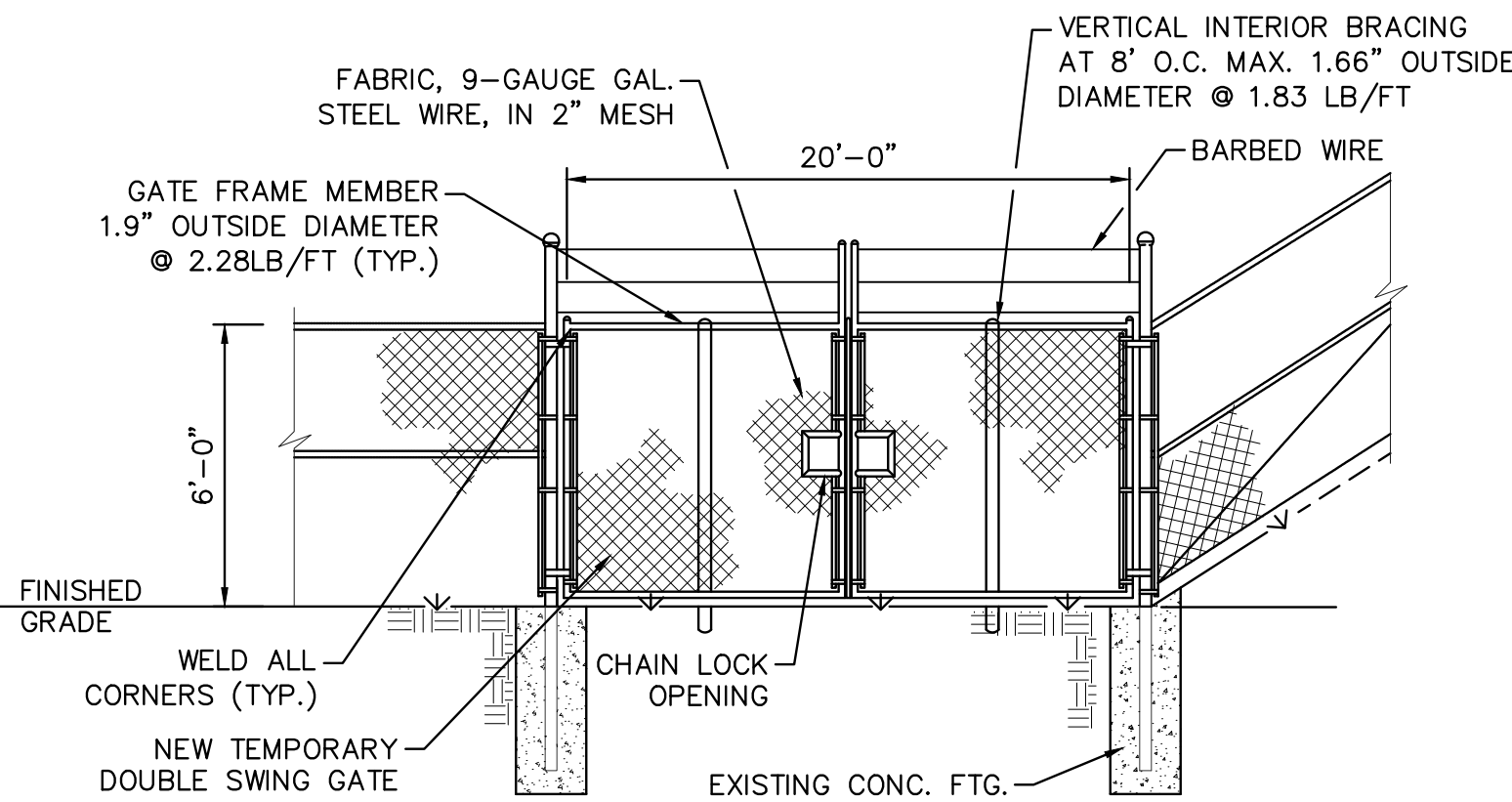


CONSTRUCTION FENCE DETAIL N.T.S.



NOTES:

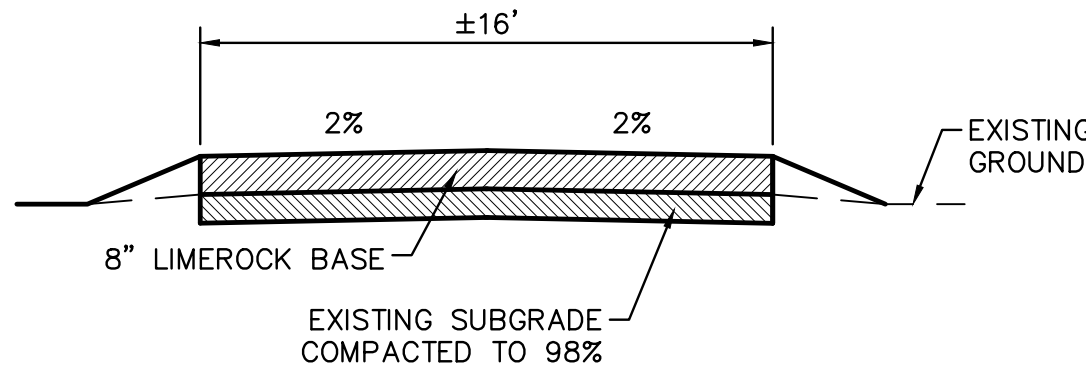
- THE CONTRACTOR SHALL PROVIDE FULLY FUNCTIONING PORTABLE LIGHTED RUNWAY CLOSURE MARKERS FOR THE PROJECT.
- THE FUEL AND MAINTENANCE COSTS ASSOCIATED WITH USING THE PORTABLE LIGHTED RUNWAY CLOSURE MARKERS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR THROUGHOUT THE CONSTRUCTION. THIS INCLUDES REPLACING THE ENGINE AND/OR GENERATOR. ANY REPAIRS REQUIRED TO THE PORTABLE LIGHTED RUNWAY CLOSURE MARKERS SHALL BE AT THE CONTRACTOR'S EXPENSE, WITH NO ADDITIONAL COMPENSATION.
- THE CONTRACTOR SHALL CLEAN, REPAIR AND REPLACE ANY DAMAGED PARTS ON THE PORTABLE LIGHTED RUNWAY CLOSURE MARKERS.



TEMPORARY SECURITY DOUBLE SWING GATE N.T.S.

NOTES:

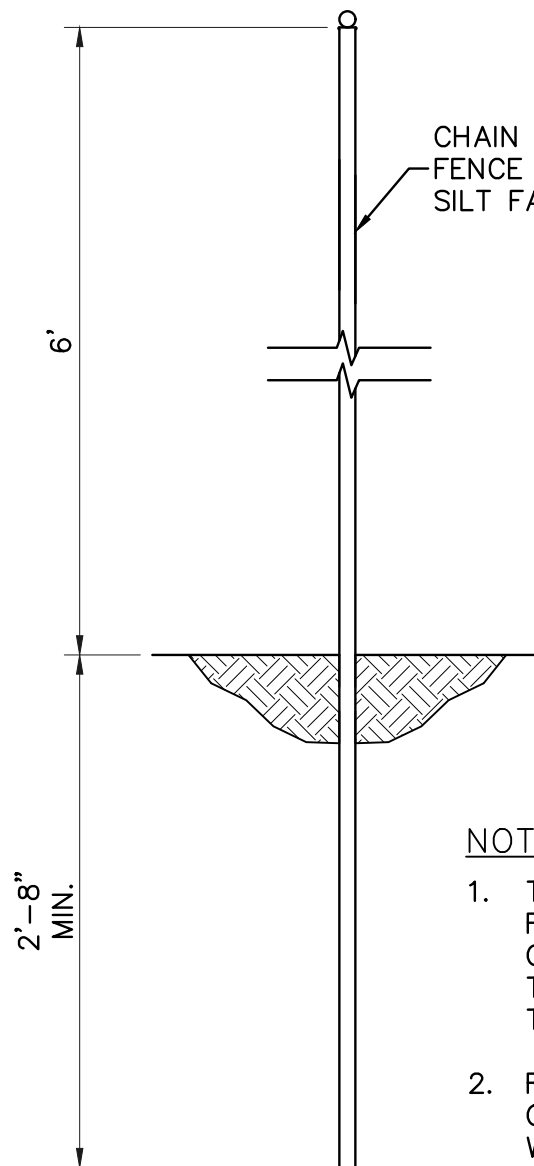
- TEMPORARY GATES ARE TO BE REMOVED AFTER CONSTRUCTION IS COMPLETE. COST OF GATES ARE TO BE INCLUDED IN MOBILIZATION PAY ITEM. EXACT LOCATION OF GATES TO BE COORDINATED WITH OWNER.
- TEMPORARY GATE DETAIL SHOW MAX WIDTH, AND LIKELY HEIGHT. CONTRACTOR TO MEASURE ALL ACTUAL DIMENSIONS IN FIELD PRIOR TO FABRICATION.



TEMPORARY ACCESS ROAD SECTION N.T.S.

ACCESS ROAD NOTES:

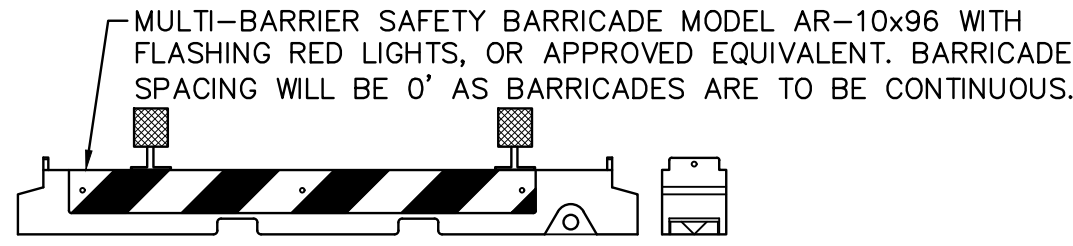
- THE EXACT LIMITS AND LOCATION OF THE ACCESS ROAD WILL BE COORDINATED WITH FVE OPERATIONS STAFF AND SHALL BE APPROVED IN THE FIELD BY THE ENGINEER.
- THE ACCESS ROAD SHALL BE 8" THICK.
- AFTER COMPLETION OF CONSTRUCTION, THE ACCESS ROAD SHALL BE RETURNED TO ITS ORIGINAL CONDITION OR BETTER. THE CONTRACTOR WILL SOD LIMITS.
- ROAD TO BE PAID FOR AS INCIDENTAL TO MOBILIZATION (C-105)



TEMPORARY SECURITY FENCE DETAIL N.T.S.

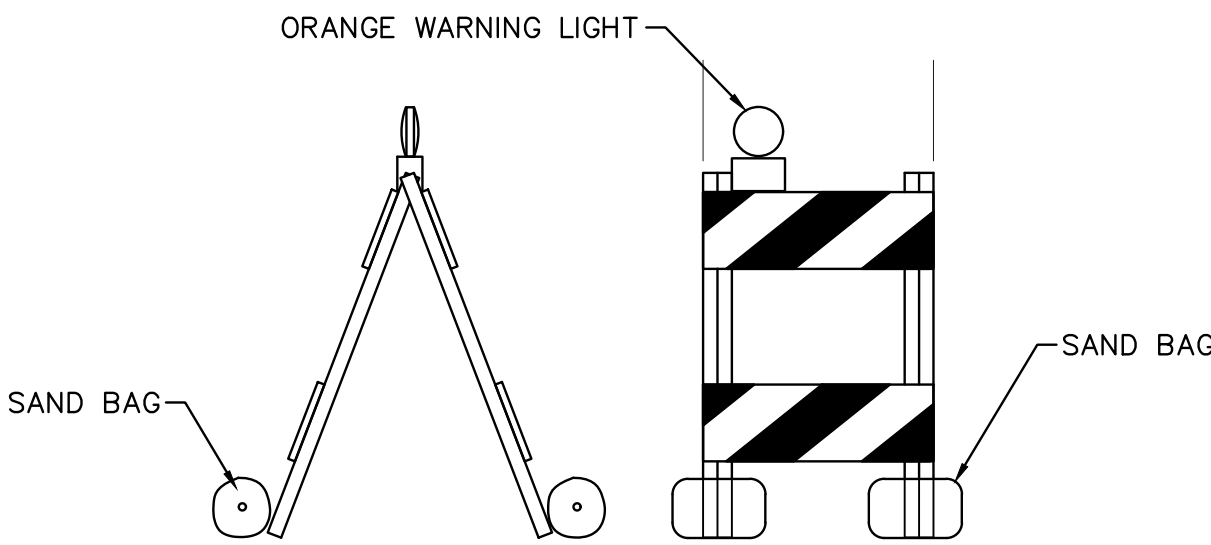
NOTES:

- TEMPORARY FENCE AND SILT FABRIC MUST BE MAINTAINED IN GOOD WORKING ORDER THROUGHOUT THE DURATION OF THE CONSTRUCTION.
- REPAIRS, AS REQUIRED OR AS ORDERED BY THE AIRPORT STAFF, WILL ME MADE WITHIN 24 HRS OF NOTICE.



LOW LEVEL AIRFIELD BARRICADE DETAIL & NOTES N.T.S.

- BARRICADES SHALL BE PLACED AS SHOWN ON THE PHASING PLANS TO DELINEATE THE CONTRACTOR'S WORK AREAS. EXACT BARRICADE LOCATION AND QUANTITY TO BE COORDINATED WITH AIRPORT.
- BARRICADE SECTIONS CAN BE WHITE OR ORANGE WITH WHITE AND ORANGE RETRO-REFLECTIVE MARKING OR STICKERS. BARRICADES WILL BE LIGHTED AND FLAGGED.
- ALL BARRICADES SHALL BE CHECKED VISUALLY FOR SIGNS OF WEAR AND TEAR ON A WEEKLY BASIS AND SHALL BE REPAIRED OR REPLACED WHEN DEEMED APPROPRIATE BY THE RPR OR OWNER. THE CONDITIONS OF LIGHTING UNITS SHALL BE CHECKED DAILY. ALL LIGHT FIXTURES SHALL BE VERIFIED OPERATING BY THE CONTRACTOR ON A DAILY BASIS BEFORE THE CONTRACTOR CEASES OPERATION FOR THE DAY. THE AREAS AROUND ALL BARRICADES SHALL BE CLEANED AS DIRECTED IN THE GENERAL NOTES AND THE SAFETY NOTES.
- BARRICADES ALONG ACTIVE APRON OR TAXIWAY PAVEMENT SHALL BE PLACED APPROXIMATELY 4 FEET FROM THE EDGE OF THE FULL STRENGTH PAVEMENT. BARRICADES SHALL BE PLACED IN A CONTINUOUS LINE.
- ALTERNATE FORMS OF BARRICADES MAY BE PROPOSED BY THE CONTRACTOR WHICH MEET THESE FUNCTIONAL REQUIREMENTS. APPROVALS OF ANY SUCH SUBSTITUTION (IF GRANTED) SHALL BE BY THE OWNER AT NO ADDITIONAL COST TO THE OWNER.
- THE FINAL LOCATION FOR THE BARRICADES SHALL BE ESTABLISHED IN THE FIELD AS DIRECTED BY THE OWNER.
- THE CONTRACTOR SHALL FURNISH, INSTALL, MAINTAIN, RELOCATE AND REMOVE ALL BARRICADES. ALL WORK SHALL BE INCIDENTAL TO S-102 IN THE A.O.A.
- THE CONTRACTOR SHALL MAINTAIN THE LIGHTS AND THE BARRICADES IN OPERABLE CONDITION AT ALL TIMES.. THE CONTRACTOR SHALL HAVE REPLACEMENT LIGHTS AND BATTERIES ON SITE AND SHALL REPLACE LIGHTS AND/OR BATTERIES WITHIN ONE HOUR OF NOTIFICATION BY THE RPR OR OWNER. CONTRACTOR SHALL FURNISH THE OWNER WITH THE NAME AND TELEPHONE NUMBER FOR AN ON-CALL REPRESENTATIVE 24 HOURS PER DAY, SEVEN DAYS PER WEEK TO REPLACE BATTERIES AND INOPERATIVE LIGHTS AND MAINTAIN THE BARRICADES.
- FLASHING LIGHTS SHALL BE PLACED AT THE ENDS AND AT CORNERS OF EACH LINE OF BARRICADES, ALL OTHER LIGHTS ON BARRICADES SHALL BE STEADY-BURN.



TYPE II BARRICADE DETAIL N.T.S.

CALL 48 HOURS BEFORE YOU DIG

IT'S THE LAW! DIAL 811



SUNSHINE STATE ONE CALL OF FLORIDA, INC.

CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212

Kimley»Horn

© 2024 KIMLEY-HORN AND ASSOCIATES, INC.
600 PETERS ROAD, SUITE 200, PALM BEACH, FL 33411
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

QUANTUM
Technical Engineering, Inc.
2755 VISTA PARADISE SUITE 149
WEST PALM BEACH, FL 33411
941-230-9224
LICENSE NO. CA08005

ENGINEER:
THOMAS F. O'DONNELL
LIC. NO. 62476
DATE:

DRAWN BY: ALB
DATE: 06/07/2024
DESIGNED BY: KAS
SCALE: AS NOTED
CHECKED BY: TFO
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE



100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS
BY CHK'D
DATE
NO.

DESCRIPTION

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
SAFETY NOTES AND DETAILS

SHEET NO.

C05

TOTAL:

CAD FILE:

12764-C05-SAFE

DRAWING FILE NO.

BID SET

K:\FL\AVIATION\044693151_FXE_RW_9-27_REHAB\CADD\PLANSHEETS\12764-C102-PHAS2.DWG

LEGEND

- PHASE 2 WORK LIMITS
- LOW LEVEL AIRFIELD BARRICADES SEE DETAIL SHEET C05
- TEMP. TAXIWAY CLOSURE MARKER SEE DETAIL SHEET C05
- TEMP. LIGHTED RUNWAY CLOSURE MARKER SEE DETAIL SHEET C05
- RSA RUNWAY SAFETY AREA
- RPZ RUNWAY PROTECTION ZONE
- HAUL ROUTE
- TAXIWAY AIRCRAFT CROSSING, OUTSIDE OF PHASE LIMITS, IN PLACE FOR DURATION OF PHASE
- TAXIWAY AIRCRAFT CROSSING, INSIDE OF PHASE LIMITS, IN PLACE WHEN CROSSING IS OPERATIONAL
- LOCATION OF LIGHTED RUNWAY CLOSURE "X"
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE FOR DURATION OF PHASE.
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO ALLOW TAXIWAY CROSSING
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE RUNWAY
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE WHEN CONTRACTOR IS NOT PROVIDING TW CROSSING FOR AIRCRAFT. WHEN A CROSSING IS BEING USED, THESE BARRICADES WILL BE REMOVED AND THE CONTRACTOR MUST INSTALL GROUP 3 BARRICADES.

PRIMARY ITEMS OF WORK*

- 1.INSTALL BARRICADES AND LIGHTED XS.
- 2.MILL BITUMINOUS ASPHALT.
- 3.PERFORM ELECTRICAL DEMOLITION AND INSTALLATION WORK.
- 4.PAVE (P-401 AND P-403) ASPHALT.
- 5.APPLY TEMPORARY PAINT MARKING.
- 6.INSTALL TOPSOILING AND SODDING.
- 7.REMOVE LIGHTED XS ON RUNWAY 13-31.

*THIS LIST IS NOT EXHAUSTIVE NOR SEQUENTIAL; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE PROJECT AND CONTRACT DOCUMENTS TO PERFORM ALL REQUIRED WORK IN ITS APPROPRIATE SEQUENCE.

OPERATIONS

CONSTRUCTION IN THE WORK AREA SHOWN WILL REQUIRE THE CLOSURE OF RUNWAY 9-27, RUNWAY 13-31, AND TAXIWAYS A AND B. TAXIWAY A1, D, E, F, and L WILL REMAIN OPEN. WORK WILL BE PERFORMED 24 HOURS PER DAY, FRIDAY 10:00 PM TO MONDAY 6:00 AM. WORK TIMES ARE REFERENCED FROM START OF SHIFT.

CONTRACTOR TO COORDINATE BARRICADE AND LIGHTED X PLACEMENT WITH AIRPORT STAFF AND RESIDENT PROJECT REPRESENTATIVE. BARRICADE LOCATIONS ARE SCHEMATIC AND MAY BE ADJUSTED IN THE FIELD AS NECESSARY FOR THE COMPLETION OF THE WORK. UPON THE COMPLETION OF THIS PHASE, THE CONTRACTOR WILL REMOVE LIGHTED XS FROM RUNWAY 13-31.

PHASE 2

LIMITS OF WORK

FOR RUNWAY 9-27, THE LIMITS OF THIS PHASE ARE GENERALLY ALONG RUNWAY 9-27 BETWEEN 85.5 FEET SOUTH OF TAXIWAY F, 394 FEET EAST OF RUNWAY 13-31, 85.5 FEET NORTH OF TAXIWAY A, AND EAST OF TAXIWAY B. FOR RUNWAY 13-31, THE LIMITS OF THIS PROJECT ARE GENERALLY ALONG RUNWAY 13-31 BETWEEN THE RUNWAY 13 BLAST PAD, 85.5 FEET WEST OF TAXIWAY N, THE RUNWAY 9-27 SAFETY AREA, AND 85.5 FEET EAST OF TAXIWAY B.

WORK SEQUENCING

WORK IN THIS AREA WILL BE PERFORMED SEQUENTIALLY AFTER THE COMPLETION OF PHASE 1. PHASE 1, 2, AND 3 WILL BE CONTINUOUS.

CALL 48 HOURS BEFORE YOU DIG

IT'S THE LAW! DIAL 811



SUNSHINE STATE ONE CALL OF FLORIDA, INC.

CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212

Kimley-Horn

© 2024 KIMLEY-HORN AND ASSOCIATES, INC.
4001 PETERSON ROAD, SUITE 2000, PALM BEACH, FL 33411
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

QUANTUM

2751 VISTA PARKWAY SUITE 1-4
WEST PALM BEACH, FL 33411
TEL: 561-952-9224
LICENSE NO. CA38855

BID SET

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
PHASING AND SAFETY PLAN - PHASE 2

SHEET NO. OF

C102

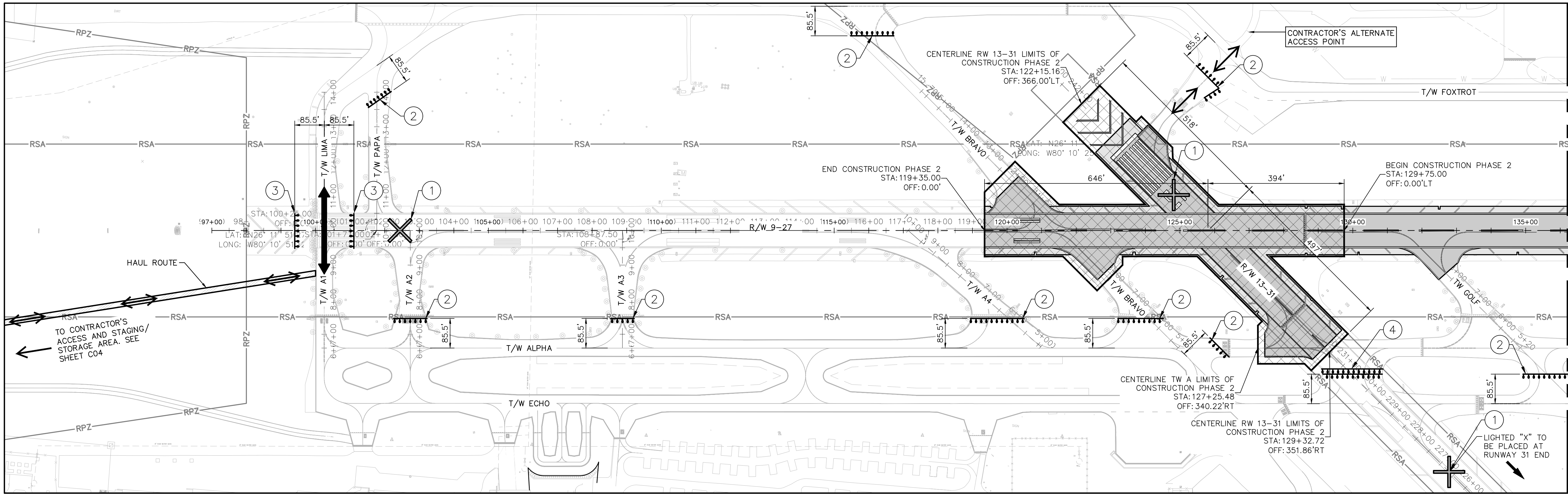
TOTAL: 110

CAD FILE:

12764-C102-PHAS2

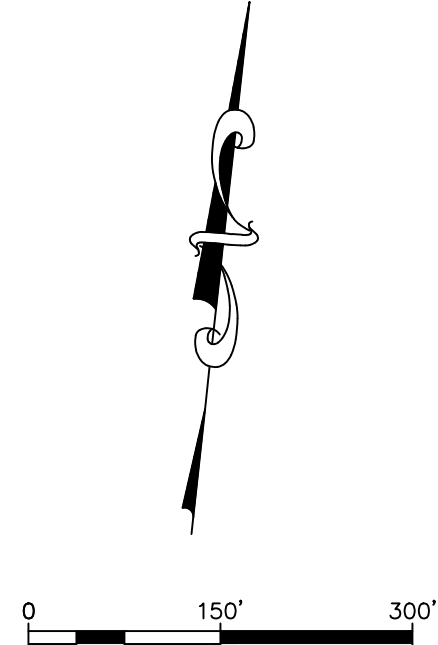
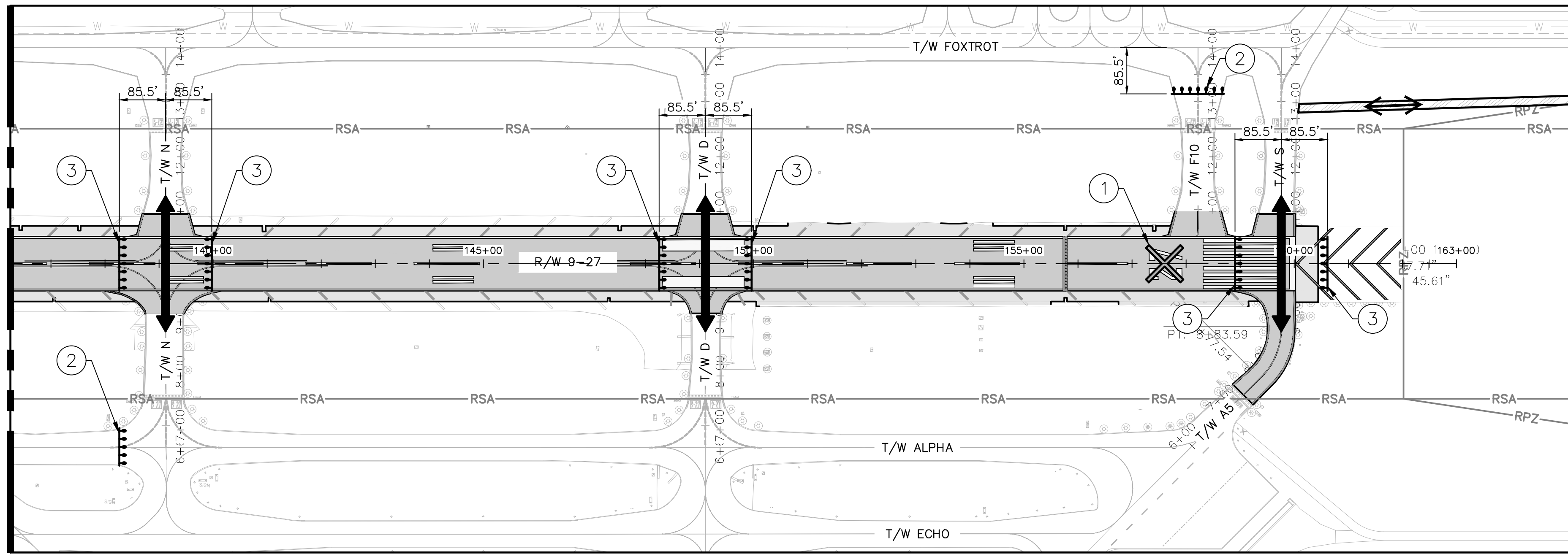
DRAWING FILE NO.

CAM #24-0854
Exhibit 1B
Page 202 of 417



MATCH LINE SEE THIS SHEET

MATCH LINE SEE THIS SHEET



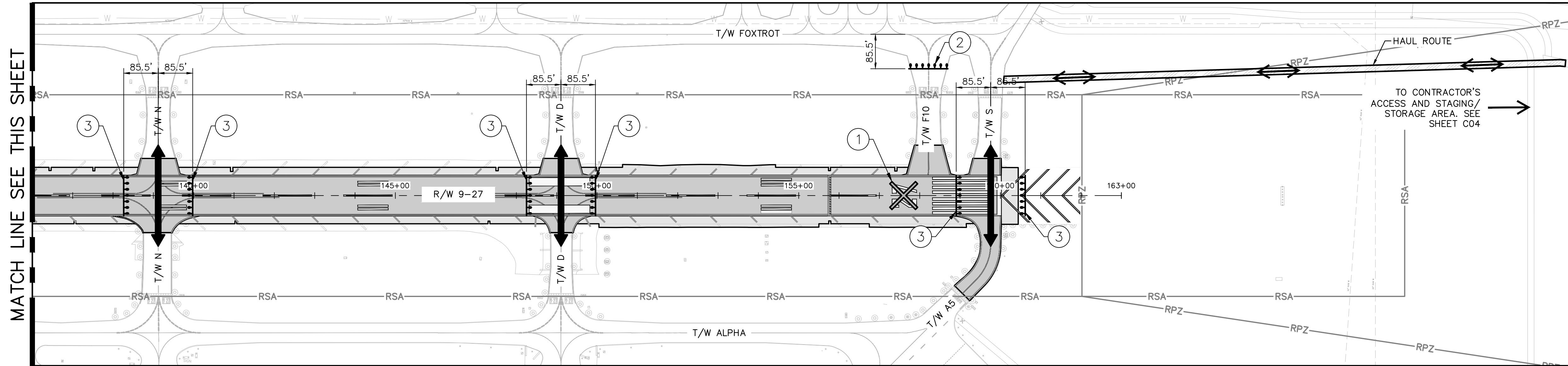
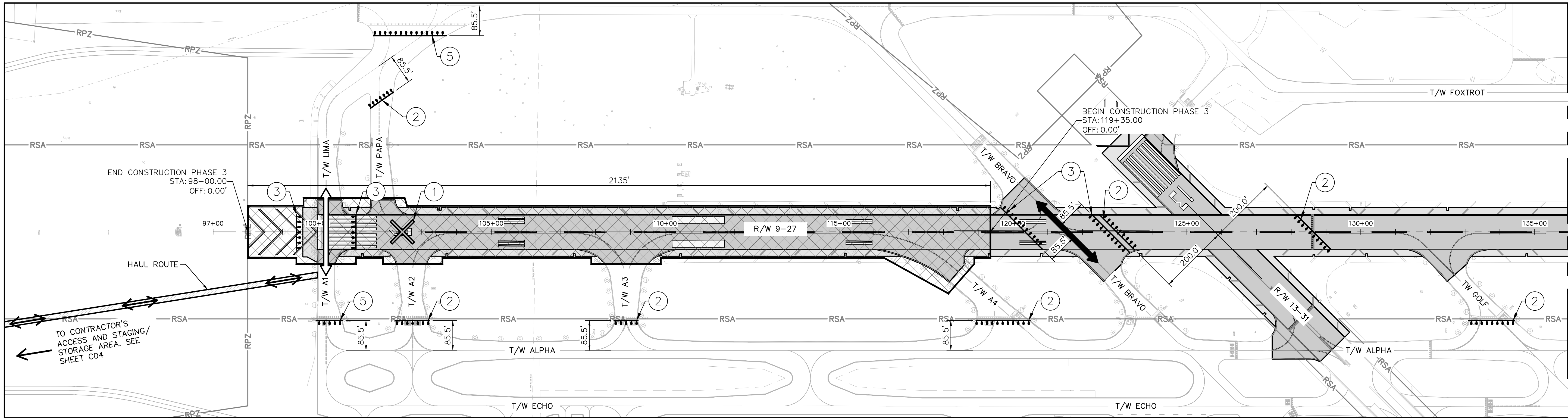
ENGINEER:
THOMAS F. O'DONNELL
Lic. No. 62476
DATE:

DRAWN BY: DATE: 06/07/2024
ALB
DESIGNED BY: SCALE: AS NOTED
KAS
CHECKED BY: TFO
FIELD BOOK:

CITY of FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301
TEL: 561-840-0825
FAX:

NO.	DATE	BY	CHK'D	REVISIONS	DESCRIPTION

K:\FL\AVIATION\044693151_FXE_RW_9-27_REHAB\CADD\PLANSHEETS\12764-C103-PHASE3.DWG



LEGEND

- PHASE 3 WORK LIMITS
- LOW LEVEL AIRFIELD BARRICADES SEE DETAIL SHEET C05
- TEMP. TAXIWAY CLOSURE MARKER SEE DETAIL SHEET C05
- TEMP. LIGHTED RUNWAY CLOSURE MARKER SEE DETAIL SHEET C05
- RSA RUNWAY SAFETY AREA
- RPZ RUNWAY PROTECTION ZONE
- HAUL ROUTE
- TAXIWAY AIRCRAFT CROSSING, OUTSIDE OF PHASE LIMITS, IN PLACE FOR DURATION OF PHASE
- TAXIWAY AIRCRAFT CROSSING, INSIDE OF PHASE LIMITS, IN PLACE WHEN CROSSING IS OPERATIONAL
- 1 LOCATION OF LIGHTED RUNWAY CLOSURE "X"
- 2 LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE FOR DURATION OF PHASE.
- 3 LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO ALLOW TAXIWAY CROSSING
- 4 LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE RUNWAY
- 5 LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE WHEN CONTRACTOR IS NOT PROVIDING TW CROSSING FOR AIRCRAFT. WHEN A CROSSING IS BEING USED, THESE BARRICADES WILL BE REMOVED AND THE CONTRACTOR MUST INSTALL GROUP 3 BARRICADES.

PRIMARY ITEMS OF WORK*

- 1.INSTALL BARRICADES AND LIGHTED XS.
- 2.MILL BITUMINOUS ASPHALT.
- 3.PERFORM ELECTRICAL DEMOLITION AND INSTALLATION WORK.
- 4.PAVE (P-401 AND P-403) ASPHALT.
- 5.APPLY TEMPORARY PAINT MARKING.
- 6.INSTALL TOPSOILING AND SODDING.
- 7.REMOVE BARRICADES AND LIGHTED XS.

*THIS LIST IS NOT EXHAUSTIVE NOR SEQUENTIAL; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE PROJECT AND CONTRACT DOCUMENTS TO PERFORM ALL REQUIRED WORK IN ITS APPROPRIATE SEQUENCE.

OPERATIONS

CONSTRUCTION IN THE WORK AREA SHOWN WILL REQUIRE THE CLOSURE OF RUNWAY 9-27, AND TAXIWAYS A1, A2, A3, A4, L AND P. RUNWAY 13-31 AND TAXIWAYS B, D, E, AND F WILL REMAIN OPEN. CONTRACTOR TO PROVIDE ONE TAXIWAY CROSSING THROUGH CONSTRUCTION AREA AT ALL TIMES. WORK WILL BE PERFORMED 24 HOURS PER DAY, MONDAY 6:00 AM TO THURSDAY 10:00 PM. WORK TIMES ARE REFERENCED FROM START OF SHIFT.

CONTRACTOR TO COORDINATE BARRICADE AND LIGHTED X PLACEMENT WITH AIRPORT STAFF AND RESIDENT PROJECT REPRESENTATIVE. BARRICADE LOCATIONS ARE SCHEMATIC AND MAY BE ADJUSTED IN THE FIELD AS NECESSARY FOR THE COMPLETION OF THE WORK. UPON THE COMPLETION OF THIS PHASE, THE CONTRACTOR WILL REMOVE ALL BARRICADES AND LIGHTED XS.

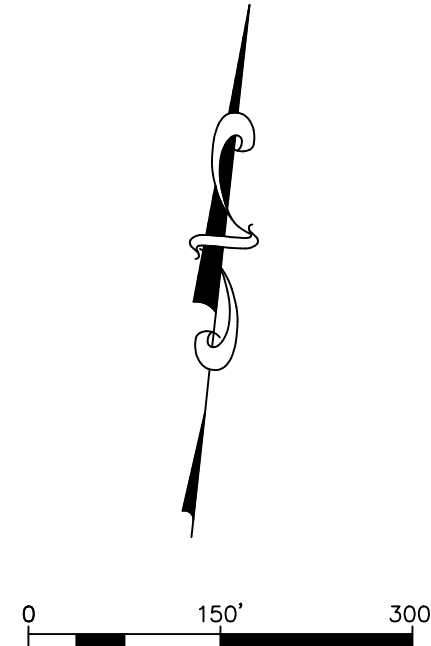
PHASE 3

LIMITS OF WORK

THE LIMITS OF THIS PHASE ARE GENERALLY ALONG RUNWAY 9-27 BETWEEN 85.5 FEET SOUTH OF TAXIWAY F, 85.5 FEET NORTH OF TAXIWAY A, AND WEST OF TAXIWAY B.

WORK SEQUENCING

WORK IN THIS AREA WILL BE PERFORMED SEQUENTIALLY AFTER THE COMPLETION OF PHASE 2. PHASE 1, 2, AND 3 WILL BE CONTINUOUS



MATCH LINE SEE THIS SHEET

ENGINEER:
THOMAS F. O'DONNELL
Lic. No. 62476
DATE:

DRAWN BY: ALB
DATE: 06/07/2024
DESIGNED BY: KAS
SCALE: AS NOTED
CHECKED BY: TFO
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
PHASING AND SAFETY PLAN - PHASE 3

SHEET NO. OF
C103
TOTAL: 110
CAD FILE:
12764-C103-PHASE3
DRAWING FILE NO.

Kimley-Horn
2751 VISTA PARKWAY SUITE 1-4
WEST PALM BEACH, FL 33411
TEL: 561-924-1234
FAX: 561-924-1235
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

811
IT'S THE LAW!
DIAL 811
Know what's below.
Call before you dig.
SUNSHINE STATE ONE CALL OF FLORIDA, INC.

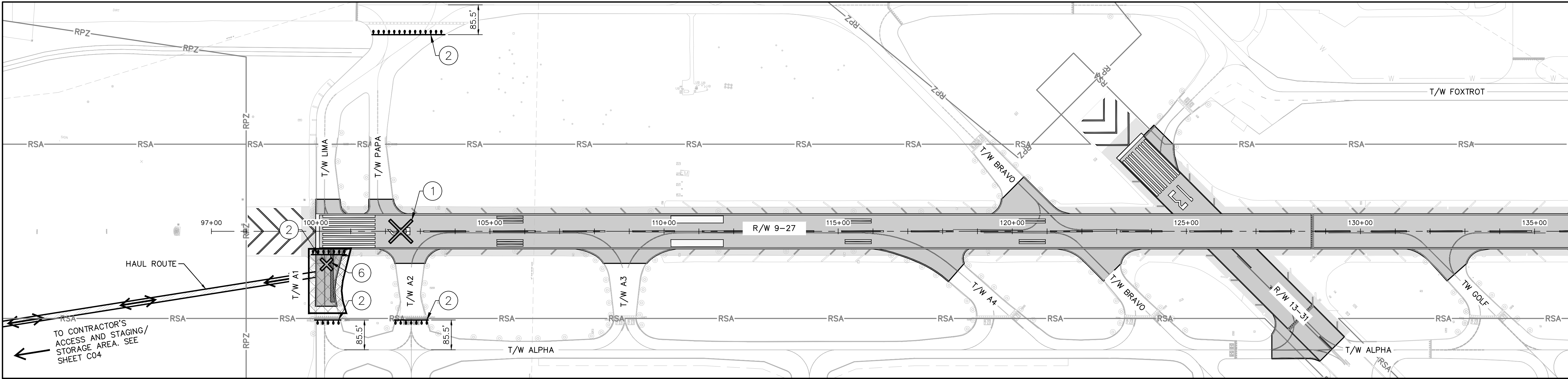
CALL 48 HOURS
BEFORE YOU DIG

IT'S THE LAW!
DIAL 811

CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212

BID SET

K:\FTL AVIATION\044693151_FXE_RW_9-27_REHAB\CADD\PLANS\SHEETS\12764-C103A-PHAS3A.DWG



LEGEND

- PHASE 3A - ADD ALT 1 WORK LIMITS
- LOW LEVEL AIRFIELD BARRICADES SEE DETAIL SHEET C05
- TEMP. TAXIWAY CLOSURE MARKER SEE DETAIL SHEET C05
- TEMP. LIGHTED RUNWAY CLOSURE MARKER SEE DETAIL SHEET C05
- RSA RUNWAY SAFETY AREA
- RPZ RUNWAY PROTECTION ZONE
- HAUL ROUTE
- TAXIWAY AIRCRAFT CROSSING, OUTSIDE OF PHASE LIMITS, IN PLACE FOR DURATION OF PHASE
- TAXIWAY AIRCRAFT CROSSING, INSIDE OF PHASE LIMITS, IN PLACE WHEN CROSSING IS OPERATIONAL
- LOCATION OF LIGHTED RUNWAY CLOSURE "X"
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE FOR DURATION OF PHASE.
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO ALLOW TAXIWAY CROSSING
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE RUNWAY
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE WHEN CONTRACTOR IS NOT PROVIDING TW CROSSING FOR AIRCRAFT. WHEN A CROSSING IS BEING USED, THESE BARRICADES WILL BE REMOVED AND THE CONTRACTOR MUST INSTALL GROUP 3 BARRICADES.
- LOCATION OF TEMP TAXIWAY CLOSURE MARKER

PRIMARY ITEMS OF WORK*

- 1.INSTALL BARRICADES AND LIGHTED XS.
- 2.PERFORM ELECTRICAL DEMOLITION WORK.
- 3.PERFORM CLEARING AND GRUBBING AND EXCAVATION
- 4.CONSTRUCT SUBBASE AND LIME ROCK BASE COURSES.
- 5.CONSTRUCT SHOULDERS.
- 6.CONSTRUCT TRANSITIONAL WEDGES AS REQUIRED TO OPEN RUNWAY.
- 7.APPLY PRIME COAT.
- 8.REMOVE LIGHTED XS.

OPERATIONS

CONSTRUCTION IN THE WORK AREA SHOWN WILL REQUIRE THE CLOSURE OF RUNWAY 9-27, AND TAXIWAY A1. CONTRACTOR WILL COORDINATE THE OPENING OF RUNWAY 13-31 AND TAXIWAY CROSSINGS WITH PHASES 1, 2, AND 3. WORK WILL BE PERFORMED 24 HOURS PER DAY CONCURRENT WITH PHASES 1, 2, AND 3. WORK TIMES ARE REFERENCED FROM START OF SHIFT

UPON THE COMPLETION OF THIS WORK, AND PRIOR TO OPENING RUNWAY 9-27, THE CONTRACTOR IS TO VERIFY THAT THERE ARE NO PAVEMENT DROP-OFFS EXCEEDING 1½" INCHES AND SURFACE GRADES IN EXCESS OF 5% IN THE RUNWAY SAFETY AREA. IF THESE CONDITIONS EXIST, THEY MUST BE CORRECTED BY CONSTRUCTING TRANSITIONAL WEDGES USING SOIL OR ASPHALT.

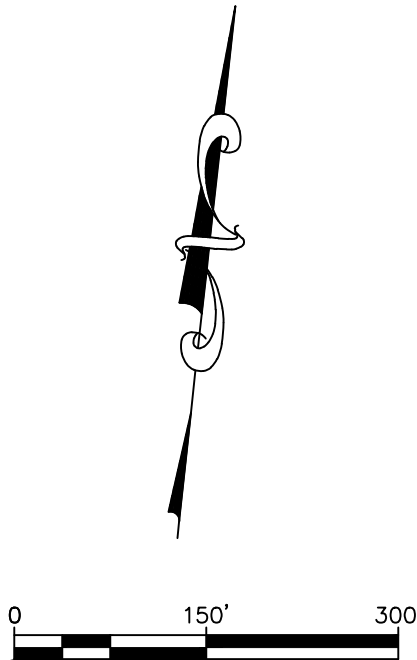
CONTRACTOR TO COORDINATE BARRICADE AND LIGHTED X PLACEMENT WITH AIRPORT STAFF AND RESIDENT PROJECT REPRESENTATIVE. BARRICADE LOCATIONS ARE SCHEMATIC AND MAY BE ADJUSTED IN THE FIELD AS NECESSARY FOR THE COMPLETION OF THE WORK. UPON THE COMPLETION OF THIS PHASE THE CONTRACTOR WILL REMOVE THE LIGHTED XS. BARRICADES ARE TO REMAIN IN PLACE THROUGH THE COMPLETION OF PHASE 3A WORK AREA B.

LIMITS OF WORK

THE LIMITS OF THIS PHASE ARE GENERALLY ALONG TAXIWAY A1 BETWEEN RUNWAY 9-27 AND TAXIWAY A.

WORK SEQUENCING

WORK IN THIS AREA WILL BE PERFORMED CONCURRENTLY WITH PHASE 1, 2, AND 3.



PHASE 3A - ADD ALT 1, WORK AREA B

PRIMARY ITEMS OF WORK*

- 1.INSTALL BARRICADES AND TAXIWAY CLOSURE MARKER
- 2.INSTALL LIGHTED XS - NIGHTLY.
- 3.MILL BITUMINOUS ASPHALT.
- 4.PERFORM ELECTRICAL INSTALLATION WORK.
- 5.PAVE (P-401) ASPHALT.
- 6.APPLY TEMPORARY PAINT MARKING.
- 7.INSTALL TOPSOILING AND SODDING.
- 8.REMOVE LIGHTED XS - NIGHTLY.
- 9.REMOVE BARRICADES AND TAXIWAY CLOSURE MARKER.

OPERATIONS

CONSTRUCTION IN THE WORK AREA SHOWN WILL REQUIRE THE CLOSURE OF RUNWAY 9-27, AND TAXIWAY A1. RUNWAY 13-31, AND TAXIWAYS A, A2, B, E, F, L and P WILL REMAIN OPEN. WORK WILL BE PERFORMED NIGHTLY, 10:00 PM TO 6:00 AM, SUNDAY - THURSDAY. WORK TIMES ARE REFERENCED FROM START OF SHIFT.

CONTRACTOR TO COORDINATE BARRICADE AND LIGHTED X PLACEMENT WITH AIRPORT STAFF AND RESIDENT PROJECT REPRESENTATIVE. BARRICADE LOCATIONS ARE SCHEMATIC AND MAY BE ADJUSTED IN THE FIELD AS NECESSARY FOR THE COMPLETION OF THE WORK. CONTRACTOR TO REMOVE ALL LIGHTED XS UPON THE COMPLETION OF EACH NIGHT'S WORK. UPON THE COMPLETION OF THIS PHASE, THE CONTRACTOR WILL REMOVE ALL BARRICADES, TAXIWAY CLOSURE MARKERS, AND LIGHTED XS.

LIMITS OF WORK

THE LIMITS OF THIS PHASE ARE GENERALLY ALONG TAXIWAY A1 BETWEEN RUNWAY 9-27, AND TAXIWAY A.

WORK SEQUENCING

WORK IN THIS AREA WILL BE PERFORMED SEQUENTIALLY AFTER PHASE 3A, WORK AREA A.

PHASE 3A - ADD ALT 1, WORK AREA C

PRIMARY ITEMS OF WORK*

- 1.ALLOW ASPHALT TO CURE 30 DAYS
- 2.INSTALL BARRICADES, TAXIWAY CLOSURE MARKER, AND LIGHTED XS - NIGHTLY
- 3.APPLY FINAL PAINT MARKING.
- 4.REMOVE BARRICADES, TAXIWAY CLOSURE MARKER, AND LIGHTED XS - NIGHTLY.

*THIS LIST IS NOT EXHAUSTIVE NOR SEQUENTIAL; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE PROJECT AND CONTRACT DOCUMENTS TO PERFORM ALL REQUIRED WORK IN ITS APPROPRIATE SEQUENCE.

OPERATIONS

CONSTRUCTION IN THE WORK AREA SHOWN WILL REQUIRE THE CLOSURE OF RUNWAY 9-27, AND TAXIWAY A1. RUNWAY 13-31, AND TAXIWAYS A, A2, B, E, F, L and P WILL REMAIN OPEN. WORK WILL BE PERFORMED NIGHTLY, 10:00 PM TO 6:00 AM, SUNDAY - THURSDAY. WORK TIMES ARE REFERENCED FROM START OF SHIFT.

CONTRACTOR TO COORDINATE BARRICADE AND LIGHTED X PLACEMENT WITH AIRPORT STAFF AND RESIDENT PROJECT REPRESENTATIVE. BARRICADE LOCATIONS ARE SCHEMATIC AND MAY BE ADJUSTED IN THE FIELD AS NECESSARY FOR THE COMPLETION OF THE WORK. CONTRACTOR TO REMOVE ALL BARRICADES, TAXIWAY CLOSURE MARKERS, LIGHTED XS UPON THE COMPLETION OF EACH NIGHT'S WORK.

LIMITS OF WORK

THE LIMITS OF THIS PHASE ARE GENERALLY ALONG TAXIWAY A1 BETWEEN RUNWAY 9-27, AND TAXIWAY A.

WORK SEQUENCING

WORK IN THIS AREA WILL BE PERFORMED SEQUENTIALLY AFTER PHASE 3A, WORK AREA B AND ITS 30 DAY ASPHALT CURE TIME

CALL 48 HOURS BEFORE YOU DIG

IT'S THE LAW! DIAL 811



SUNSHINE STATE ONE CALL OF FLORIDA, INC.

CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212

Kimley»Horn

© 2024 KIMLEY-HORN AND ASSOCIATES, INC.
600 PETER ROAD, SUITE 200, PALM BEACH, FL 33411
PHONE: 561-838-1000 FAX: 561-739-2241
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

QUANTUM
Electrical Engineering, Inc.

2755 VISTA PARKWAY SUITE 1-4
WEST PALM BEACH, FL 33411
941-336-9224
LICENSE NO. CA18005

ENGINEER:
THOMAS F. O'DONNELL

DATE: 06/07/2024
DESIGNED BY: KAS
CHECKED BY: TFO

DATE: 06/07/2024
DESIGNED BY: KAS
CHECKED BY: TFO

AS NOTED

FIELD BOOK:

33301

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

33301

ENGINEERING & ARCHITECTURE

PUBLIC WORKS DEPARTMENT

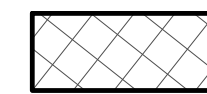







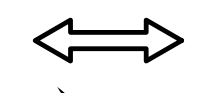
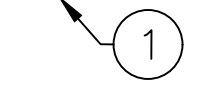
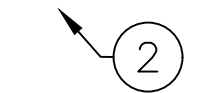
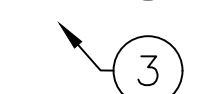
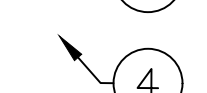

CITY OF FORT LAUDERDALE

TEL: 561-840-0825
FAX:

100 North Andrews Avenue, Fort Lauderdale, Florida

K:\FLT\AVIATION\044693151_FXE_RW_9-27_REHAB\CADD\PLANSHEETS\12764-C105-PHASE5.DWG

LEGEND

-  PHASE 5 WORK LIMITS
-  LOW LEVEL AIRFIELD BARRICADES SEE DETAIL SHEET C05
-  TEMP. TAXIWAY CLOSURE MARKER SEE DETAIL SHEET C05
-  TEMP. LIGHTED RUNWAY CLOSURE MARKER SEE DETAIL SHEET C05
-  RSA RUNWAY SAFETY AREA
-  RPZ RUNWAY PROTECTION ZONE
-  HAUL ROUTE
-  TAXIWAY AIRCRAFT CROSSING, OUTSIDE OF PHASE LIMITS, IN PLACE FOR DURATION OF PHASE
-  TAXIWAY AIRCRAFT CROSSING, INSIDE OF PHASE LIMITS, IN PLACE WHEN CROSSING IS OPERATIONAL
-  LOCATION OF LIGHTED RUNWAY CLOSURE "X"
-  LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE FOR DURATION OF PHASE.
-  LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO ALLOW TAXIWAY CROSSING
-  LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE RUNWAY
-  LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE WHEN CONTRACTOR IS NOT PROVIDING TW CROSSING FOR AIRCRAFT. WHEN A CROSSING IS BEING USED, THESE BARRICADES WILL BE REMOVED AND THE CONTRACTOR MUST INSTALL GROUP 3 BARRICADES.

PRIMARY ITEMS OF WORK*

- 1.INSTALL BARRICADES AND LIGHTED XS - NIGHTLY.
- 2.PERFORM RUNWAY 9-27 AND RUNWAY 13-31 GROOVING
- 3.APPLY SEAL COAT TO BLAST PAD
- 4.APPLY FINAL PAINT MARKING.
- 5.REMOVE BARRICADES AND LIGHTED XS - NIGHTLY.

*THIS LIST IS NOT EXHAUSTIVE NOR SEQUENTIAL; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE PROJECT AND CONTRACT DOCUMENTS TO PERFORM ALL REQUIRED WORK IN ITS APPROPRIATE SEQUENCE.

OPERATIONS

CONSTRUCTION IN THE WORK AREA SHOWN WILL REQUIRE THE CLOSURE OF RUNWAY 9-27, RUNWAY 13-31, AND TAXIWAY B. TAXIWAY A1, D, E, F, and L WILL REMAIN OPEN. WORK WILL BE PERFORMED NIGHTLY, 10:00 PM TO 6:00 AM FRIDAY - SUNDAY, OVER TWO CONSECUTIVE WEEKENDS. WORK TIMES ARE REFERENCED FROM START OF SHIFT.

CONTRACTOR TO COORDINATE BARRICADE AND LIGHTED X PLACEMENT WITH AIRPORT STAFF AND RESIDENT PROJECT REPRESENTATIVE. BARRICADE LOCATIONS ARE SCHEMATIC AND MAY BE ADJUSTED IN THE FIELD AS NECESSARY FOR THE COMPLETION OF THE WORK. CONTRACTOR TO REMOVE ALL BARRICADES AND LIGHTED XS UPON THE COMPLETION OF EACH NIGHT'S WORK.

PHASE 5

LIMITS OF WORK

FOR RUNWAY 9-27, THE LIMITS OF THIS PHASE ARE GENERALLY ALONG RUNWAY 9-27 BETWEEN 85.5 FEET SOUTH OF TAXIWAY F, 394 FEET EAST OF RUNWAY 13-31, 85.5 FEET NORTH OF TAXIWAY A, AND EAST OF TAXIWAY B. FOR RUNWAY 13-31, THE LIMITS OF THIS PROJECT ARE GENERALLY ALONG RUNWAY 13-31 BETWEEN THE RUNWAY 13 BLAST PAD, 85.5 FEET WEST OF TAXIWAY N, THE RUNWAY 9-27 SAFETY AREA, AND 85.5 FEET EAST OF TAXIWAY B.

WORK SEQUENCING

WORK IN THIS AREA WILL BE PERFORMED CONCURRENTLY WITH PHASES 4 AND 6 OVER TWO CONSECUTIVE WEEKENDS.

CALL 48 HOURS BEFORE YOU DIG

IT'S THE LAW!
DIAL 811



SUNSHINE STATE ONE CALL OF FLORIDA, INC.

CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212

Kimley-Horn
© 2024 KIMLEY-HORN AND ASSOCIATES, INC.
600 PETER ROAD, SUITE 200, PALM BEACH, FL 33411
PHONE: 561-991-1100 FAX: 561-739-2831
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

QUANTUM
Electrical Engineering, Inc.
2761 VISTA PARKWAY SUITE 1-4
WEST PALM BEACH, FL 33411
TEL: 561-991-9234
LICENSE NO. CA38805

BID SET

PROJECT # 12764

RUNWAY 9-27

PAVEMENT REHABILITATION

PHASING AND SAFETY PLAN - PHASE 5

SHEET NO.

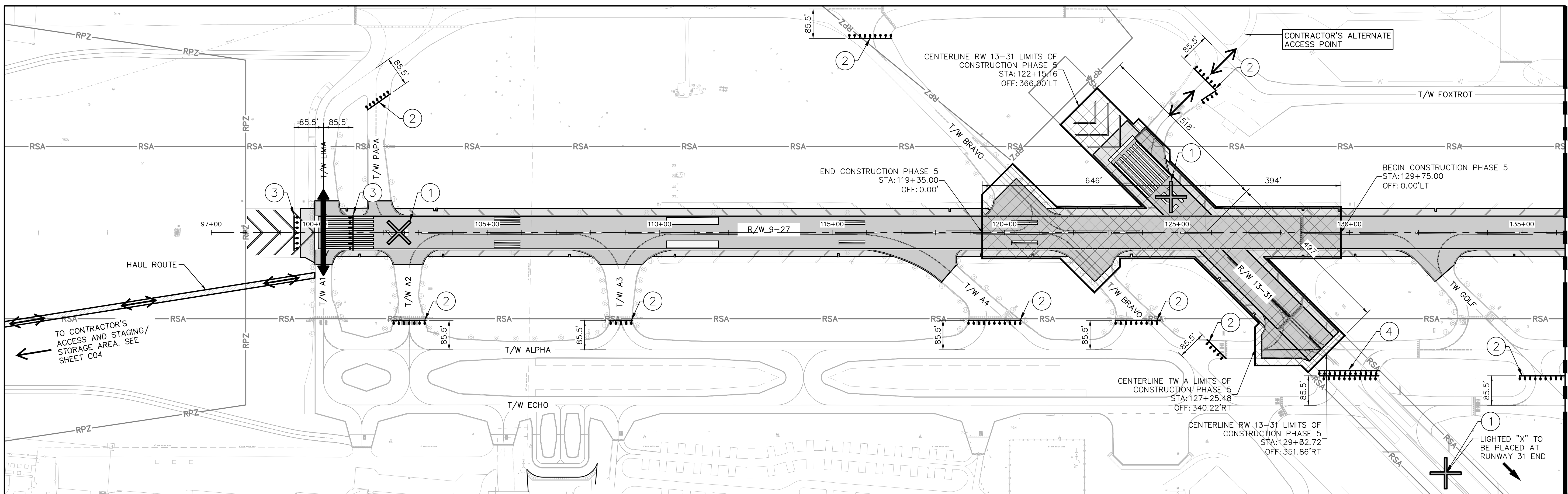
C105

TOTAL: 110

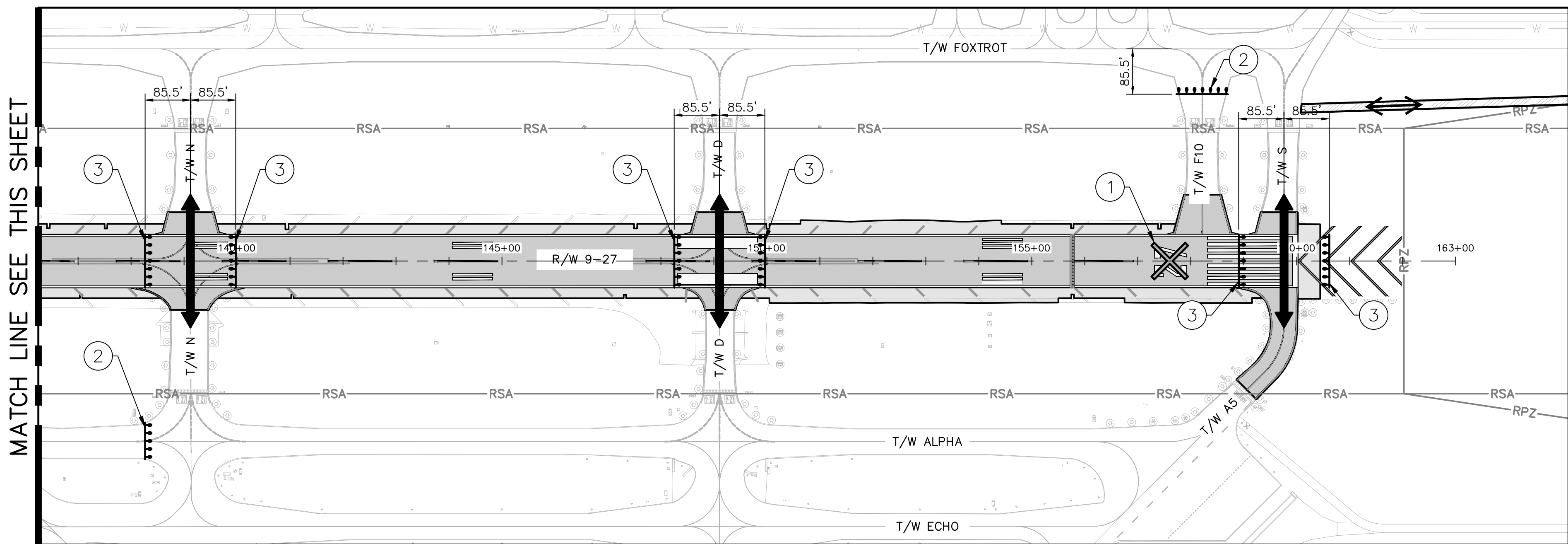
CAD FILE:

12764-C105-PHASE5

DRAWING FILE NO.



MATCH LINE SEE THIS SHEET



ENGINEER:
THOMAS F. O'DONNELL
Lic. No. 62476
DATE:

DRAWN BY: DATE: 06/07/2024
ALB

DESIGNED BY: SCALE: AS NOTED

CHECKED BY: TFO

FIELD BOOK:

CITY of FORT LAUDERDALE

PUBLIC WORKS DEPARTMENT

ENGINEERING & ARCHITECTURE



100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS
NO. DATE BY CH'D DESCRIPTION

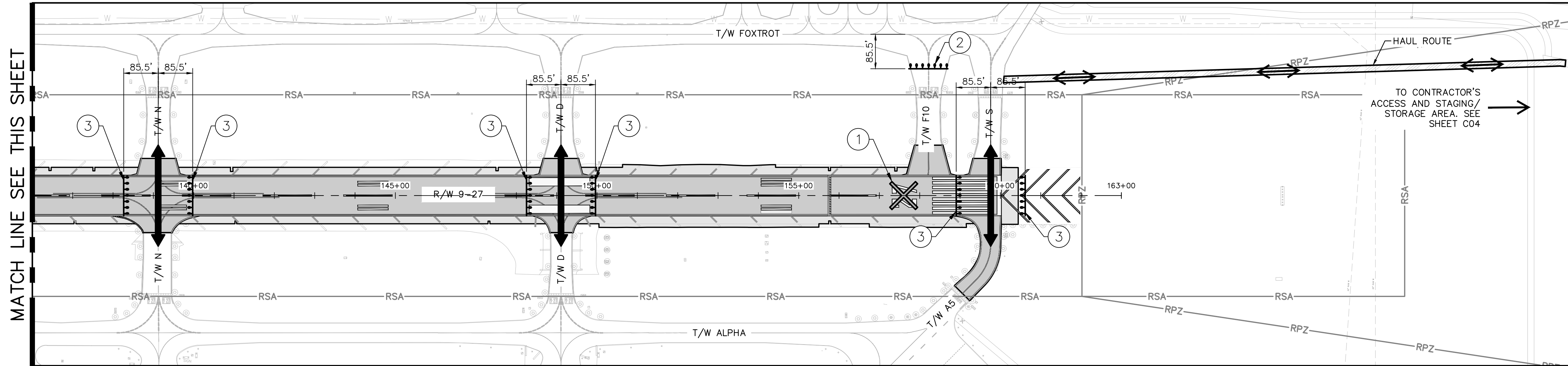
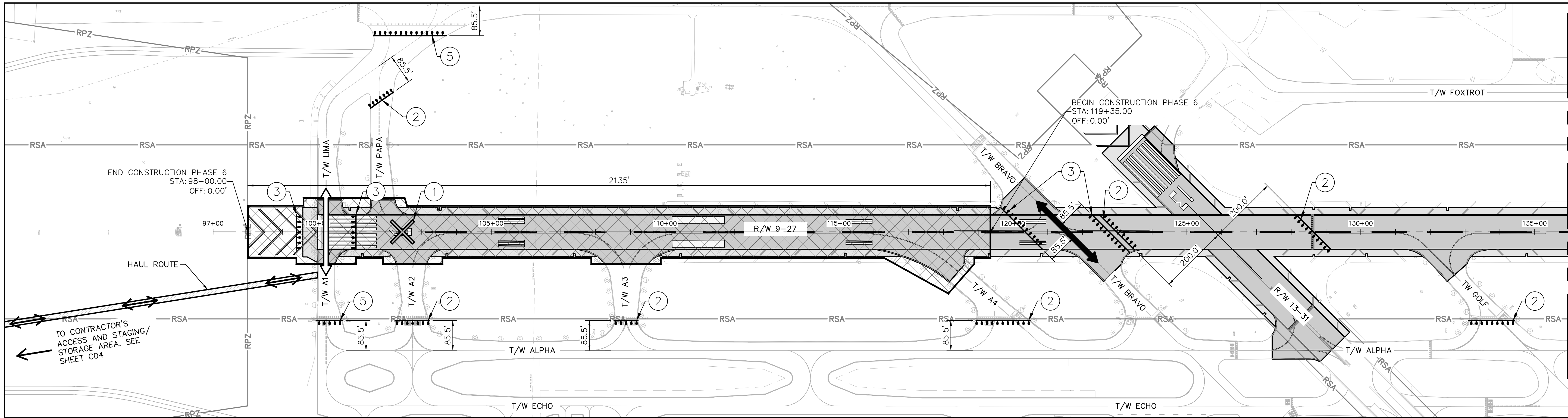
PROJECT # 12764

RUNWAY 9-27

PAVEMENT REHABILITATION

PHASING AND SAFETY PLAN - PHASE 5

K:\FLAVIATION\044693151_FXE_RW_9-27_REHAB\CADD\PLANSHEETS\12764-C106-PHASE6.DWG



LEGEND

- PHASE 6 WORK LIMITS
- LOW LEVEL AIRFIELD BARRICADES SEE DETAIL SHEET C05
- TEMP. TAXIWAY CLOSURE MARKER SEE DETAIL SHEET C05
- TEMP. LIGHTED RUNWAY CLOSURE MARKER SEE DETAIL SHEET C05
- RSA RUNWAY SAFETY AREA
- RPZ RUNWAY PROTECTION ZONE
- HAUL ROUTE
- TAXIWAY AIRCRAFT CROSSING, OUTSIDE OF PHASE LIMITS, IN PLACE FOR DURATION OF PHASE
- TAXIWAY AIRCRAFT CROSSING, INSIDE OF PHASE LIMITS, IN PLACE WHEN CROSSING IS OPERATIONAL
- LOCATION OF LIGHTED RUNWAY CLOSURE "X"
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE FOR DURATION OF PHASE.
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO ALLOW TAXIWAY CROSSING
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE RUNWAY
- LOW LEVEL AIRFIELD BARRICADE AS REQUIRED TO CLOSE TAXIWAY. IN PLACE WHEN CONTRACTOR IS NOT PROVIDING TW CROSSING FOR AIRCRAFT. WHEN A CROSSING IS BEING USED, THESE BARRICADES WILL BE REMOVED AND THE CONTRACTOR MUST INSTALL GROUP 3 BARRICADES.

PRIMARY ITEMS OF WORK*

1. INSTALL BARRICADES AND LIGHTED XS - NIGHTLY.
2. PERFORM RUNWAY 9-27 GROOVING
3. APPLY SEAL COAT TO BLAST PAD
4. APPLY FINAL PAINT MARKING.
5. REMOVE BARRICADES AND LIGHTED XS - NIGHTLY.

*THIS LIST IS NOT EXHAUSTIVE NOR SEQUENTIAL; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE PROJECT AND CONTRACT DOCUMENTS TO PERFORM ALL REQUIRED WORK IN ITS APPROPRIATE SEQUENCE.

OPERATIONS

CONSTRUCTION IN THE WORK AREA SHOWN WILL REQUIRE THE CLOSURE OF RUNWAY 9-27, AND TAXIWAYS A1, A2, A3, A4, L AND P. RUNWAY 13-31 AND TAXIWAYS B, D, E, AND F WILL REMAIN OPEN. CONTRACTOR TO PROVIDE ONE TAXIWAY CROSSING THROUGH CONSTRUCTION AREA AT ALL TIMES. WORK WILL BE PERFORMED NIGHTLY, 10:00 PM TO 6:00 AM SUNDAY - THURSDAY. WORK TIMES ARE REFERENCED FROM START OF SHIFT.

CONTRACTOR TO COORDINATE BARRICADE AND LIGHTED X PLACEMENT WITH AIRPORT STAFF AND RESIDENT PROJECT REPRESENTATIVE. BARRICADE LOCATIONS ARE SCHEMATIC AND MAY BE ADJUSTED IN THE FIELD AS NECESSARY FOR THE COMPLETION OF THE WORK. CONTRACTOR TO REMOVE ALL BARRICADES AND LIGHTED XS UPON THE COMPLETION OF EACH NIGHT'S WORK.

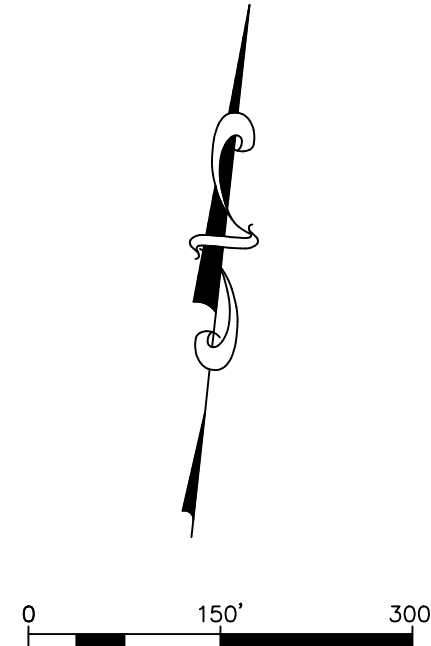
PHASE 6

LIMITS OF WORK

THE LIMITS OF THIS PHASE ARE GENERALLY ALONG RUNWAY 9-27 BETWEEN 85.5 FEET SOUTH OF TAXIWAY F, 85.5 FEET NORTH OF TAXIWAY A, AND WEST OF TAXIWAY B.

WORK SEQUENCING

WORK IN THIS AREA WILL BE PERFORMED SEQUENTIALLY AFTER THE COMPLETION OF PHASE 5.



Kimley»Horn QUANTUM

2751 VISTA FAIRWAY SUITE 1-4
WEST PALM BEACH, FL 33411
TEL: 561-838-1234 FAX: 561-838-1235
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

2751 VISTA FAIRWAY SUITE 1-4
WEST PALM BEACH, FL 33411
TEL: 561-838-1234 FAX: 561-838-1235
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

CALL 48 HOURS BEFORE YOU DIG

IT'S THE LAW! DIAL 811

Know what's below. Call before you dig.

SUNSHINE STATE ONE CALL OF FLORIDA, INC.

CALL 48 HOURS BEFORE DIGGING

FAA FACILITIES 954-356-7212

BID SET

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
PHASING AND SAFETY PLAN - PHASE 6

SHEET NO. OF
C106

TOTAL: 110

CAD FILE:
12764-C106-PHASE6

DRAWING FILE NO.

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE

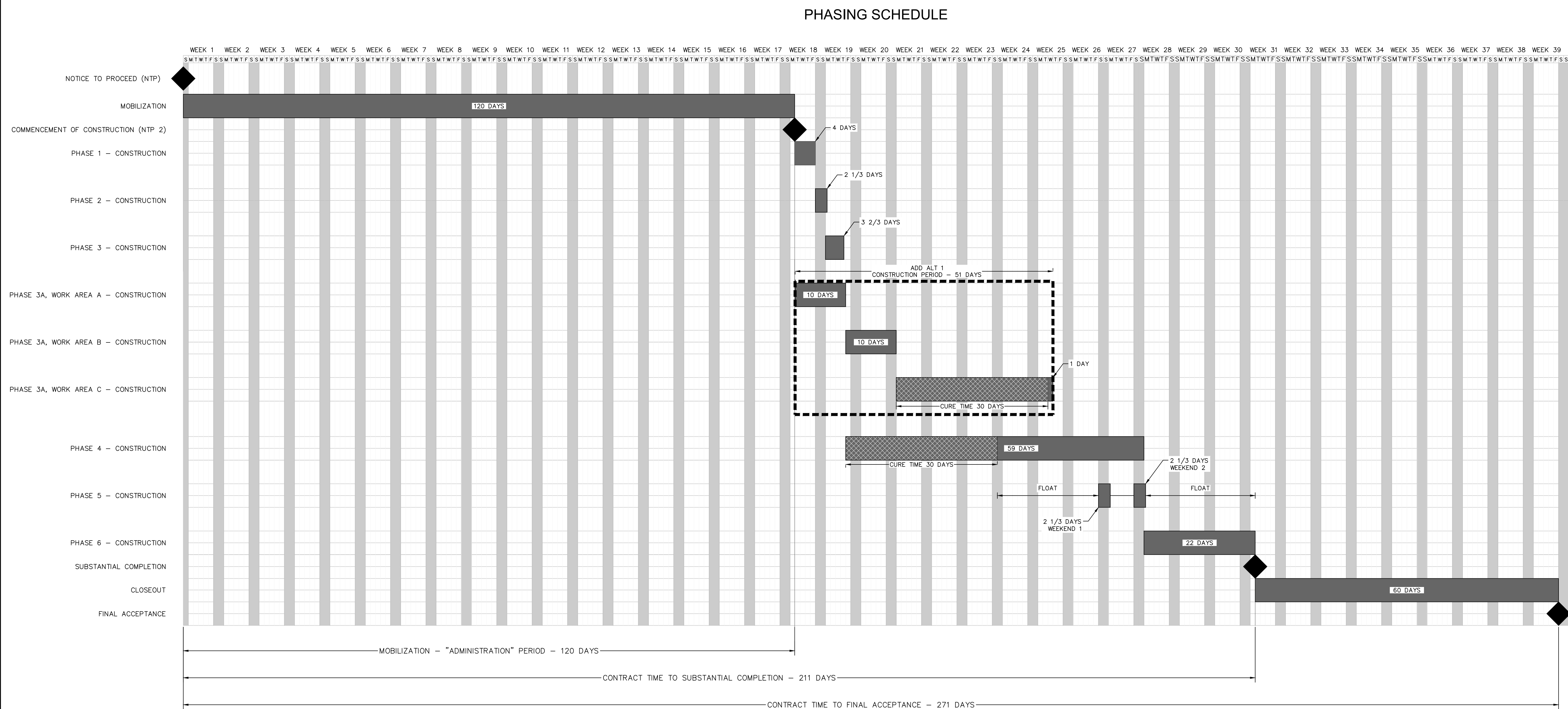
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

ENGINEER:
THOMAS F. O'DONNELL
Lic. No. 62476
DATE:

DRAWN BY: DATE: 06/07/2024
ALB
DESIGNED BY: SCALE: AS NOTED
KAS
CHECKED BY: TFO
FIELD BOOK:

TEL: 561-840-0825
FAX:

NO.	DATE	BY	CHK'D	DESCRIPTION



TOTAL CONTRACT TIME
194 (WORK DAYS)

TOTAL CONTRACT TIME
271 (CALENDAR DAYS)

**CALL 48 HOURS
BEFORE YOU DIG**

**IT'S THE LAW!
DIAL 811**

**Know what's below.
Call before you dig.**

SUNSHINE STATE ONE CALL OF FLORIDA, INC.

**CALL 48 HOURS BEFORE DIGGING
FAA FACILITIES 954-356-7212**

Kimley»Horn © 2024 KIMLEY-HORN AND ASSOCIATES, INC.
8001 PETERS ROAD, SUITE 200A, PLANTATION, FL 33324
PHONE: 954-520-5500 FAX: 954-739-2247
WWW.KIMLEY-HORN.COM REGISTRY NO. 35056

QUANTUM Electrical Engineering, Inc.
2555 VISTA PARKWAY SUITE 1-9
WEST PALM BEACH, FL 33411
561-210-9224
LICENSE NO. CA38065

BID SET

PROJECT # 12764
RUNWAY 9-27
PAVEMENT REHABILITATION
PHASING SCHEDULE

SHEET NO.	OF
C107	
TOTAL:	110
CAD FILE:	12764-C107-PHAS
DRAWING FILE NO.	

DATE:	06/07/2024
DRAWN BY:	ALB
DESIGNED BY:	KAS
CHECKED BY:	TFO
FIELD BOOK:	

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE

ENGINEER:
THOMAS F. O'DONNELL
REG. No: 62478
DATE:

TEL: 561-840-0825