DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

SOUTHWEST REGION

FEBRUARY, 2009

PROJECT SPECIFICATIONS

PRECISION APPROACH PATH INDICATOR (PAPI) RUNWAY 22

EL PASO INTERNATIONAL AIRPORT

EL PASO, TX

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DIVISION 1 - GENERAL REQUIREMENTS
SECTION 1-1 SUMMARY OF WORK

1-1.1 CONTRACT SCOPE. - This specification together with the drawing covers the requirements for all trenching and backfill for the power line for construction and the installation of a Precision Approach Path Indicator (PAPI) System for Runway 22 at El Paso International Airport, EL PASO, TEXAS.

The site work consists principally of establish new PAPI. The PAPI work include concrete slab, foundation, installation of underground electric, grounding , lighting protection and control lines, access road to PAPI, and parking area. The contractor shall submit the RRP-Runway point of intercept (the point where the PAPI angle intercepts the runway centerline) - elevation to the hundredth of a foot and coordinates (use NAD/83 for horizontal datum, and elevation in NAD88 for vertical datum) to the hundredth of a second. The RRP data shall be certified by license land surveyor and submitted to the project engineer within 10 days from the actual starting day of the construction.

Any items or cables not shown in the list of Government- Furnished Material (GFM), shall furnish by the contractor at no additional cost to the FAA. All material used in this project must be produced in the U.S.A.

The contractor shall install the lightning and grounding protection system, construction of concrete foundation, slab, sidewalk, and establish HMA access road with Geotextile, if required, per construction and standard drawing. Before trenching for the power lines, grounding system and concrete foundations, the contractor is responsible to locate and determine all the utility lines to avoid any damage to any existing utilities with no additional cost to FAA.

1-1.1.1 MISCELLANEOUS. – The Contractor shall perform any other miscellaneous civil and electrical work as described in the drawings and specifications. Except for government furnished materials, the Contractor shall furnish all plant, labor, material, equipment, energy, and transportation necessary to construct all elements of the facilities and appurtenances called for in the contract documents.

1-1.2 CONTRACT TIME.

1-1.2.1 PERIOD OF PERFORMANCE. – The estimated construction time for this project is 36 calendar days.

1-1.2.2 WORK HOURS AND BADGES. – Preferable work shall be performed between the hours of 6:00 a.m. and 6:00 p.m. Monday through Friday. Work in this particular project may be performed at night if requested by the airport operation manager. Work to be performed within the safety area of the runways may require after hours work as determined during the preconstruction meeting. All work to be performed after hours shall be coordinated with the Resident Engineer 48 hours in advance. Issuing the badges shall be coordinate three weeks in advance. Point of contact is the Airport Program Manage Mr. ANTONIO MARMOLEJO, C.M, at: 915-780-4766.

1-1.1.3 INTENT OF SPECIFICATIONS. - This specification identifies all labor, materials, plant, and equipment to perform the work required to construct the facilities. All material not specifically indicated as furnished by the Government, as depicted on the Government-furnished material list, shall be furnished by the Contractor. The fact that the specifications may fail to be sufficiently complete in some detail will not relieve the Contractor of full responsibility for providing materials and workmanship of high quality and protecting them adequately until incorporation in the work. The specifications for materials set out the minimum standard of quality which the Contracting Officer believes necessary to procure satisfactory completion of the work. No substitutions will be permitted until the Contractor has received written permission from the Contracting Officer to make a substitution for the material which has been specified.

1-1.3.1 COMPLIANCE WITH LOCAL AND OTHER CODES. – The Contractor shall comply with local (TX Department of Transportation Standard Specification for Construction of Highway, Street, and Bridges, City of El Paso), and other codes and standards (e.g., the National Electrical Code) adopted by the Contract Documents. Where the requirements of the specifications and drawings exceed those of the local and adopted codes, the Contractor shall comply with the requirements of the specifications and drawings.

1-1.3.2 CONFLICT RESOLUTION. – The Contractor shall meet the requirements of the contract documents. Specifications shall govern over drawings.

1-1.3.3 GOVERTXENT-FURNISHED MATERIAL. – Government-furnished material (GFM) will be made available to the Contractor in accordance with provisions in the contract documents.

1-1.3.4 CONTRACTOR-FURNISHED MATERIAL. – The contractor shall make himself aware of all materials, which he will be required to furnish under this contract. He/She shall make himself aware of any and all materials, which may have a long lead time from a manufacturer or distributor and shall order these items as early as possible after the contract award.

1-1.4 REQUIREMENTS.

1-1.4.1 PRECONSTRUCTION CONFERENCE. – The Contractor shall attend a preconstruction conference prior to commencement of this project. Local procedures related to ingress-egress, airport security, and air traffic operations will be discussed. Compliance with these procedures while on airport property is mandatory. The Contracting Officer shall coordinate this meeting and shall ensure that all necessary participants (Regional and Sector FAA employees, Airport representative, General & Sub Contractor's, etc,) are aware of this meeting.

1-1.4.2 MINIMIZING DISRUPTION. – The contractor shall perform work with the least possible inconvenience to the FAA and to the airport owners.
The Contractor shall concentrate on completing construction, trenching, cabling, etc., so as to reduce the amount of interruption to aircraft operations or airport facilities.

1-1.4.3 SPECIAL CONSIDERATIONS. – The contractor shall consider all requirements for material disposal, security clearance, two-way radios, and vehicle operations within the AOA, equipment flagging, temporary marking, and barricades.

1-1.4.4 PROTECTION OF EXISTING WORK. – The contractor shall take all necessary precautions to prevent damage to any existing feature.

Where damage occurs, the Contractor will repair the damage to the satisfaction of the landowner and the FAA at no additional cost to the FAA.

1-1.4.5 PROTECTION OF EXISTING UTILITIES. – The contractor shall immediately notify the FAA of damage to a utility and/or cable service by him or one of his subcontractors or suppliers. The Contractor shall be responsible for the restoration of service due to damage as a result of his operation whether due to negligence or accident.

1-1.4.6 TEMPORARY MARKINGS. – All open trenches, temporary structures, equipment, etc., shall be properly marked by the Contractor. All temporary markings and barricades shall be visible at all times and meet the requirements of the Local Authorities and RE.

1-1.4.7 SITE CLEANUP AND RESTORATION. – The contractor shall clean each site on a daily basis. All debris, spoil, unused materials, etc., shall be removed and properly disposed of each day. Upon completion of the work and before acceptance and final payment will be made, the contractor shall leave the site in a neat and presentable condition to the satisfaction of the FAA. Any seeding, sodding, etc., will be at no additional cost to the FAA.

1-1.4.8 ACCESS FOR INSPECTION. – The contractor shall allow all authorized FAA representative -RE- complete access to all portions of the work.

1-1.4.9 SUBMITTALS. - Samples, certifications, tickets, reports, and shop drawings shall be submitted to the RE for review and approval. A minimum of six (6) non-returnable sets of drawings and two (2) non-returnable copies of tests, certifications, tickets, reports, and samples shall be provided in submissions. Time requirements for approval are as noted throughout this specification document. Rejection of samples, materials, or drawings that do not meet specifications shall be no grounds for claim by the Contractor.

1-1.4.9.1 Submission Labeling. - The assembled submission shall be labeled as follows:

Date

Number of contract drawings and latest revision,

Specification page and paragraph number,

Name of project or facility,

Name of Contractor and subcontractor or supplier,

Clearly identified contents and location of work.

1-1.4.9.2 EQUIVALENT MATERIAL. – The contractor may submit for approval material other that that specified, provided that it meets the following:

a. Meets the requirements of the specifications.
b. Material is available in a timely basis.
c. The material must be produced in the U.S.A.

Use of an equivalent material shall not obligate the FAA to pay for any additional costs that may be associated with furnishing and installing the equivalent material. Equivalent material submittals shall be clearly marked as such and shall meet the requirements of the project.

1-1.4.10 CONSTRUCTION TESTING. – The contractor or an approved testing laboratory, as required by the specifications, shall provide all labor, materials, and equipment to perform all testing required by the specifications. All tests shall be at the contractor's expense.

1-1.4.11 PROJECT CLOSEOUT REQUIREMENTS. –

1-1.4.11.1 RECORD DRAWINGS. – The contractor shall maintain construction drawings current by redlining all the corrections and changes that are made during the installation, cable routing, grounding resistance test, and construction period. Upon construction completion, the contractor shall submit three (3) complete copies of "Record Drawings."

1-1.4.11.2 COMPLETION CERTIFICATE. – When the contractor considers the work is complete, he/she shall submit written certification that contract documents have been reviewed; work has been inspected in the presence of the RE and are operational; required operational and maintenance manual, data, and parts lists have been submitted and approved; spare parts has been provided as required; required instruction of maintenance personnel has been accomplished; and work is completed, premises cleaned, and ready for inspection.

1-1.4.11.3 FINAL INSPECTION. - The RE will schedule the final inspection upon approval and endorsement of the Contractor's Completion Certification.

1-1.4.11.4 PUNCH LIST. – The RE will furnish the contractor with a list of discrepancies in the work, material and equipment noted during the final inspection.

1-1.4.11.5 FINAL CLEANING. – After final inspection but before final acceptance of the work, all exterior surfaces of the equipment shall be cleaned of dirt, mud, or oil accumulations. All debris shall be removed from cabinets and the general site area. The RE & Contractor will coordinate with the airport officials for final acceptance of the cleanup of airport ground surfaces affected by the construction.

1-1.4.11.6 ACCEPTANCE OF WORK. - The contractor shall correct discrepancies noted during the final inspection, clean the premises, and deliver record drawings before notifying the FAA that the work is ready for acceptance. Upon acceptance by the FAA, the contractor shall surrender all SIDA/AOA Badges and vehicle passes to the FAA.

END OF SECTION

DIVISION 2 - SITE WORK

SECTION 2-2 EXCAVATION AND BACKFILL

2-2.1 General. - The Contractor shall perform and complete all work as necessary for excavation, filling, backfilling, and grading the work area to the elevations shown on the applicable drawings as required by this section and complying with the local standards and specifications.

2-2.2 Excavation. -

2-2.2.1 Drainage. - Excavation shall be performed so that the area of the site and the area immediately surrounding the site and affecting operations at the site will be continually and effectively drained. Water shall not be permitted to accumulate in the excavation. The excavation shall be drained by pumping or other satisfactory methods to prevent softening of the foundation bottom, undercutting of footings, or other actions detrimental to proper construction procedures.

2-2.2.2 Freezing. - When freezing weather is expected, excavations shall not be made to the full depth, unless the footing concrete can be placed immediately. If excavation is already at full depth, the excavation shall be protected from frost.

2-2.2.2.1 Rock Excavation. - When rock conditions are encountered during excavations for slabs, footings, or foundations, all material in the excavation area shall be removed to a depth 6 inches below the bottom of the excavation grade and replaced with fill material as specified herein. If excavation reveals solid rock at the bottom of the excavation grade and no potentially faulty bearing surfaces, such as soil or crumbling rock, are apparent by visual inspection by the FAA, over excavation is not required. Rock encountered during footing excavations shall be leveled to a clean, even, hard surface at the indicated grade. No footings shall be permitted to rest partly on soil and partly on rock. In the event that excavation reveals potential foundation bearing surfaces of part rock and part soil, the Contractor shall remove the soil and fill the voids with concrete meeting the requirements of Division 3.

2-2.2.3 Trench Excavation. - Trenches for underground cables shall conform to the dimensions and elevations of the applicable drawings. The banks need not be kept vertical but may be sloped or widened to such general limits as may be set by the FAA, provided there is no interference with other utilities. The trench bottom shall be a minimum of 9 inches wide. The trench depth shall be deep enough to allow cable placement to be in accordance with Specification FAA-C-1391B.

2-2.2.4 Excavation for Walkways and Access Roads. - The excavation shall conform to the dimensions and elevations of the drawings applicable to areas designed for vehicular and pedestrian traffic. Subgrade areas for access roads and walkways shall be plowed, disked, and moistened or aerated, as required, to obtain compaction as required by this specification. Muck, peat, and other material not meeting the requirements of this specification shall be removed to a minimum depth of 12 inches below excavation grade or as required to provide the specified foundation. Low areas resulting from removal of such material shall be brought up to required grade.

2-2.3 Fill and Backfill. -

2-2.3.1 Weather Conditions. - No fill or backfill operations shall be performed when weather conditions are determined by the FAA to be too wet or cold to permit such operations.

2-2.3.2 Satisfactory Material. - Material suitable for fill, backfill, and embankment purposes shall be reasonably free of shale, sod, clods, and large stones, organic debris, trash, and frozen material. All material shall comply with local standard specification.

2-2.3.2.1 Backfill Slope. - Backfill shall be brought up evenly on each side of the foundation structure. In all cases, the exterior backfill shall be sloped to drain away from the foundation at least to a slope of four horizontal to one vertical.
Compaction methods shall be in accordance with the standard specification.

2-2.3.3 Backfilling of Trenches. - The trenches shall not be backfilled until cable splices have been installed and tested in accordance with Division 16.

Unless otherwise specified, trenches shall be opened only to the extent that cables can be installed and the trench closed during the same working day. Fill material shall meet the standard specification requirements.

2-2.3.3.1 Lower Portion of Trench. – After installation and testing, encase piping in a 12 inches of concrete before backfilling or placing the roadway subbase. Use the satisfactory soil material or the subbase material to perform the compaction for the initial backfill. The material used shall be free of particles larger than 1 inch.

2-2.3.3.2 Remainder of Trench. - Except for trenches under roadways, each subsequent layer of trench backfill shall be a maximum of 8 inches deep, loose measurement, and shall compacted to 95% of the max dry density. For trenches under access roads, the second layer of trench backfill shall be 5 inches deep, loose measurement, and shall contain no particles that would be retained on a 1-inch sieve. All subsequent layers shall be a maximum of 8 inches deep, loose measurement, and shall consist of material meeting the requirements of the standard specification. Each layer shall be compacted to the approximate density of the surrounding soil, except that compaction for trenches passing under access roads shall be 95 percent maximum density. Trenches shall be completely backfilled and tamped level with the adjacent surface. When sod is to be used over the trench, backfilling shall be stopped at a depth approximately equal to the thickness of the sod to be used.

2-2.3.4 Fill and Embankment for Access Roads, Walkways and Culverts. - Fills and embankments shall be constructed at the locations and to lines and grades indicated with material meeting the requirements of this specification. The material shall be placed in successive horizontal layers of 8 inches, loose measurement, for the full width of the cross section. Fills and embankments shall be compacted to 95 percent of maximum density. Final elevations after compaction shall not vary more than 0.05 feet from the established grade and approved cross section.

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 or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the contractor.

2-2.3.5 COMPACTION.

2-2.3.5.1 General.

(1) All compaction shall be accomplished by using power-operated mechanical equipment except for limited use of manual tampers in constricted areas. Operate power equipment as specified to achieve the minimum degree of compaction subject to acceptance by testing.

(2) Cohesive soils are defined herein as those containing less than 60 percent sand, gravel, or stone. Percentages greater than 60 percent are herein termed non-cohesive soils.

2-2.3.5.2 Cohesive Soil Compaction.

(1) Use sheepsfoot roller of such minimum weight that at least 200 psi will be transmitted to surface area of studs or feet. Operate at speeds not exceeding 4 mph on each layer of fill until roller walks itself to top of grade.

(2) Use motor-operated soil tamper (stomper) in confined areas, including trenches, on each layer of fill until no further visible consolidation is evident.

(3) Use a heavy blunt tamping rod on each layer of fill in the most constricted locations where power equipment cannot be used.

2-2.3.5.3 Non-Cohesive Soil Compaction.

(1) Use pneumatic tire roller fully loaded and weighing not less than 275 pounds per inch of tire tread width. Operate at speeds not exceeding 4 mph. A minimum of ten passes of the roller is required on each layer of fill.

(2) Use motor-operated vibratory tamper in confined areas, including trenches, on each layer of fill until no further visible consolidation is evident.

(3) Use heavy blunt tamping rods on each fill layer in constricted locations where power equipment cannot be used.

2-2.3.5.4 Moisture Control.

(1) Where soil material must be moisture-conditioned before compaction, uniformly apply water to a layer of soil material in such quantity that free water will not appear on the surface during or subsequent to compaction operations.

(2) Scarify and air-dry soil material that is too wet to permit compaction to specified density.

2-2.3.5.5 Percentage of Maximum Density Requirements.

(1) General Requirements. The required densities for cohesive and non-cohesive soils are determined by quantitative testing procedures defined by ASTM Standards and shown in the local standard the specification. To assure compliance, the contractor may arrange for such professional soil testing services, at no additional cost to the Government.

The FAA, at its expense, may also make such arrangements if qualitative testing procedures appear inadequate.

(2) Structures, Slabs, and Access Roads/Parking Areas. Compact top surfaces of subgrade and each layer of backfill or fill material to 90% of maximum density for cohesive soils or to 95% relative density for non-cohesive material.

(3) Turf and Non-Vehicular Surfaced Areas. Compact top surfaces of subgrade and each layer of backfill or fill material to 90 percent of maximum density for cohesive soils or to 90 percent relative density for non-cohesive material.

2-2.3.5.6 Qualitative Testing and Inspection Procedures.

1) General. - The contractor shall perform qualitative soil compaction testing and inspection procedures for each type of backfill or fill material used wherever directed by, and in the presence of, the Resident Engineer. Special attention shall be given to the backfilling of structures and trenches.

(2) Qualitative Testing.

(a) Qualitative soil testing will consist of comparing the resistance to penetration of undisturbed soil to that of compacted backfill of the same composition. For borrow material the penetration comparison shall be made between maximum test sample density and in-place fill density.

(b) A soil penetration device (penetrometer) indicating depth and force exerted shall be utilized. Compaction will be adequate if backfill or fill possesses at least 95% of the resistance to penetration of undisturbed soil or test sample, respectively.

(c) Borrow test sample shall be a four-inch deep (compacted measurement) layer of soil, aerated or moistened as directed by the Contractor's Resident Engineer, and compacted by power equipment until no further consolidation occurs, as approved by the RE.

(3) Concrete Slab Base Course. - Compact with vibratory tamper until no further visible consolidation is evident.

END OF SECTION

SECTION 2-3 ACCESS ROAD AND WALKWAYS

2-3.1 General. - The Contractor shall provide the necessary materials, labor, and equipment for the construction of access roads and walkways as specified in TX Department of Transportation Standard Specification for Construction of Highway, Street, and Bridges and on applicable drawings.

2-3.2 Aggregate Material. – Insure that the aggregate meets the grading requirements when tested in accordance with AASHTO T 11 and AASHTO T 27.

2-3.4 Culverts. - Culverts as shown on the drawings.

2-3.5 Geotextile.

2-3.5.1 Application. - The most common application of geotextiles in FAA navaids construction is as a separator. In this application, the geotextile is placed over prepared roadway subgrade soil (If shown in the plans), and crushed aggregate is placed and compacted on top of the geotextile. The geotextile permits water to permeate into the subgrade, while preventing the aggregate from mixing with the subgrade soil. The geotextile specified below is for application as a separator.

2-3.5.2 Separator Geotextile Selection Criteria. - The geotextile fibers, and the threads used in joining the geotextile by sewing, shall consist of long chain polymeric fibers composed of polypropylene, polyester, polyolefins, or polyamide. Both the geotextile and threads shall be resistant to chemical attack, mildew, and rot. The geotextile shall conform to the physical property requirements listed in the following table. All values shall represent certifiable minimum values in the weakest principle direction of the fabric.

Property	Test Method	Requirement
Thickness	ASTM D-5199	25 mils
Grab tensile strength	ASTM D-4632	350 lbs
Grab elongation	ASTM D-4632	MD=27%, CD=17%
Puncture resistance	ASTM D-4833	190 lbs
Mullen burst strength	ASTM D-3786	850 psi
Water flow rate	ASTM D-4491	7.0 gpm/ft2
Permittivity	ASTM D-4491	0.11 sec-1
CBR	ASTM D-6241	1350 lbs
Apparent opening size	ASTM D-4751	U. S. Sieve #80

MIRAFI_WOVAN 600X fabric or equal. Contractor shall submit the manufacturer's description data for the proposed material and a 6" X 6" sample to the C.O.

2-3.5.3 Geotextile Fabric Width. - Fabric width shall be at least 15.0 feet for the normal 12-foot-wide riding surface access road. Fabric in other vehicular areas shall be cut to fit, and overlapped as required below, to fully cover such areas.

2-3.5.4 General. - Geotextile fabric, if required in the project drawings, shall be installed on prepared subgrade for all areas that will experience vehicular traffic.

2-3.5.5 Construction Requirements.

(a) Prepared subgrade and foundations shall be compacted smooth and level as specified elsewhere and as shown on the drawings.

(b) The geotextile fabric shall be rolled out directly upon the prepared surface, and shall not be dragged over any surface. Fabric in place shall have a smooth surface and shall be free of folds, wrinkles, cuts, or other imperfections. Individual panels of fabric shall be overlapped at least 36 inches, with the preceding layer overlapping the following layer in the direction that surfacing material will be spread. No vehicular traffic will be permitted directly upon the fabric.

2-3.6 Surfacing. - Surfacing shall be done only when the ground surface is at optimum moisture content and unfrozen. Placement shall be made to the line and grade.

2-3.6.1 Aggregate Placing. - Aggregate surfaced roads, parking areas, and turnaround areas shall consist of a minimum of 6 inches of compacted thickness of surface course aggregate. Walkways shall consist of a minimum of 4 inches of compacted thickness of surface course aggregate. Aggregate shall be compacted by roller as specified.

2-3.6.2 Compaction and Grading.

2-3.6.2.1 Each layer of aggregate shall be compacted using a steel wheel tandem or three wheel steel roller weighing not less than 8 tons. For compacting aggregate on a geotextile fabric, use a smooth-drum roller. Compaction shall closely follow the spreading operation to prevent loss of contained moisture or displacement of materials.

2-3.6.2.2 When the surface stability of the crushed aggregate cannot be obtained due to lack of fines, additional fines shall be added to the upper portion of the course in an amount sufficient to secure stability, at no additional cost to the Government. In no case, however, shall the quantity of fines added increase the percent passing the Number 200 sieve by more than 15 percent in the upper portion.

2-3.6.2.3 Any irregularities or depressions that develop in the layers under rolling operations shall be corrected by loosening the material and removing or adding aggregate and rerolling. The rolling shall be continued until the surface is shown to be smooth and uniform, and to such trueness that when tested with a 10-foot straightedge it shall not show any deviation in excess of 1/4-inch. At all places not accessible to the roller, the aggregate of each layer shall be tamped separately and compacted to grade and line with mechanical tampers.

2-3.6.2.4 If any subgrade material is worked into the aggregate material during the compacting or finishing operations, all granular material within the affected areas shall be removed and replaced with new aggregate.

The Contractor's Resident Engineer may restrict hauling or traffic over the completed or partially completed base after inclement weather or at any time when the subgrade is soft, and there is a tendency for the subgrade material to work into the base material.

2-3.6.2.5 If considered necessary by the Project Engineer, water shall be applied to each layer to aid in compaction and prevent segregation of the material. Disc or harrow surfacing material during moistening operations to secure uniform moisture distribution. Add water in a manner that will not soften the subgrade. All work associated with the additional water shall be accomplished at no additional cost to the Government.

2-3.6.2.6 The aggregate shall be compacted to 95 percent maximum density as determined by AASHO-T99. Compaction shall continue until no further discernible compaction is evidenced under action of the compaction equipment. If in the opinion of the Project Engineer, the required degree of compaction has not been achieved, testing in accordance with the standard will be conducted and paid for by the Government. If testing confirms unacceptable compaction, reconstruction or other remedial work may be required by the Contractor at no additional cost to the Government.

2-3.7 Quality Assurance. - The Contractor shall furnish a certificate that all materials, compositions, densities, and mixtures used in the construction of access roads and walkways meet specification requirements. The Contractor shall give the FAA, at the time of delivery, two copies of the aggregate delivery ticket. The tickets shall indicate the delivery date, time dispatched, name and location of the project, name of Contractor, name of supplier, truck number, quantity, and composition or job mix formula.

2-3.8 Site Restoration. - The Contractor shall furnish all labor, materials, tools, equipment, plant, and services necessary to provide for the restoration of the disturbed ground work to its original condition, to the satisfaction of the Government representative.

END OF SECTION

2-5 BORING UNDER RUNWAY/ TAXYWAY - This item shall cover boring and installation of underground cable.

All the equipment necessary for the installation and the methodology used for the selection of the HDPE shall comply with attachments 4 through 9.

2-5.1 Special Condition. - work under this item may be delayed due to restriction/limitation on construction work in the vicinity of Runway Safety areas and Taxiway safety areas and Air Operation condition.

2-5.2 Underground Utilities. - The Contractor shall be responsible for any damage to any underground equipment and utilities such as fuel tanks, water line and power and control cables. If it is necessary to interrupt existing utilities, items, structures, the Contractor shall coordinate with the RE who shall coordinate with the applicable authorities.

2-5-3. Material Classification. - Pipe shall be High-Density Polyethylene Pipe (HDPE) and comply with attachment 9.

2-5-4 Construction Methods. - The minimum depth of the casing pipe shall be 5'-0" from Runway / Taxiway lowest grade, and 4'-0 from lowest grade of any roadway / driveway. The depth of the HDPE shall change through transition (per attachment 9) from 5 feet to the depth required to attach this HDPE to handholes located on both sides of the Runway/ Taxiway. Work pits shall from outside the safety area of runways/taxiways. For any work inside the safety area, the Resident Engineer shall have permission from the ATCT to allow the contractor to conduct any work inside the Runway safety area. Minimum of 40 feet needed from the edge of roadway/driveway for boring. The end of pipe shall be 55 feet from edge of runway/ taxiway pavement and 40 feet from edge of / roadway / driveway pavement.

END OF SECTION

2-6 Hot-Mix Asphalt Pavement (HMA)

2-6.1 General. - The Contractor shall provide labor, materials, and equipment necessary to perform operations in connection with the construction of Hot-mix asphalt (HMA). The contractor shall construct new pavement using Dense-Graded Hot-Mix Asphalt method. The contractor shall comply with Items 247, 310, 340 of Texas Department of Transportation Specification Book.

2-6.1 Submittal - Submittal shall be HMA using Dense-Graded Hot-Mix Asphalt method.

END OF SECTION

DIVISION 3 - CONCRETE

SECTION 3-1 CONCRETE FORMWORK

3-1.1 GENERAL. - The Contractor shall provide all labor, equipment and materials as required to locate and place concrete forms specified herein or on applicable drawings. All concrete slabs and foundations shall be formed.

3-1.2 MATERIALS. –

3-1.2.1.1 Lumber for forms: The lumber shall be stacked neatly on wood platform raised above grade.

3-1.2.1.2 Fiber board form lining: the board shall have a minimum thickness of 3/16" and wet thoroughly with water within 12 hours before use.

3-1.2.1.1 Plywood forms lining: shall be with minimum thickness of 3/8", exterior exposure water proof adhesive, and conforming to APA HDO.

3-1.2.2.3 Forms. - Forms shall be wood, plywood, metal, or other approved material, smooth and free from irregularities, dents, and sags. The Contractor shall use prefabricated forms as manufactured by "Sonotube" or equivalent for cylindrical pier foundations or other work as indicated on the applicable drawings in the Plans. All form materials shall be of the grade or type suitable to obtain the kind of finish specified.

3-1.2.2.2 Form ties. - Form ties shall be either fixed band type or threaded internal disconnecting type with a working load suitable to prevent deformation of forms. They shall be of the type as to leave no metal closer to the surface than 1-1/2 inches for steel ties and 1 inch for stainless steel ties. Twisted wire ties shall not be permitted.

3-1.2.2.3 Form oil. - Form oil shall be non-staining and shall not cause softening of the concrete or impede the wetting of surfaces to be cured with water or curing compounds.

3-1.3.1 Formwork Placement. - Formwork shall not be placed prior to inspection, testing, or approval of the excavated area and embedded items by the FAA.

Forms shall result in a final structure which does not exceed + 1/2-inch variation in any dimension shown on the applicable drawings. The forms shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. Form oils shall be placed on forms or form ties and shall be removed from reinforcing steel or conduits if accidentally applied to such.

3-1.3.2 Form Removal. - Forms shall not be removed for a minimum of 3 days after the completion of concrete placement, provided a 50 degree Fahrenheit ambient temperature has been maintained. Wood forms may be loosened within 24 to 36 hours after the placement operation to meet the requirements of this specification if such action will not damage or deform the concrete structure. No additional loads shall be placed on the concrete for at least 72 hours after placing.

The following standard shall:

American Concrete Institute: ACI-301, 305, 306, 318.

American Institute of steel Construction (AISC): Manual of steel Construction.

American Iron and Steel Institute (AISI): Cold-formed Steel Design Manual.

END OF SECTION

SECTION 3-2 STEEL REINFORCEMENT

3-2.1 General. - The Contractor shall provide the necessary labor, materials, and equipment for the placement of steel reinforcement and anchor bolts as specified herein and shown on the applicable drawings. All steel reinforcing bars must be produced in the USA.

3-2.2 Materials. -

3-2.2.1 Reinforcing Steel. - Reinforcing steel shall conform to ASTM A 615, Grade 60 with minimum yield strength of 60,000 psi.

3-2.2.2 Tie Wire, Chairs, and Spacers. - All devices necessary to properly space steel reinforcement in place during concrete placement shall Galvanized metal spacers or precast mortar or concrete blocks. Supports shall be uniform high density polyethylene (plastic) or fiberglass reinforced plastic (FRP), conforming to CRSI class I. Tie wire shall be 16 gage minimum black steel conform to Fed QQ-W-416.

3-2.2.3 Anchor Bolts. - Anchor bolts shall conform to ASTM A 325.

3-2.2.4 Washers. - Washers shall conform to ASTM A 325.

3-2.2.5 Welded Wire Fabric. - Welded wire fabric shall conform to ASTM A 82, ASTM A 185.

3-2.3 Reinforcement Surfaces. - Steel reinforcement shall be free of mud, oil, or other nonmetallic coatings which may affect bonding quality. Mill scale or rust remaining after hand brushing with a wire brush is permissible.

3-2.4 Bending. - All bands in bars and ties shall be cold bent. No bends shall be made in bars or ties partially imbedded in concrete and shall conform to ACI 315, 318.

3-2.5 Lap splices and Embedment. – Bar splice and embedment length shall be as shown on the plans but in no case shall they be less than ACI-315.

3-2.6 Placing Reinforcement. - Steel reinforcement shall be accurately placed at the spacing and in the sizes indicated on the applicable drawings and secured against displacement during the pour operations. Reinforcement shall be placed within +/- 1/4 inch of the indicated dimensions. Reinforcement splices or welding of crossing reinforcement shall not be permitted.

Reference Standard. – The following reference standard shall be used

ASTM A 663	Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties
ACI-301	Specification for Structural Concrete for Building

Field Quality Control: Concrete shall not be deposited until the COR has observed the final placing of the steel and has given permission to place concrete.

END OF SECTION

SECTION 3-3 CAST-IN-PLACE CONCRETE

3-3.1 General. - The Contractor shall provide the necessary materials, labor, and equipment for the mixing, sampling, placing, curing, and testing of concrete using the latest revisions of the following standards.

3-3.1.1 American Society for Testing and Material (ASTM) Specifications. -

ASTM C 31	Test Specimens in the field
ASTM C 33	Specifications for Concrete Aggregates
ASTM C 39	Test Methods for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	Specifications for Ready-Mixed Concrete
ASTM C 143	Slump of Portland Cement Concrete
ASTM C 150	Specification for Portland Cement
ASTM C 171	Specification for Sheet Materials for Curing Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	Specification for Air Entraining Admixtures for Concrete
ASTM C 293	Test method for Flexural Strength of Concrete
ASTM C 494	Specification for Chemical Admixtures for Concrete
ASTM C 618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete
ASTM C 881	Specification for Epoxy-Resin-Base Bonding Systems for Concrete

3-3.1.2 American Concrete Institute (ACI). -

ACI 221.1	Recommended Practice for Selecting Proportions of Concrete
ACI 214	Recommended Practice for Evaluation of Strength Test Results
ACI 301	Specification for Structural Concrete for Building
ACI 304	Guide for Measuring, Mixing, Transporting and Placing Concrete
ACI 304.2R	Placing Concrete by Pumping Method
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308	Standard Practice for Curing Concrete
ACI 318	Building Code Requirements for Reinforced Concrete

3-3.2-1 Design Criteria. – The design of the cast-in-place concrete shall be satisfy all the minimum requirements for the strength and the proportions of the concrete in ACI 211.1.

3-3.2-2 Classification of the Concrete. – The concrete shall be class "A" for all reinforced concrete elements, and class "C" for all pumped concrete. Both classes shall provide minimum 28 days comp. strength of 3000 psi, and 4 inches of max. slump.

3-3.3 Materials. -

3-3.3.1 Cement. - All cement shall conform to ASTM C 150, Type (I).

3-3.3.2 Fly Ash/Pozzolans. – Shall conform ASTM C-618, Class "F" fly ash. A supplier's certificate shall be supplied.

3-3.3.3 Admixtures. – A 3000 psi concrete or stronger shall contain air-entraining admixtures.

Admixtures shall be batched at the batch plant.

(1) Air-Entraining Admixture: Conforming to ASTM C-260. The total average air content shall be in accordance with recommendation of ACI 211.1; 5% (+/-) 0.5% for 1-1/2" maximum size aggregate.
(2) Water Reducing Admixtures: Conforming to ASTM C-494; Types "A" or "D" only. Accurately measured and added to the mix.

(3) Water Reducing Admixtures- High Rang (HRWR): High Rang Water Reducer shall conforming to ASTM C-494, Type "F" or "G". HRWR accurately measured and added to the mix at the concrete batch plant.

(4) Set Retarding Admixtures: Conforming to ASTM C-494; Type "B" and "D" only. Accurately measured and added to the mix.

3-3.3.2 Aggregates. –

(1) Fine aggregate: Washed natural sand or sand manufactured by crushing stones need to meet the following gradation requirements;

Sieve Size	Percent Retained	Percent Passing
3/8"	0	100
# 4	0-5	95-100
# 8	0-20	80-100
# 16	15-50	50-85
# 30	40-75	25-60
# 50	70-90	10-30
# 100	90-98	2-10

Blending is permitted to meet the gradation requirements. Fine aggregate shall not be more than 45% retained between any two consecutive sieves.

(2) Coarse aggregate: gravel shall conform to ASTM C 33.

3-3.3.3 Water. - Water used in mixing and curing operations shall be clean and free from oils, acids, organic matter, and chemical suspensions that may adversely affect cure times, strength requirements, or service life of the concrete.

3-3.3.4 Sheet Curing material. – Shall be conforming to ASTM C-171

3-3.4 Quality. -

3-3.4.1 Slump. - The concrete shall have a slump of 3 to 4 inches as determined by ASTM C 143,

3-3.4.2 Strength. – When tested in accordance with ASTM C-39 and ASTM C-293, The concrete mix shall give minimum compressive strength of 2,000 psi for 7-day and 3,000 psi for 28-day, Also minimum flexural strength of 400 psi for 4-day and 500 psi for 7-day.

3-3.4.3 Proportions. - Concrete materials shall be proportioned in accordance with ACI 211.1 for site-mixed concrete and ASTM C 94 for ready-mixed concrete.

3-3.5 Placing Concrete. -

3-3.5.1 Site Preparation. - Prior to placing concrete, all areas to receive concrete shall be inspected and approved by the RE. Concrete shall not be deposited on muddy or frozen material. All surfaces to be in contact with the concrete shall be wetted.

3-3.5.3 Conveying. - Concrete shall be conveyed from the mixer to the deposit site by equipment that will prevent separation or loss of material and that will ensure a nearly continuous flow of material at the deposit site.

3-3.5.4 Depositing. - Concrete shall be placed in such a manner as to prevent displacement of forms, or reinforcement. Placing shall be stopped if contamination due to sloughing occurs until the contaminant can be removed. Concrete shall be deposited in 12- to 18-inch layers as level as possible prior to consolidation operations. Under no circumstances shall fresh concrete be placed over concrete that is no longer plastic.

3-3.5.5 Consolidation. - Consolidation of concrete during and after placing shall be performed using an internal vibrator with a vibration frequency not less than 6,000 impulses per minute for spuds with diameters greater than 5" and 10,000 impulses for smaller spuds. Each layer shall be consolidated so that concrete is thoroughly worked around reinforcement, imbedded items, and forms. Vibrators shall penetrate about 6 inches into underlying layers to ensure proper union of the layers. Movement of the vibrator over the layer shall be such as to ensure uniform plasticity without pooling of cement.

3-3.5.6 Finish. - Concrete shall be finished monolithically to a smooth, level surface by floating and troweling. Surfaces shall be finished by tamping the concrete with suitable tools to force coarse aggregate down from the surface, screed with straight edges, and floated to the required finish level.

3-3.6 Curing. - Concrete shall be maintained above 50 degrees F and less than 100 degrees F and in a moist condition during the cure period for at least 18 hours. The cure period shall be 7 consecutive days. In cold weather the curing period can be up to 14 days. Curing shall be conforming to ASTM C-309, and ASTM C-171. The when tested, shall conform to ASTM C-156.

3-3.8. Quality Assurance. -

3-3.8.1 Concrete Certification. - The Contractor shall provide the FAA with a delivery ticket. The delivery ticket shall be per ASTM C 94.

3-3.8.2 Slump Test. - Concrete slump tests shall be performed, in accordance with ASTM C 143, by the Contractor during placement operations when directed by the RE.

3-3.8.3 Compression Test. - The Contractor will make test cylinders at his discretion with a minimum of four (4) concrete cylinders for each test set. Two cylinders shall be broken at 7 days, and two cylinders broken at 28 days. Sample shall be taken at minimum of every 150 cubic yards of concrete. Test shall be in accordance with ASTM C-39.

3-3.8.4 Air Content Test. – This test shall be done before placing the concrete in forms and accordance to ASTM C-231 or ASTM C-173.

END OF SECTION

DIVISION 5 - METALS

5-1. GENERAL. - The Contractor shall provide all labor, equipment and materials as required to fabricate and install miscellaneous metals specified herein or on applicable drawings. All wilding work shall conform to Structural Welding Code "ASW". The contractor shall uses latest revisions of the following standards for all steel work provided.

5-1.1 American Society for Testing and Material (ASTM) Specifications. -

ASTM A 36	Specification for Structural Steel.
ASTM A 123	Specifications for Zinc(Hot-Dip Galvanized)
ASTM A 307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
ASTM A 325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 240	Heat Resisting Chromium-Nickel Stainless Steel Plate
ASTM A 653	Specifications for General Requirements for Steel Sheet

5-1.2 Federal Specifications. -

FF-B588	Bolts, Toggles, and Expansion Sleeve, Screw
FF-H-111	Hardware, Builders' Shelf and Miscellaneous
FF-S-85	Screws, Cap, Slotted and Hexagon-Head
FF-S-92	Screw, Machine: Slotted, Cross-Recessed or Hexagon Head
TT-P-645	Primer, Paint, Zinc Chromate, Alkyd Type

5-1.3 Military Specification. -

MIL-P-21035	High Zinc Dust Content, Galvanizing Repair

5-2. Field Quality Control:

Samples will be furnished when requested by the COR before incorporated into work.

5-3. Submittals:

Shop drawings showing fabricated items.
Product data sheets for the manufactured components.

END OF SECTION

DIVISION 16 - ELECTRICAL

16-1 INSTALLATION OF POWER AND CONTROL CABLE

16-1.1 GENERAL. – This section sets forth requirements for the electrical power and control cable installation.

16-1.1.1 Rules. - The installation shall conform to the applicable rules of the National Electrical Code or local code, whichever requires the highest quality of material and workmanship. Where required by local government, the workmen shall be properly licensed.

16-1.1.2 Workmanship. - All electrical installation work shall be performed by experienced men regularly engaged in this type of work. All materials and equipment shall be installed in conformance with the contract documents and in accordance with recommendations of the manufacturer.

16-1.2 Applicable Documents. - The latest editions in effect of the following documents form a part of this section and are applicable to the extent specified herein.

16-1.1.2.1 FAA Specifications.

a) FAA-C-1217F Interior Electrical Work.

b) FAA-C-1391B Installation and Splicing of Underground Cables.

c) FAA-STD-019e Lightning, Grounding Bonding & Shielding Requirement.

16-1.3 Materials. - Electrical materials not supplies as Government-furnished material shall be supplied by the contractor as specified below.

16-1.3.1 Power Cable. - Cable shall comply with (FAA-C-1391B)

16-1.3.2 Conduit. - Conduit associated with underground cable installations shall be of the types indicated on the applicable drawings and shall be galvanized if metallic. Conduit shall comply with (FAA-C-1391B).

16-1.4 Preparation. - Trench excavation and bedding material used in preparation for placing direct burial cable or rigid conduit shall be in accordance with specification.

16-1.5 Cable and Conduit Depths. - Underground cable and conduits shall be installed in accordance with (FAA-C-1391B).

16-1.5.1 Crossing Existing Cables. - When crossing over or under existing cables, cable shall be installed in rigid metal conduit with grounding bushings on both ends and shall extend five feet beyond the cables. Minimum separation between cables shall be in accordance with (FAA-C-1391B).

16-1.6 Cable Markers. - Cable markers shall be installed in accordance with (FAA-C-1391B).

16-1.7 Cable Guard Wires. - Cable guard wires shall be installed above all DEB conductors per (FAA-C-1391B).

16-1.8 Grounding. - All exposed noncurrent-carrying metallic parts of power distribution systems shall be grounded to a counterpoise as shown on the applicable drawings. Requirements of the National Electrical Code shall also be met.

16-1.8.1 Ground Conductor. – The grounding conductor shall be per FAA-STD-019e.

16-1.8.2 Ground Electrode Rod. – As described in the specification.

16-1.8.3 Exothermic Process. - Where the drawings require connection of a grounding conductor to a metal object by exothermic process, the contractor shall supply the correct exothermic welding kit for the application.

The mold and cartridge used shall be selected on the basis of size, number, and type of conductor to be connected, composition and surface shape of object, and position in which the weld will be made.

Prior to any backfill of underground connection, the Contractor shall inspect and photograph each weld. Sector Resident Engineer shall be notified 24 hours prior to any such inspections.

16-1.9 Cable Tests. - All cable shall be tested according to (FAA-C-1391B).

16-1.10 PAPI OPERATIONAL TEST. – With the system completely de-energized at the power source, a complete check shall be made of all wiring to the units.
After the power connection have been made and upon approval of the installation by the COR, the contractor shall conduct an operational test of the PAPI system, not less than four hours at each setting.

16-1.11 Cable Abandonment. - Ends of cables to be abandoned shall be buried two feet below grade unless otherwise specified.

16-1.12 Quality Assurance. - All electrical equipment and materials provided by the contractor shall be as specified or equal product, in accordance with the specification, must be produced in the USA, and approved by FAA electrical Engineer. Two copies of tabulated results of all cable tests and ground resistance test performed shall be forwarded to the FAA for approval.

END OF SECTION