Incorporated into the contract documents will be the Dallas Fort Worth International Airport Standard Technical Specificaiton Book: Published June 01, 2018 and can be found at www.dfwairport.com/business/solicitations.

Specifications marked as "Applicable" below will be incorporated into the contract documents. Specifications may be revised and or added to the above pushlished book will be as indicated and dated below. Revised or Added specifications are attachere herein.

Section	Description	Applicable	Revised	Added
DIVISION 00	**PROCUREMENT AND CONTRACTING REQUIREMENTS**			
00 01 01	Project Title Page	✓	11-30-2018	
00 01 07	Seals Page	✓	11-30-2018	
00 01 10	Table Of Contents	✓	11-30-2018	
00 01 17	RFI and Addendum Matrix	✓		
DIVISION 01	**GENERAL REQUIREMENTS**			
01 11 00	Summary of Work	✓	11-30-2018	
01 14 16	Coordination with Occupants	✓		
01 14 19.13	Significant Industrial User Permit	✓		
01 18 16	Protection of Existing Underground Utilities and Cables	✓		
01 18 16.13	DFW Airport Utility Location Sign-Off Sheet	✓		
01 21 00	Standby Time Allowance			
01 23 00	Alternates	✓	11-30-2018	
01 25 13	Product Substitution Procedures	✓		
01 29 00	Payment Procedures	✓		
01 29 73	Schedule of Values			
01 29 85	Wage Rate Requirements	✓	1-11-2019 ~~11-30-2018~~	
01 30 00	Allowances	✓	11-30-2018	
01 31 16	Multiple Contract Coordination	✓		
01 31 19	Project Meetings	✓		
01 32 16	Construction Progress Schedule	✓	11-30-2018	
01 33 23	Shop Drawings, Product Data, and Samples	✓		
01 33 29.06.01	Contaminated Media Management Plan	✓		
01 35 13.13	Minimum Standards for Construction and Maintenance on the AOA			
01 35 16	Alteration Project Procedures	✓		
01 41 00	Regulatory Requirements	✓		
01 41 26.10	Construction Air Permitting	✓		
01 41 26.13	Concrete Batch Plant and Hot Mix Asphalt Plant			
01 42 13	Abbreviations, Acronyms and Definitions	✓		
01 42 19	Reference Standards	✓		
01 45 16.13	Contractor Quality Control	✓		
01 45 23	Testing And Inspecting Services	✓		
01 50 00	Temporary Facilities and Controls	✓		
01 50 13	Owner's Field Office			
01 52 00	Contractor's Construction Area	✓		
01 52 00.01	Construction Signage	✓		
01 52 13	Dust Control	✓		

Section	Description	Applicable	Revised	Added
01 52 16	Haul Road			
01 55 20	Contractor Use of the Parking Revenue Area (PRA)			
01 55 26	Traffic Control	✓		
01 55 29	Staging Areas	✓		
01 56 13	Concrete Waste	✓		
01 56 23	Temporary Barricades	✓		
01 56 26	Temporary Fencing	✓		
01 57 13	Temporary Erosion and Sediment Control	✓		
01 57 19	Spill Prevention Control and Countermeasure (SPCC)	✓		
01 57 19.13	Spill Response	✓		
01 57 19.19	HVAC Environmental Controls			
01 57 23	Temporary Storm Water Pollution Control	✓		
01 58 00	Project Identification			
01 61 16	Materials and Equipment	✓		
01 62 00	Product Options	✓		
01 66 00	Product Storage and Handling Requirements	✓		
01 71 13	Mobilization	✓		
01 71 14	Land Use Requirements	✓		
01 71 33	Protection of Adjacent Construction	✓		
01 73 29	Cutting And Patching	✓		
01 74 13	Progress Cleaning	✓		
01 74 19	Construction Waste	✓		
01 74 23	Final Cleaning	✓		
01 75 00	Testing, Adjusting and Balancing Air Conditioning Systems	✓		
01 76 00	Protecting Installed Construction	✓		
01 76 50	Punch List	✓	11-30-2018	
01 77 00	Closeout Procedures	✓	11-30-2018	
01 77 00.01	Closeout Procedures – System Acceptance	✓	11-30-2018	
01 78 23	Operation and Maintenance Data	✓		
01 78 33.36	Bonds and Warranties	✓		
01 78 39	Project Record Documents	✓		
01 78 46	Extra Stock Materials			
01 79 00	Demonstration and Training	✓		
01 81 13	Sustainable Design Requirements			
01 91 00	Commissioning	✓		11-30-2018
01 91 00.13	Commissioning Plan	✓		11-30-2018
DIVISION 07	**THERMAL AND MOISTURE PROTECTION**			
07 92 00	Joint Sealers	✓		11-30-2018
DIVISION 10	**SPECIALTIES**			
10 14 00	Signage	✓		11-30-2018
DIVISION 12	**FURNISHINGS**			
12 93 01	Precast Concrete Wheel Stops	✓		11-30-2018
DIVISION 26	**ELECTRICAL**			

26 05 00	Common Work Results for Electrical	✓	1-11-2019	11-30-2018
26 05 19	Wire and Cable	✓		11-30-2018
26 05 30	Maintenance Testing of Electrical Systems	✓		11-30-2018
26 05 33.13	Conduit	✓		11-30-2018
26 05 33	Boxes	✓	1-11-2019	11-30-2018
26 05 43	Underground Electrical Ductbanks and Conduit	✓	1-11-2019	11-30-2018
26 05 53	Electrical Identification	✓		11-30-2018
26 21 16	Service Entrance	✓		11-30-2018
26 22 16	Dry Type Transformers	✓		11-30-2018
26 24 16	Panelboards	✓		11-30-2018
26 50 00	Light Fixtures - Site	✓	1-11-2019	11-30-2018
DIVISION 27	**TELECOMMUNICATIONS**			
27 05 00	Common Work Results for Communications	✓	1-11-2019	11-30-2018
27 05 10	Telecommnication Adminstrative Requirements	✓		11-30-2018
27 05 26	Telecommunicaitons Grounding and Bonding	✓	1-11-2019	11-30-2018
27 05 43	Exterior Communication Pathways	✓		11-30-2018
27 11 00	Communication Cabinets and Equipment Rooms	✓		11-30-2018
27 13 00	Backbone and Riser Media Insfrastructure	✓		11-30-2018
27 15 00	Horizontal Media Infrastructure	✓		11-30-2018
DIVISION 28	**ELECTRONIC SAFETY AND SECURITY**			
28 05 00	Common Work Results for Electronic Safety and Security*	✓		11-30-2018
28 15 00	Emergency Phone*	✓		11-30-2018
28 23 00	Video Surveillance*	✓		11-30-2018
DIVISION 32	**EXTERIOR IMPROVEMENTS**			
32 01 02	TxDOT Reference	✓		11-30-2018
32 92 19	Seeding and Sodding	✓		
SPECIAL PROVISIONS				
TX-105-DFW	Removing Treated and Untreated Base and Asphalt Pavement	✓		11-30-2018
TX-132-DFW	Embankment	✓		11-30-2018
TX-204-DFW	Sprinkling	✓		11-30-2018
TX-216-DFW	Proof Rolling	✓		11-30-2018
TX-678-DFW	Pavement Surface Preparation for Markings	✓		11-30-2018

*Provided in Volume II

ATTACHMENTS

Attachment A Geotechnical Investigation

APPLICABLE TXDOT STANDARD SPECIFICATIONS*

TXDOT Item 100 Clearing and Grubbing
TXDOT Item 104 Removing Concrete
TXDOT Item 110 Excavation
TXDOT Item 132 Embankment
TXDOT Item 160 Furnishing and Placing Topsoil
TXDOT Item 168 Vegatative Watering
TXDOT Item 247 Flexible Base
TXDOT Item 340 Dense-Graded Hot-Mix Asphalt (Small Quantity)

TXDOT Item 360	Concrete Pavement
TXDOT Item 432	Riprap
TXDOT Item 502	Barricades, Signs, and Traffic Handling
TXDOT Item 506	Temporary Erosion, Sedimentation, and Environment Controls
TXDOT Item 529	Concrete Curb & Gutter
TXDOT Item 531	Sidewalks
TXDOT Item 666	Retroreflectorized Pavement Markings

*Standard Specifications for Construction and Maintenance of Highway, Streets, and Bridges, November 2014

– END OF SECTION –

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the required Forms and Schedules.

1.2 FORMS

A. Request for Authorization of Additional Classification and Rate - Standard Form 1444 (www.wdol.gov)

B. General Wage Decision Rates for Tarrant and Dallas County, Texas (http://www.wdol.gov)

1.3 WAGE RATES

A. U.S. Department of Labor (DOL) provides the required minimum wages and fringe benefits to be paid to all laborers and mechanics employed to work on this contract, either under this contract or under a related subcontract. The Contractor and all subcontractors are required to report the actual wages paid to laborers and mechanics doing work under this contract. The reported wages will be verified by review of the weekly payroll reports and by periodic on-site interviews conducted by the Construction Manager.

B. The Wage Determination establishes the minimum wages and fringe benefits to be paid to laborers and mechanics throughout the duration of this contract. In no event shall these minimum wages be modified.

C. In the event that the work specified in this contract requires work to be done by laborers or mechanics whose job classification is not listed in the Wage Determination, the Contractor is responsible for preparing the attached Request for Authorization of Additional Classification and Rate Standard Form 1444 (additional copies are available from the Owner's Authorized Representative). The Contractor must complete Items 3 through 15 and submit the request to the Owner's Authorized Representative prior to issuance of the Contractor's Notice to Proceed or as soon as the need for the additional classification or rate is identified (if the work has been authorized to begin).

AUTHORIZED FOR LOCAL REPRODUCTION

REQUEST FOR AUTHORIZATION OF ADDITIONAL CLASSIFICATION AND RATE	CHECK APPROPRIATE BOX ☐ SERVICE CONTRACT ☐ CONSTRUCTION CONTRACT	OMB Number: 9000-0089 Expiration Date: 7/31/2014

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (MVP), Office of Acquisition Policy, GSA, Washington, DC 20405; and to the Office of Management and Budget, Paperwork Reduction Project (9000-0089), Washington, DC 20503.

INSTRUCTIONS: THE CONTRACTOR SHALL COMPLETE ITEMS 3 THROUGH 16, KEEP A PENDING COPY, AND SUBMIT THE REQUEST, IN QUADRUPLICATE, TO THE CONTRACTING OFFICER.

1. **TO:** ADMINISTRATOR, Employment Standards Administration WAGE AND HOUR DIVISION U.S. DEPARTMENT OF LABOR WASHINGTON, D.C. 20210	2. **FROM:** *(REPORTING OFFICE)*
3. CONTRACTOR	4. DATE OF REQUEST

5. CONTRACT NUMBER	6. DATE BID OPENED *(SEALED BIDDING)*	7. DATE OF AWARD	8. DATE CONTRACT WORK STARTED	9. DATE OPTION EXERCISED (If *APPLICABLE) (SCA ONLY)*

10. SUBCONTRACTOR *(IF ANY)*

11. PROJECT AND DESCRIPTION OF WORK *(ATTACH ADDITIONAL SHEET IF NEEDED)*

12. LOCATION *(CITY, COUNTY AND STATE)*

13. IN ORDER TO COMPLETE THE WORK PROVIDED FOR UNDER THE ABOVE CONTRACT, IT IS NECESSARY TO ESTABLISH THE FOLLOWING RATE(S) FOR THE INDICATED CLASSIFICATION(S) NOT INCLUDED IN THE DEPARTMENT OF LABOR DETERMINATION

NUMBER: DATED:

a. LIST IN ORDER: PROPOSED CLASSIFICATION TITLE(S); JOB DESCRIPTION(S); DUTIES; AND RATIONALE FOR PROPOSED CLASSIFICATIONS (SCA ONLY) *(Use reverse or attach additional sheets, if necessary)*	b. WAGE RATE(S)	c. FRINGE BENEFITS PAYMENTS

14. SIGNATURE AND TITLE OF SUBCONTRACTOR REPRESENTATIVE *(IF ANY)*	15. SIGNATURE AND TITLE OF PRIME CONTRACTOR REPRESENTATIVE	
16. SIGNATURE OF EMPLOYEE OR REPRESENTATIVE	TITLE	CHECK APPROPRIATE BOX-REFERENCING BLOCK 13. ☐ AGREE ☐ DISAGREE

TO BE COMPLETED BY CONTRACTING OFFICER *(CHECK AS APPROPRIATE - SEE FAR 22.1019 (SCA) OR FAR 22.406-3 (DBA))*

☐ THE INTERESTED PARTIES AGREE AND THE CONTRACTING OFFICER RECOMMENDS APPROVAL BY THE WAGE AND HOUR DIVISION. AVAILABLE INFORMATION AND RECOMMENDATIONS ARE ATTACHED.

☐ THE INTERESTED PARTIES CANNOT AGREE ON THE PROPOSED CLASSIFICATION AND WAGE RATE. A DETERMINATION OF THE QUESTION BY THE WAGE AND HOUR DIVISION IS THEREFORE REQUESTED. AVAILABLE INFORMATION AND RECOMMENDATIONS ARE ATTACHED.

(Send copies 1, 2, and 3 to Department of Labor)

SIGNATURE OF CONTRACTING OFFICER OR REPRESENTATIVE	TITLE AND COMMERCIAL TELEPHONE NO.	DATE SUBMITTED

PREVIOUS EDITION IS USABLE

STANDARD FORM 1444 (REV. 12-2001)
Prescribed by GSA-FAR (48 CFR) 53.222(f)

General Decision Number: TX190025 01/04/2019 TX25

Superseded General Decision Number: TX20180035

State: Texas

Construction Type: Highway

Counties: Archer, Callahan, Clay, Collin, Dallas, Delta, Denton, Ellis, Grayson, Hunt, Johnson, Jones, Kaufman, Parker, Rockwall, Tarrant and Wise Counties in Texas.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.60 for calendar year 2019 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.60 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2019. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/04/2019

* SUTX2011-007 08/03/2011

	Rates	Fringes
CONCRETE FINISHER (Paving and		

Structures).....$ 14.12

ELECTRICIAN.....$ 19.80

FORM BUILDER/FORM SETTER
Paving & Curb.....$ 13.16
Structures.....$ 13.84

LABORER
Asphalt Raker.....$ 12.69
Flagger.....$ 10.06
Laborer, Common.....$ 10.72
Laborer, Utility.....$ 12.32
Pipelayer.....$ 13.24
Work Zone Barricade
Servicer.....$ 11.68

POWER EQUIPMENT OPERATOR:
Asphalt Distributor.....$ 15.32
Asphalt Paving Machine.....$ 13.99
Broom or Sweeper.....$ 11.74
Concrete Pavement
Finishing Machine.....$ 16.05
Concrete Saw.....$ 14.48
Crane Operator, Lattice
Boom 80 Tons or Less.....$ 17.27
Crane Operator, Lattice
Boom over 80 Tons.....$ 20.52
Crane, Hydraulic 80 Tons
or Less.....$ 18.12
Crawler Tractor.....$ 14.07
Excavator, 50,000 pounds
or less.....$ 17.19
Excavator, over 50,000
pounds.....$ 16.99
Foundation Drill , Truck
Mounted.....$ 21.07
Foundation Drill, Crawler
Mounted.....$ 17.99
Front End Loader 3 CY or
Less.....$ 13.69
Front End Loader, over 3 CY.$ 14.72
Loader/Backhoe.....$ 15.18
Mechanic.....$ 17.68
Milling Machine.....$ 14.32
Motor Grader, Fine Grade....$ 17.19
Motor Grader, Rough.....$ 16.02
Pavement Marking Machine....$ 13.63
Reclaimer/Pulverizer.....$ 11.01
Roller, Asphalt.....$ 13.08
Roller, Other.....$ 11.51
Scraper.....$ 12.96
Small Slipform Machine.....$ 15.96
Spreader Box.....$ 14.73

Servicer.....$ 14.58

Steel Worker (Reinforcing).....$ 16.18

TRUCK DRIVER
Lowboy-Float.....$ 16.24
Off Road Hauler.....$ 12.25
Single Axle.....$ 12.31
Single or Tandem Axle Dump Truck.....$ 12.62
Tandem Axle Tractor with Semi Trailer.....$ 12.86
Transit-Mix.....$ 14.14

WELDER.....$ 14.84

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is

based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

~~General Decision Number: TX180035 01/05/2018 TX35~~

~~Superseded General Decision Number: TX20170035~~

~~State: Texas~~

~~Construction Type: Highway~~

~~Counties: Archer, Callahan, Clay, Collin, Dallas, Delta, Denton, Ellis, Grayson, Hunt, Johnson, Jones, Kaufman, Parker, Rockwall, Tarrant and Wise Counties in Texas.~~

~~HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).~~

~~Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually.~~

~~Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.~~

~~Modification Number Publication Date~~
~~0 01/05/2018~~

~~* SUTX2011-007 08/03/2011~~

~~Rates Fringes~~

~~CONCRETE FINISHER (Paving and Structures).....$ 14.12~~

~~ELECTRICIAN.....$ 19.80~~

~~FORM BUILDER/FORM SETTER~~
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~~Concrete Pavement~~
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~~Boom 80 Tons or Less.....$ 17.27~~
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~~Front End Loader 3 CY or~~
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~~Motor Grader, Fine Grade....$ 17.19~~
~~Motor Grader, Rough.....$ 16.02~~
~~Pavement Marking Machine....$ 13.63~~
~~Reclaimer/Pulverizer.....$ 11.01~~
~~Roller, Asphalt.....$ 13.08~~
~~Roller, Other.....$ 11.51~~
~~Scraper.....$ 12.96~~
~~Small Slipform Machine.....$ 15.96~~
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~~TRUCK DRIVER~~
~~Lowboy-Float.....$ 16.24~~
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~~Single or Tandem Axle Dump~~
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~~Tandem Axle Tractor with~~
~~Semi Trailer.....$ 12.86~~
~~Transit-Mix.....$ 14.14~~

~~WELDER.....$ 14.84~~
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~~WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.~~

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~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).~~

~~----------~~

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~~Union Rate Identifiers~~

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survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter

~~* a conformance (additional classification and rate) ruling~~

~~On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.~~

~~With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:~~

~~Branch of Construction Wage Determinations~~
~~Wage and Hour Division~~
~~U.S. Department of Labor~~
~~200 Constitution Avenue, N.W.~~
~~Washington, DC 20210~~

~~2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:~~

~~Wage and Hour Administrator~~
~~U.S. Department of Labor~~
~~200 Constitution Avenue, N.W.~~
~~Washington, DC 20210~~

~~The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.~~

~~3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:~~

~~Administrative Review Board~~
~~U.S. Department of Labor~~
~~200 Constitution Avenue, N.W.~~
~~Washington, DC 20210~~

~~4.) All decisions by the Administrative Review Board are final.~~

~~==========~~

~~END OF GENERAL DECISION~~

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

- END OF SECTION -

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SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This item is intended to supplement the specifications for the Electrical requirements of this contract. It is the intent and meaning of the Plans and Specifications that the Contractor shall provide an electrical installation that is operational and complete, including all items and appurtenances necessary, reasonably incidental or customarily included, even though each and every item is not specifically called out or shown.

B. Installations and construction under these provisions shall be coordinated with the Airport Construction Manager. Specification requirements for approvals, reviews, or other involvements of the Engineer shall be transmitted by the Contractor through the Construction Manager to the Engineer.

1.2 APPLICABLE CODES AND STANDARDS.

A. Codes. All electrical work shall conform with the requirements and recommendations of the latest edition of the National Electrical Code. In conflicts among drawings, specifications and codes, the most stringent requirements shall govern.

B. Standards. The specifications and standards of the following organizations are by reference made part of these specifications and all electrical work, unless otherwise indicated, shall comply with their requirements and recommendations wherever applicable.

1. Institute of Electrical and Electronic Engineers (IEEE)
2. American National Standards Institute (ANSI)
3. American Society for Testing and Materials (ASTM)
4. Insulated Power Cable Engineers Association (ICEA)
5. National Institute of Standards and Technology (NIST).
6. National Electrical Contractor's Association (NECA)
7. National Electrical Manufacturer's Association (NEMA)
8. National Fire Protection Association (NFPA)
9. Underwriter's Laboratories, Inc. (UL)
10. National Electrical Safety Code (NESC)

1.3 REQUIREMENTS OF REGULATORY AGENCIES

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

B. The requirements and recommendations of the latest edition of the Occupational Safety and Health Act are by reference made a part of these specifications and all electrical work shall comply with their requirements and recommendations wherever applicable.

1.4 WORKMANSHIP AND PERSONNEL REQUIREMENTS

A. All electrical work shall be performed by workmen skilled in the electrical trade and licensed for the work either by Dallas/Fort Worth or State of Texas. The DFW Airport Building Official will recognize the credentials of Master Electricians with valid current licenses from Dallas/Fort Worth. Credentials will be recognized of Journeyman Electricians with valid current licenses from Dallas/Fort Worth or other licensing entities having established reciprocal agreements with these municipalities.

B. A licensed Master Electrician will be required for the issuance of a building permit for constructing, installing, altering, maintaining, repairing or replacing any electrical wiring, apparatus, or equipment on any voltage level in the jurisdiction of the Airport.

C. A licensed Master Electrician or a licensed Journeyman Electrician is required to be on the job site whenever any electrical work is performed. Any airfield electrical work or associated electrical installations shall be accomplished under the direct supervision of a licensed Journeyman Electrician.

D. To insure compliance with Paragraph "c" above, only a documented Electrical work force with a ratio of a maximum ration of 3 licensed Apprentices for each licensed Journeyman Electrician shall be allowed to work on the airfield electrical systems.

E. Contractor shall prepare documentation associated with the electrical work force confirming adherence to the requirements of Paragraph "d" above. These documents shall be submitted to the Construction Manager for approval. Also, any work force changes or revisions which affect compliance with paragraph "d" above shall also be submitted to the Construction Manager for approval.

F. All circuits will be handled throughout the installation process by qualified licensed electrical personnel.

G. Every cable splicer shall be qualified in making cable splices and terminations on cables rated above 1,000 volts A.C. The Contractor shall submit for approval of the Construction Manager proof of the qualifications of each proposed cable splicer for the cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splice medium voltage cable at airports.

H. At least thirty (30) days prior to performing any cable splicing/terminating, Contractor shall submit to the Construction Manager a written list of proposed cable splicing/terminating personnel, including written evidence that the proposed personnel have had a minimum of eight (8) hours of technical training by authorized splice/termination kit manufacturer personnel. Approved training shall include a thorough review of kit components and splicing/terminating techniques and procedures. Field splices shall only be installed by technicians approved by the Construction Manager and by DFW maintenance superintendent.

I. In addition, each trained cable splicer shall be required to install a splice and a connector on type and size of the cable to be used under this contract. Sample connections shall be accomplished in accordance with the manufacturer's instructions and in the presence of the Construction Manager.

J. All communications work shall be performed under the direct supervision of a Building Industry Consulting Service International, Inc. (BICSI) registered Cabling Installer/Technician level.

K. The Contractor performing construction on the electrical and/or communication system shall have a minimum of 5 years of experience on construction of projects of similar type of work and of similar size and complexity. The owner will require all Electrical Contractors bidding on this project to submit proof of experience that they have successfully completed at least two projects of comparative size and complexity within the past 5 years.

1.5 EQUIPMENT, MATERIAL AND INSTALLATION REQUIREMENTS

A. The Contractor shall furnish and install all materials, equipment, accessories, connections and incidental items in accordance with the approved recommendations of the manufacturer and the best practices of the trade to provide a complete installation ready for use and operational by the Owner.

B. All equipment and materials shall be new, unless specifically noted otherwise, and shall bear the manufacturer's name, trademark and ASME, UL, and/or other labels in every case where a standard had been established for the particular item.

C. The Contractor shall promptly notify the Construction Manager in writing of any conflict between any requirements of the Contract Documents and equipment manufacturer's directions and shall obtain written instructions from the Construction Manager before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instructions from the Construction Manager, Contractor shall bear all costs arising in correcting deficiencies.

D. After review of equipment submittals, and instructions by the Engineer to proceed, equipment installations may require arrangements or connections different from those shown on the drawings. It is the responsibility of the Contractor to install the equipment to operate properly. The Contractor shall provide any additional equipment and/or materials required for installations to operate in accordance with the intent of the drawings and specifications.

E. It is the responsibility of the Contractor to insure that items installed fit the space available with adequate room for proper equipment operation and maintenance. Contractor shall make field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation provides a complete and operational system that complies with the requirements of the drawings and specifications.

F. The Contractor shall be responsible for coordinating proper location of roughing in and connections by other trades. Changes associated with coordination requirements shall be made at no increase in the Contract amount or additional costs to other trades.

G. The Contractor shall support work and equipment plumb, rigid and true to line. The Contractor shall determine how equipment, fixtures, conduit, etc., are to be installed, as required by codes, drawings and specifications. Foundations, bolts, inserts, stands, hangers, brackets and accessories required for proper support shall be provided by

the Contractor, whether or not specifically indicated on the drawings.

1.6 SUBMITTALS

A. Submit manufacturer's data or shop drawings of the following items giving full information as to the dimensions, materials, and other information required to define compliance with the specifications. Other items to be submitted are listed in the specification sections.

Handholes/Manholes/ Pull Boxes and Accessories	S-1 Plug Cutouts and Cabinet
Ductbanks	Constant Current Regulator
Conduit	ALRCS
Support Hardware	Multi-hole Adapter Ring
#10 Copper Cable	Fixture Bases, and accessories
#6 Copper Cable	Shop Drawings
Support Hardware	Tape 3/8+ -
Cadweld	Identification Tags
316 Stainless Steel Bolts	Ground Rods
Fixture Installation and Location	Grounding

B. When requested by the Engineer, samples of these items shall be submitted for approval. Equipment/installation diagrams shall also be submitted for approval, as required by project specifications and/or requested by the Engineer.

C. Contractor submittal package shall include a typewritten list indicating each bid item, with a breakdown of all item components and all parts that are assembled or associated with bid item installation.

D. Submittal package list shall indicate: (1) Bid item number, (2) Part numbers of associated item components, as required and (3) Reference page number where item and components information is located in the submittal package. The contractor shall organize submittals so that common components to multiple bid items are not duplicated in the submittals.

E. Checking of submittals by the Engineer is done only as an aid to the Contractor and approval of submittals shall not relieve Contractor of responsibility for any errors or omissions in the submittals, nor shall it relieve the Contractor of total responsibility for proper and complete execution of the job.

PART 2 - PRODUCTS – Not used

PART 3 - EXECUTION

3.1 INSPECTION AND TESTING

A. All work performed by the Contractor shall be subject to periodic inspections by the ~~City~~ Engineer, the Owner’s Representative, and the Owner's Construction Manager to

verify that the installation is in compliance with the applicable requirements of these specifications.

3.2 AOA AREA INSTALLATION PROVISIONS

A. To enhance personnel safety and avoid contractual problems, the Contractor shall comply with the provisions indicated below.

3.3 ELECTRICAL WORK PROVISIONS.

A. Existing Underground Utilities. At least forty-eight (48) hours prior to beginning any excavation within the AOA, locations of all utility lines in the construction area will be identified and marked with surveyor flags by appropriate utility personnel. The Contractor shall be responsible for maintaining the location flags. Any flags displaced shall be replaced by the Contractor. The Contractor shall coordinate with Construction Manager any additional prior notification time required during weekend and/or holiday work periods.

B. Also at least forty-eight (48) hours prior to beginning any excavation within the AOA, the contractor shall request the DFW Airport construction manager to have airport staff identify circuits in proposed excavation areas. The Contractor shall coordinate with Construction Manager any additional prior notification time required during weekend and/or holiday work periods.

C. The above noted line identification information shall not relieve the Contractor of the responsibility of pinpointing underground lines to avoid unplanned disruptions or disturbing of installation or operation of underground lines in construction areas. Contractor shall use cable tracing equipment or other methods approved by the Construction Manager at his disposal, to pinpoint line locations. Excavation shall not proceed until all underground lines have been identified to the satisfaction of the Construction Manager.

D. Repair of underground lines damaged by the Contractor shall be the sole responsibility of the Contractor.

3.4 TEMPORARY AND BYPASS CIRCUIT PROVISIONS

A. During construction, temporary or bypass wiring or cable installations may be required to maintain operation of certain equipment, as indicated in Construction Documents and/or as specified. Temporary/bypass circuit installations shall adhere to provisions indicated below.

1. General Requirements. Contractor shall review the requirements in the specifications and Construction Documents, including, but not restricted to: Phasing and Sequencing Plans, Demolition Plans and Wiring Diagrams. Contractor shall determine locations, sizes and quantities of temporary/bypass wiring and conduits required for project construction.
2. At least 14 days prior to commencement of installation of temporary/bypass wiring, the Contractor shall submit a layout of proposed temporary/bypass conduits and circuits to the Construction Manager for review and approval, including proposed installation protection provisions.

3. Equipment and Materials. Temporary/bypass wiring shall meet the requirements of Section 260543 – Underground Electrical Duct Banks and Conduit (Item 260543), and shall also conform to the Construction Plans. Temporary/bypass wiring shall be identified at junction points with brass tags as approved by the Construction Manager.
4. Installation. Temporary/bypass circuits shall be installed with due consideration to personnel safety and circuit protection against physical damage. All damage to existing circuits as a result of Contractor action or inaction shall be corrected accordingly at the Contractor's expense and corrective action approved by the Owner.
5. Temporary/bypass, high voltage lighting system cables shall be protected from damage by vehicles with suitable fencing, barriers and/or adequately sized boards or timbers.
6. Temporary/bypass circuits shall be removed immediately upon completion of construction or purpose for which the wiring was installed. Upon removal of boards or timbers fastened to the pavement surface to protect temporary/bypass circuits, the Contractor shall repair the pavement with materials and methods approved by the Construction Manager. Temporary/bypass cable and counterpoise shall be removed and discarded off the Airport by the Contractor.

3.5 EXISTING ELECTRICAL EQUIPMENT AND MATERIALS

A. The Contractor shall remove all existing wiring and electrical equipment made unnecessary by the new installation. All materials removed shall become property of the Contractor and disposed of by the Contractor. The Contractor shall list materials according to type, class and/or size, and store or dispose of materials as directed by the Construction Manager.

3.6 POWER SERVICE CONTINUITY

A. Provide labor, materials and supervision required to maintain full capacity power service continuity when connection or modifications are made to existing systems and facilities. Do not interrupt service without prior consent of the Construction Manager, with a definite understanding of time and duration of outage. All outages will take place at a time for minimum disruption of facility activity. Coordinate with Owner.

3.7 AS-BUILT DRAWINGS

A. The Contractor shall maintain a set of as-built drawings on the job site as required the General Provisions of the Contract. Contractor shall mark on the as-built drawings all work details, alterations installed to meet site conditions and changes made by Change Notices. As-built drawings shall be kept available for inspection by the Construction Manager and/or the ~~City~~ Engineer at all times.

B. Airfield wiring verification diagrams shall be maintained throughout the project and later submitted to DFW Planning, Design, and Construction upon completion. These field wiring diagrams shall depict the exact routing and number of cables installed in each conduit originating from the airfield lighting vaults and extending to each manhole, handhole, pullbox, sign, and lighting fixture for each new circuit or circuit revision.

PART 4 - MEASUREMENT AND PAYMENT

4.1 There is no separate measurement or payment for this section. Payment for items included in this section will be incidental with the item in which they are installed.

END OF SECTION

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SECTION 260533 – BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish and install wall and ceiling outlet boxes, floor boxes, and pull and junction boxes.

1.2 RELATED SECTIONS

A. Section 260519 - Wire and Cable.

B. Section 260553 - Electrical Identification.

C. Section 260543 – Underground Electrical Duct Banks and Conduit

1.3 REFERENCES

A. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NFPA 70 - National Electrical Code.

PART 2 - PRODUCTS

2.1 MANHOLES, HANDHOLES AND PULLBOXES

A. Pre-cast or cast-in-place manholes, handholes, and pullboxes shall be located as shown on the plans.

B. Dimensions and reinforcement shall be as noted on plans. See Standard Detail Drawings for electrical pull boxes and CTMS Type 1 Ground Boxes.

C. The Contractor shall prepare and submit detailed shop drawings for pre-cast and cast-in-place concrete pullboxes and manholes indicating reinforcement, dimensions and details of each miscellaneous item.

1. All shop drawings shall be checked by the fabricator before being submitted for approval to the Construction Manager and Engineer-of-Record.

2. The Contractor shall be responsible for the correctness and completeness of the drawings and fit and field connections even if the drawings have been approved by the Construction Manager.

D. Concrete used for the construction of pre-cast or cast-in-place manholes and pullboxes shall conform to the requirements of Item ~~P-610, Structural Portland Cement Concrete~~ *360*.

E. All reinforcing steel shall be of the size and in the location as shown on the plans. Reinforcing steel shall conform to the requirements of Item ~~P-610, Structural Portland Cement Concrete~~ *360*.

F. Duct terminators or end bells shall be provided in manhole, pull box, and handhole walls. They shall have a smooth, bull-nosed edge.

1. Terminators shall be formed of high impact, high strength, prime virgin acrylonitrile butadiene styrene (ABS) plastic, containing the proper number, size and arrangement of openings to receive ducts installed under this contract.

2. Terminators shall be hollow, 6 inches outside-to-outside of interior and exterior surfaces, to allow placement of reinforcing steel inside. Terminators shall be provided and installed for reception of future ducts. Only factory-fabricated plastic plugs of proper size shall be furnished and installed in the duct openings.

G. Frames and covers shall be East Jordan Iron Works, Inc.; Neenah Foundry Company, or as shown on the plans, or approved equivalent. Frames and covers shall be constructed in accordance with the details and shall be placed carefully to the lines or grades indicated on the plans. Frames and covers shall be hinged and vermin proof. Covers shall have built-in, flush lifting eyes or pockets with stainless steel rods for ease of cover lifting. Bolted-on or U-bolt type devices shall not be acceptable as cover lifting eyes. Cover bolts shall be corrosion resistant, all thread, 18-8, type 304 stainless steel. Threaded studs are not acceptable for bolting down covers. Covers are to include torsion assist stainless steel springs.

H. Castings, whether carbon-steel, gray steel iron or ductile iron, shall conform to the shape and dimensions shown on the plans and shall be clean, substantial castings, free from sand or blow holes or other defects. Surfaces of the casting shall be free from burnt-on sand and shall be reasonably smooth.

1. Bearing surfaces between manhole covers and frames shall be cast and machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact.

2. Cast iron castings shall conform to the requirements of the Standard Specification for "Gray Iron Castings," ASTM Designation A48, Class No. 30.

3. Ductile iron castings shall conform to the requirements of the Standard Specifications for "Modular Iron Casting," ASTM Designation A536.

I. Pulling rings for cable installations shall be cast iron. Rings shall be Line Material Industries, Milwaukee, Wisconsin, Model No. DU2T2, or as otherwise shown on the plans, or approved equivalent. U-bolt or bolted-in type pulling rings shall not be acceptable.

J. Threaded inserts shall be Star Holzin, or approved equivalent, 1/2-inch diameter x 2 3/8-inch, unless otherwise noted on the drawings. Bolts shall be of the size indicated on drawings or as required.

K. Cable support racks shall be as detailed on the drawings.

L. Except for manhole and pullbox covers, frames and their related fittings and ground rods, all items specified under this section shall be galvanized after fabrication. Galvanizing of bolts, nuts, threaded inserts, and other connection devices shall conform to ASTM A 153, Class C or D, or to. ASTM B633. Galvanizing of other steel items shall conform to ASTM A 123 or A 153.

M. Utility Company Handholes or Manholes must be coordinated with the utility company for exact size, rating, covers, drainage, bedding and exact locations. If no information is received from the utility company, then provide a manhole with the following characteristics: 5' x 5' x 5' minimum interior dimensions with 3" round sump drain with a 6" diameter x 18" deep gravel bed, spring-loaded steel bolt-down cover, rated for 20,000lb load rating minimum. Exact requirements must be obtained by the local utility company and installation must follow the local utility company requirements.

2.2 EQUIPMENT ENCLOSURES

A. All outdoor equipment enclosures shall be stainless steel, NEMA 3R for wet locations. All doors shall be hinged and lockable.

2.3 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on Drawings are approximate unless dimensioned.

C. Locate and install boxes to allow access. Provide access doors where installation is inaccessible. Coordinate locations and sizes of required access doors with those specified in Division 08 - Openings.

D. Locate and install to maintain headroom and to present a neat appearance.

PART 3 - EXECUTION

3.1 PULL AND JUNCTION BOX INSTALLATION

A. Support pull and junction boxes independent of conduit.

B. Provide pull boxes in feeder and branch circuits as required.

C. Identify all junction boxes by circuit number engraved on the cover.

D. Provide weatherproof pull boxes or junction boxes where installed outdoors with watertight gasketed covers fastened by means of corrosion resistant screws.

PART 4 - MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT

A. Electrical or communication handholes, shall be measured by each unit, completed in

place and accepted. This shall include the handhole structure, lid, cover and ID tag, saddle racks, ducts plugs, labels, encasement, ground rod with test report and connections, sump drain with gravel pit and all required excavation, foundation, dewatering, backfilling, sheeting and bracing, restoration of disturbed areas and connections. Separate measurement shall be made for the various types and sizes.

4.2 BASIS OF PAYMENT

A. The accepted quantity of electrical or communication handholes 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 conduit and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Line Item 260533 -1	24” x 36” x 24” Pullbox – Per Each
Line Item 260533 -2	48” x 48” x 48” Electrical Handhole – Per Each
Line Item 260533 -3	Utility Company Hand Hole – Per Each

END OF SECTION

SECTION 260543 - UNDERGROUND ELECTRICAL DUCTBANKS AND CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This item shall consist of underground electrical ducts installed in accordance with this specification at the locations and in accordance with the dimensions, designs, and details shown in the plans. This item shall include the installation of all underground electrical ducts or underground conduits. It shall also include all trenching, backfilling, removal, and restoration of any paved areas; manholes, concrete encasement, mandreling installation of nylon pull string and duct markers, capping, and the testing of the installation as a completed duct system ready for installation of cables, to the satisfaction of the Engineer.

1.2 GENERAL

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

B. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer’s certification of compliance with the applicable specification when requested by the Engineer.

C. Manufacturer’s certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the Engineer and replaced with materials that comply with these specifications, at the Contractor’s cost.

D. All materials and equipment used to construct this item shall be submitted to the Engineer for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete 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.

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.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Concrete shall conform to Item *360* ~~403S, Structural Portland Cement Concrete~~ and ductbanks shall be encased in Class D Concrete, 1500 psi.

2.2 STEEL CONDUIT

A. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10 mil thick coat of asphaltum sealer or shall have a factory bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mil of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions.

2.3 PLASTIC CONDUIT

A. Plastic conduit and fittings-shall conform to the following requirements:

1. UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
2. UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
3. UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
4. UL 651A covers W-C-1094-Rigid PVC Conduit and high density polyethylene (HDPE) Conduit type III and Class 4.

B. 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:

1. Type I–Schedule 40 PVC suitable for underground use either direct-buried or encased in concrete.
2. Type II–Schedule 40 PVC suitable for either above ground or underground use.
3. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
4. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

C. The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

2.4 SPLIT CONDUIT

A. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

2.5 CONDUIT SPACERS

A. 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.

2.6 CONCRETE

A. Concrete shall conform to Item *360* ~~P-610, Structural Portland Cement Concrete,~~ using 1/8 inch maximum size coarse aggregate with a minimum 28-day compressive strength of 4000 psi. Where reinforced duct banks are specified, reinforcing steel shall conform to ASTM A615 Grade 60. Concrete and reinforcing steel are incidental to the respective pay item of which they are a component part.

2.7 FLOWABLE BACKFILL

A. Flowable material used to back fill conduit and duct bank trenches shall be designed utilizing a minimum of 5 lb cement (ASTM C150 – Type II) and 250 lb fly ash (ASTM C618, Class C or F) per cubic yard with remainder of volume consisting of sand, water and only approved admixtures to achieve a compressive strength of 100 to 200 psi when tested in accordance with ASTM D 4832 after 28 days.

2.8 TRENCH MARKING TAPE

A. The Contractor shall furnish and install trench marking tape (warning tape) over the top of concrete encased single and multi-way duct bank for the full length of the duct bank and below the ground surface in the non-encased conduit trench at no separate payment. Distances above duct bank and above non-encased conduit shall be as shown on the plans. The tape shall be 6 inches (150 mm) wide except where shown otherwise on the plans, 4 mils thick, bright red in color, marked “Electric Line Buried Below”.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The Engineer shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. No duct bank or underground

conduit shall be less than 18 inches (0.5 m) below finished grade. Where under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade.

B. 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.

C. 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 Engineer of any blockage in the existing ducts.

D. 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.

E. 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).

F. 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.

G. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

H. 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.

I. When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4 inch (6 mm) sieve. Flowable backfill may alternatively be used The Contractor shall ascertain the type of soil or rock to be excavated before bidding.

All such rock removal shall be performed and paid for under Item *110* ~~P-152~~.

J. Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the Engineer. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

K. 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).

L. Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

M. Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the Engineer, the unsuitable material shall be removed per Item *110* ~~P-152~~ and replaced with suitable material. Alternatively, additional duct bank supports that are adequate and stable shall be installed, as approved by the Engineer.

N. All excavation shall be unclassified and shall be considered incidental to the respective ~~L-110~~ *Spec 260543* pay item of which it is a component part. Dewatering necessary for duct installation, erosion and turbidity control, per Federal, state, and local requirements is incidental to its respective pay item as a part of ~~Item L-110~~ *Spec 260543*. The cost of all excavation regardless of type of material encountered, shall be included in the unit price bid for the ~~L-110~~ *Spec 260543* Item.

O. Unless otherwise specified, excavated materials that are deemed by the Engineer to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

P. Any excess excavation shall be filled with suitable material approved by the Engineer and compacted per Item *110* ~~P-152~~.

Q. 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 Engineer, with care taken to minimize possible damage or disruption of existing cable,

including careful backfilling in area of cable.

R. In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

3.2 DUCT BANKS

A. 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.

B. 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, proper provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. Where two or more conduits in the duct bank are intended to carry conductors of equivalent voltage insulation rating, the Contractor shall space the conduits not less than 1.5 inch (37 mm) apart (measured from outside wall to outside wall). Where two or more conduits in the duct bank are intended to carry conductors of differing voltage insulation rating, the Contractor shall space the conduits not less than 3-inches apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. End bells or couplings shall be installed flush with the concrete encasement at access points.Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

C. Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

D. 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.

E. 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.

F. 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.

G. When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the Engineer shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the Engineer.

3.3 CONDUITS WITHOUT CONCRETE ENCASEMENT

A. 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.

B. Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4 inch (6 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

C. 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.

D. When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

E. 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.

F. Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the

earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the Engineer for review prior to use.

3.4 BACKFILLING FOR CONDUITS

A. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 “Excavation and Embankment” except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

B. Flowable backfill may alternatively be used.

C. Trenches shall not contain pools of water during back filling operations.

D. 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.

E. Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

3.5 BACKFILLING FOR DUCT BANKS

A. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item *110* ~~P-152 “Excavation and Embankment”~~ except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of ~~P-152~~ *Item 110*, 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.

B. Flowable backfill may alternatively be used.

C. Trenches shall not contain pools of water during backfilling operations.

D. 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.

E. Any excess excavated material shall be removed and disposed of per instructions issued by the Engineer.

3.6 RESTORATION

A. 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 a minimum of 4" seeding and topsoiling.as

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~~ *Spec 260543* 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.

3.7 BORE DRILL

A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of the project. Perform the work in general conformance with ASTM F1962, current revision, “Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles, Including River Crossings.”

B. Locate all existing utilities in the area of the bore drill pathway prior to construction. Call all applicable municipalities and review existing landmarks. The contractor shall install a pilot bore prior to actual bore drilling operation to assure clear pathway. Keep detailed records of bore depth, pitch, fluids used and any special conditions. Monitor and adjust the drilling fluid mix as needed to match soil conditions. Once pilot bore has verified a clear pathway, then bore hole may be reamed and enlarged for installation of pipe.

C. Where pipe joints are required consult the PVC manufacturer on guidance for the proper connection methods approved for their products. Where butt fusion is approved, follow ASTM D3261. Test butt splice joint in accordance with ASTM D638. Use a data logging device to record the critical butt fusion parameters and procedures used in making each butt fusion joint. Compare the records to the pipe manufacturers butt fusion procedures to make sure the joints were made properly before pulling the pipe back into the bore hole.

D. The guidance system shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

E. The conduit duct shall be HDPE Schedule 80 PVC conduit. Conduit shall have an SDR ration of 9 or 11. The Contractor is responsible for selection of Schedule 80 PVC raceway that is compatible with the proposed directional bore method and equipment.”

F. The drilling fluid must be a mixture of Bentonite drilling clay, project specific cutting fluid additives and potable water is to be used at the cutting fluid and over ream hole filler. The drilling fluid mixture shall have the following viscosities as measured by a March Funnel:

1. Rock Clay - 60 sec.
2. Hard Clay - 40 sec.
3. Soft Clay - 45 sec.
4. Sandy Clay - 90 sec
5. Stable Sand - 120 sec.
6. Loose Sand - 150 sec.
7. Wet Sand - 150 sec.

G. The Contractor will contain all drilling and pipe lubricating mud by taking special measures to prevent run-off onto adjacent properties and/or waterways. All surplus drilling and pipe lubricating mud will be removed from the site and properly disposed of by the Contractor at no cost to the Owner. The Contractor will also be responsible for all required erosion control measures at no cost to the Owner.

~~3.8 COUNTERPOISE WIRE~~

~~A. Counterpoise wire shall be installed as specified in Item L-108.~~

PART 4 - MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT

A. Underground conduits and duct banks shall be measured by the linear feet of conduits and duct banks installed, including conduit, conduit transitions at existing pavement, couplings, endbells, encasement, locator tape, bore casing and pit excavation, trenching and backfill with designated, resolution, and incidentals necessary all measured in place, completed, and accepted. Also incidental to the ductbank item is modifications to existing pullbox or manhole to accept new ducts. Separate measurement shall be made for the various types and sizes.

B. Underground conduits and duct banks directional drilled shall be measured by the linear feet of conduits and duct banks installed, including drilling equipment, drill pit with associated excavation, backfill and restoration, drill fluids and all incidentals, conduit plugs, all measured in place, completed, and accepted. Separate measurement shall be made for the various types, sizes and installed location

4.2 BASIS OF PAYMENT

A. 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, and/or removal of conduit. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Payment will be made under:

Line Item 260543 -1 2-way, 4” Sch. 40 PVC, Concrete Encased, Directional Drilled – Per Linear Foot

Line Item 260543 -2 2-way, 4" Sch. 40 PVC, Concrete Encased, Direct Buried – Utility Company – Per Linear Foot

Line Item 260543 -3 1" Sch. 40 PVC, Installed in Earth – Per Linear Foot

Line Item 260543 -4 3-way, 1" Sch. 40 PVC, Installed in Earth – Per Linear Foot

Line Item 260543 -5 4-way, 1" Sch. 40 PVC, Installed in Earth – Per Linear Foot

Line Item 260543 -6 1-1/2" Sch. 40 PVC, Installed in Earth – Per Linear Foot

~~Line Item 260543 -7 2-way, 1-1/2" Sch. 40 PVC, Installed in Earth – Per Linear Foot~~

~~Line Item 260543 -8~~*Line Item 260543 -7* 3-way, 1-1/2" Sch. 40 PVC, Installed in Earth – Per Linear Foot

~~Line Item 260543 -9~~*Line Item 260543 -8* 4-way, 1-1/2" Sch. 40 PVC, Installed in Earth – Per Linear Foot

~~Line Item 260543 -10~~*Line Item 260543 -9* 2-way, 2" Sch. 40 PVC, Installed in Earth – Per Linear Foot

~~Line Item 260543 -11~~*Line Item 260543 -10* 4-way, 2" Sch. 40 PVC, Installed in Earth – Per Linear Foot

MATERIAL REQUIREMENTS

Fed.Spec.W-C-1094 Conduit and Conduit Fittings; Plastic, Rigid (cancelled; replaced by UL 514 Boxes, Nonmetallic Outlet, Flush Device Boxes, & Covers, and UL 651 Standard for Conduit & Hope Conduit, Type EB & A Rigid PVC)

Underwriters Laboratories Standard 514B	Fittings for Cable and Conduit
Underwriters Laboratories Standard 1242	Intermediate Metal Conduit
Underwriters Laboratories Standard 651	Schedule 40 and 80 Rigid PVC Conduit (for Direct Burial)
Underwriters Laboratories Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit (for concrete encasement)

END OF SECTION

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SECTION 265000 - LIGHTING FIXTURES - SITE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Furnish and install light fixtures associated with site, including:

1. Exterior luminaires and accessories.
2. Lamps.
3. Ballasts.
4. Poles.
5. Pole bases.

1.2 RELATED SECTIONS

A. Section 260519 - Wire and Cable.

1.3 SUBMITTALS

A. Include product data for fixtures, including photometric data, reflectance, lens, lamps, ballasts, poles and lighting control.

B. Furnish samples upon request.

C. Provide operation and maintenance manual.

1.4 QUALITY ASSURANCE

A. Manufacturers of individual lighting fixtures shall be as scheduled on Drawings; manufacturers scheduled represent quality and design features required. Products of other manufacturers will be considered upon submittal of proper data.

PART 2 - PRODUCTS AND MATERIALS

2.1 MANUFACTURERS

A. Lamps:

1. Philips

B. Ballasts:

1. Advance.
2. Universal.
3. Valmont.

C. Paint

1. Matthews Paint Co. - "Brushed Aluminum"

2.2 EXTERIOR LUMINAIRES AND ACCESSORIES

A. Enclosures: Complete with gaskets to form weatherproof assembly. Use stainless steel NEMA 4x enclosures unless otherwise noted. All housing access shall use latches for tool-less maintenance.

B. For apron pole light, housing shall be one-piece die-cast, low copper aluminum alloy with integral cooling ribs over the optical chamber and electrical compartment. Housing shall include double thick wall with gussets on the support arm mounting end.

C. All light fixtures shall be provided with stainless steel hardware or electro-zinc plated steel hardware.

D. All fixtures to include full uplight cut-off and aircraft louver.

E. Provide low temperature ballasts, with reliable starting to minus 20 degrees F.

F. Provide fixtures with tempered glass lens. The reflector module shall be one-piece assembly consisting of multiple specular Alzak segments as needed to achieve the specified distribution pattern. The reflector shall be sealed with plug-in connections to the fixture electrical compartment.

2.3 LED LAMPS.

A. Provide fixtures with LED Lamps where noted on the contract drawings. Lamp color temperature to be 3000K.

2.4 HID LAMPS

A. Metal Halide:

1. Clear, 4000EF, standard output.
2. Phosphor coated, 3200EK, standard output.

B. High Pressure Sodium:

1. Phosphor coated, 3000EK, standard output.

2.5 HID BALLASTS.

A. High power factor and potted for low noise.

2.6 LIGHTING POLES

A. As scheduled on Drawings. Provide poles compatible with fixtures, style, finish and mounting.

B. Metal Poles: Steel lighting pole with anchor base. Provide permanent paint as scheduled, electrostatic powder epoxy finish, 3 to 5 mils thick. Straight or tapered round steel as scheduled. Provide color to match color of light fixtures. Pole must have minimum 250 LB weight capacity.

C. Wind Load: 120 mph velocity with luminaires, brackets and related equipment mounted. Deflection at 30 feet above grade less than 5 inches from vertical with 100 mph wind velocity and luminaires, brackets and related equipment mounted.

D. Hand Hole: Drilled hand access hole at manufacturer's standard location. Provide matching gasketed cover plate. Provide additional hand holes or selected poles as indicated.

E. Anchor Bolts: As recommended by pole manufacturer. Provide template, flat washers, lock washers, and hex nuts for each pole. Provide bolt cover. Cover shall extend below anchor base to conceal leveling nuts.

F. Each pole to have internal grounding lug.

G. Mounting Brackets: As scheduled on Drawings. Provide mounting brackets compatible with pole, style, finish, and mounting.

H. Vibration Damper: Provide vibration damper on pole exterior as noted on plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All site pole foundations to be closely coordinated with the apron pavement. All poles shall be located aligned and consistent with spacing as shown in the contract documents. Stake all fixture locations for approval by engineer prior to rough-in. All poles shall be located in parking islands, outside of curb lines and sidewalks.

B. Concrete Pole Bases: Size and construct as indicated on the pole base detail. Project anchor bolts 2 inches above base. Install poles on bases plumb; provide double nuts for adjustment. Grout around pole base after aligning pole. Install base cover.

C. Provide ground rod at each pole connected to ground lug with No. 6 AWG bare copper conductor.

D. Use belt slings to raise and set pre-finished poles. Support and protect pole during lifting and setting operations to prevent damage to finish on poles.

E. Provide styrofoam wedge at midpoint to prevent wire flapping inside pole and provide conductor stress relief at top of pole.

F. Connect photocell into system to signal darkness and timeclock to de-energize system at a preset time.

3.2 FIELD QUALITY CONTROL

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Repair luminaire and pole finish at completion of work to "as new" condition. If pole finish is marred or damaged and cannot be restored to "as new" condition, replace pole.

C. Aim luminaire as directed. Provide services of mechanic and bucket truck for night time adjustment before completion.

D. Demonstrate proper operation of all luminaires and controls.

PART 4 - MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT

A. Exterior Lighting shall be measured by each light pole installed. This item shall include all work and materials installed complete including, but not limited to, the pole, pole bracket, anchor bolts, ground rod and connections, foundation, light fixture(s), ballast(s), lamp(s), accessories noted in schedule, mounting hardware, painting, terminations, testing and labels. This item include the associated lighting controls as noted in the fixture schedule.

4.2 BASIS OF PAYMENT

A. Payment for these items shall include all components, installed complete. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with the provisions and intent of the plans and specifications.

Payment will be made under:

~~Line Item 265000-1 Single head LED Light pole w/ foundation - Per Each.~~

~~Line Item 265000-2~~*Line Item 265000-1* Dual head LED light pole w/ foundation - Per Each

END OF SECTION

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Project overview for the DFW South Cell Parking Lot at Dallas-Ft Worth International Airport.
2. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 1, General Requirements, and other provisions and requirements of the contract documents apply to work of Division 27 – Technology Infrastructure.
3. Each section included in Division 27 incorporates this section by reference and is incomplete without the provisions stated herein.
4. Coordinate work included in other Divisions, which affect the work in this Division.
5. ~~Mobilization for the project.~~

B. Project Overview:

1. The Telecommunications System for this project will be comprised of several components including the structured cabling system (SCS), telephone system, and active data network system, These components, as well as other related components, will be discussed individually in the following sections. The related components of the telecommunication system include grounding, administration, MEP requirements, as well as interfacing with other systems such as security.
2. The telecommunications system design will be based on the Electronic Industries Association/ Telecommunications Industries Association (EIA/TIA) standards as well as the Building Industry Consulting Services, Inc. (BICSI) standards and the DFW Design Criteria Manual.
3. The horizontal and backbone cabling and connectors will meet the DFW Design Criteria Manual. The only approved structural cabling solutions for horizontal and backbone cabling is Panduit/General. Substitutions for these SCS products are not permitted. Refer to Section 1.5 below for contractor requirements.
4. All horizontal cabling on this project will be Cat 6A rated, minimum.
5. The Structured Cabling Infrastructure (SCS) will be a new cable infrastructure system installed to support voice, data, A/V, CATV and Security Systems as noted on the contract documents. All new structured cabling will route via new and existing pathways to the ER Telecom Room or Smart Demark Location as noted on the contract documents.
6. The contractor shall provide and test a permanent link solution for the structured cabling system.
7. All horizontal and backbone cable routes will be installed in conduit.

1.2 REFERENCES

A. Section 270510 – Telecommunication Administrative Requirements.

B. Division 28 – Electronic Safety and Security.

C. Telecommunications Industry Association /Electronic Industries Association (TIA) 568 Commercial Building Telecommunications Cabling Standard, latest edition.

D. National Electrical Manufacturers Association (NEMA).

E. American Society for Testing Materials (ASTM).

F. National Electric Code (NEC®).

G. Institute of Electrical and Electronic Engineers (IEEE).

H. International Standards Organization/International Electromechanical Commission (ISO/IEC) DIS 11801, latest edition.

I. Underwriters Laboratories (UL®) Cable Certification and Follow Up Program.

J. Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910, Permit-Required Confined Spaces for General Industry; Final Rule.

K. DFW Design Criteria Manual.

L. 150/5360-13, latest edition, Planning and Design Guidelines for Airport Terminal Facilities

1.3 DEFINITIONS AND ABBREVIATIONS

A. Provide: Where the word "provide" is used, the word is understood to mean, "the Contractor shall furnish and install" the equipment, tests, inspections, etc. referenced.

B. Related Work: The sections referenced under the article RELATED SECTIONS are understood to include provisions which directly affect the work being specified in the section where the RELATED SECTIONS article occurs.

C. Concealed: Where the word "concealed" is used in conjunction with raceways, equipment and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings.

D. Exposed: Where the word "exposed" is used, the word is understood to mean open to view.

E. Above Finished Grade – AFG

F. Above Finished Floor – AFF

G. American Wire Gauge – AWG

H. Dallas-Ft. Worth - DFW

I. Equipment Room – ER

J. Gigabits Per Second – Gbps

K. Intermediate Distribution Frame – IDF

L. Main Cross Connect – MC

M. Main Distribution Frame – MDF

N. Megabits Per Second - Mbps

O. Multimode Fiber Optic Cable – MM

P. Not in Contract – NIC

Q. Optical Fiber – OF

R. Polyvinyl Chloride - PVC

S. Refer to - RE:

T. Singlemode Fiber Optic Cable – SM

U. Structured Cabling System - SCS

V. Telecommunication Closet - TC

W. Telecommunications Room – TR

X. Telecommunications Main Grounding Busbar – TMGB

Y. Typical – TYP

Z. Unless Otherwise Noted – UON

AA. With – w/

1.4 CONTRACT DRAWINGS

A. Drawings are generally diagrammatic and are intended to encompass a system that will not interfere with the structural and architectural design of the building. Coordinate the work to avoid interferences between conduit, equipment, architectural and structural work.

B. Coordinate with architectural features, trim and millwork details, and install equipment in cabinets or other special areas as directed by A/E.

C. Drawings are based on equipment specified as the ‘basis of design’. Make adjustments, modifications or changes required, due to use of other equipment, at no additional compensation.

1.5 QUALITY ASSURANCE

A. Submit written proof that the requirements outline in Section 270510 – Telecommunication Administrative Requirements are being met.

1.6 MATERIALS AND WORKMANSHIP

A. Provide new materials and equipment of a domestic manufacturer by those regularly engaged in the production and manufacture of specified materials and equipment. Where Underwriter's Laboratories or other agency has established standards for materials, provide materials, which are listed and labeled accordingly. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Perform work by workmen skilled in the trade required for the work. Install all materials and equipment to present a neat appearance when completed and in accordance with the approved recommendations of the manufacturer and the best practices of the trade and in conformance with the Contract Documents.

C. Provide all labor, materials, apparatus, and appliances essential to the complete functioning of the systems described or indicated herein, or which may be reasonably implied as essential whether mentioned in the Contract Documents or not.

D. In cases of doubt as to the Work intended or in the event of need for explanation thereof, make written request for supplementary instructions to A/E.

E. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements are the minimum standards acceptable. The right to judge the quality of equipment that deviates from the Contract Documents remains solely with A/E.

F. Exterior and interior raceway systems may be installed by a licensed electrical contractor.

G. Cable terminations and testing shall be performed only by the channel solution manufacturers Certified Contractor.

H. If a part number shown in this document has been discontinued or is no longer in production, then the manufacturer's replacement part number shall be used. If there is no replacement part number, then the contractor shall notify the engineer in writing requesting instructions for an approval replacement part number.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Follow the manufacturer's directions completely in the delivery, storage, and handling of equipment and materials.

B. Store equipment in a clean, dry place, protected from other construction. While stored, maintain factory wrappings or tightly cover and protect equipment against dirt, water, construction debris, chemical, physical or weather damage, traffic and theft.

C. Adequately brace and package equipment to prevent breakage and distortion while in transit.

1.8 OPERATING INSTRUCTIONS

A. Provide the services of competent representatives of the manufacturer capable of certifying that the equipment is installed according to the manufacturer's recommendations, is operating properly, and to instruct the Owner's operating personnel during start-up and operating tests of the complete telecommunication system. Prove the operation of equipment to the satisfaction of A/E. Give at least seven days' notice to A/E prior to beginning equipment start-up.

B. Certify that these services have been performed by including a properly executed invoice for these services or a letter from the manufacturer.

C. Perform all tests outlined in Division 27.

1.9 SERVICE

A. Remove all excess material and debris. Place all telecommunication systems in complete working order before request for final review. Broom clean all areas.

B. Clean and polish all fixtures, equipment, and materials thoroughly, and return to "as new" condition.

1.10 FINAL REVIEW

A. Prior to requesting final payment, submit final approved operation and maintenance manuals including approved submittals, test reports and "AS-BUILT" drawings. Delivery of operation and maintenance manuals is a condition of final acceptance.

1.11 GUARANTEE

A. Guarantee materials, parts and labor for all work for one year from the date of issuance of occupancy permit. During that period make good any faults or imperfections that may arise due to defects or omissions in materials or workmanship with no additional compensation and to the complete satisfaction of A/E.

B. Refer to 270510 – Telecommunication Administrative Requirements for additional requirements.

1.12 SAFETY

A. The contractor shall follow the safety procedures.

1. The contractors shall be responsible for training all personnel under their employ in areas concerning safe work habits and construction safety. The contractor shall continually inform personnel on hazards particular to this project and update the information as the project progresses.

1.13 PROJECT/SITE CONDITIONS

A. Site Visitation: Visit the site of the proposed construction to thoroughly become familiar with all details of the work and working conditions, verify all dimensions in the field, and advise A/E of any discrepancy before performing any work.

B. Space Requirements:

1. Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material that is not suitable in this respect.
2. Make changes in equipment location of up to 5 feet, to allow for field conditions prior to actual installation, at no additional compensation, as directed by A/E.
3. Install all equipment requiring service so that it is easily accessible.
4. Compare the equipment sizes with the space allotted for installation before installation and make written notice of possible conflict. Disassemble large equipment to permit installation through normal room openings when required. Should written notice not be made in a timely manner, make adjustments and modifications necessary without additional compensation.
5. Timely place all equipment too large to fit through finished openings, stairways, etc.

C. Site Obstructions

1. The drawings indicate certain information pertaining to surface and subsurface obstructions, which has been taken from available drawings. Such information is not guaranteed; however, as to the accuracy of location or the completeness of the information.
2. Before any cutting or trenching operations are begun verify with A/E, utility companies, municipalities, and other interested parties that all available information has been provided. Verify locations given.
3. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
4. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown. If damaged, repair the lines at no additional compensation.

D. Cutting and Patching

1. Submit a written request to A/E in advance of cutting or alterations.
2. Execute cutting and demolition by methods, which will prevent damages to other work and will provide proper surfaces to receive installation of repairs.
3. Restore work which has been cut or removed; install new products complying with specified products, functions, tolerances and finishes as stated in the contract documents. Provide heavy chrome-plated or nickel-plated escutcheon plates of approved pattern for penetrations of finished surface. Approved escutcheon plates are B&C No. 10 with concealed hinges.
4. Fit work airtight to conduit, sleeves and other penetrations through surfaces. For fire-rated penetrations, provide in accordance with UL 1479 and ASTM E-814

assemblies utilizing products and materials equal to the rating of all surfaces penetrated.

E. Outages: All outages to existing on-line systems shall be coordinated and approved in writing by the owner prior to outage.

F. The contractor may have to perform some work after hours such as new cable pulls through active manhole systems, outage of existing services and such.

G. The contractor shall provide and install all cross-connect cabling, connectors, coupling panels. Couplers and any other materials necessary for a complete system installation when working in existing areas to extend active circuits.

1.14 IDENTIFICATION

A. Labeling

1. Label all backbone, horizontal and ground cables, tube cables, tubes, fiber strands, patch panels, patch panel termination positions, distribution frames, jacks, and cover plates.
2. Wire, tube and fiber labels shall be white vinyl with acrylic adhesive tape. Text shall be typed with minimum 12 point font. Cable labels must wrap the overall cable jacket by minimum 1.5 times and text shall repeat for full width of tape.
3. Label shall be attached to each cable or tube at each end and in all boxes.
4. Provide front adhesive label for individual patch panel positions. Label patch panels consecutively from bottom to top. Label shall be typed with minimum font size of 12 point.
5. Label shall be attached to fiber cable at each end and to each individual fiber at each end prior to termination.
6. Cable labels shall be placed in the following locations: on jack face plates, on cable inside back boxes, junction boxes, access points, and manholes/handholds, on cable above the terminations in the TR and ER, on patch panels, and every 50 feet when not in conduit.

B. Nameplates

1. Nameplates: Provide engraved three-layer laminated plastic nameplates with white letters on a black background.
2. Provide nameplates for the following:
   a. Equipment Racks and cabinets.
   b. Telecommunication Grounding Busbars.
   c. Equipment enclosures.
   d. Surveillance Cameras
3. Nameplate font shall be minimum 24 point, bold, all caps.

C. Color Codes

1. Data Outlets: Provide blue jack.
2. ER Patch Panel: Provide blue jack.
3. Blanks: Color shall match coverplate color.

D. Cable Jacket Colors

1. CAT 6/6A Data Cables: Provide blue jacket.
2. Singlemode fiber optic cable and associated patch cord: Provide yellow jacket.
3. Multimode fiber optic cable and associated patch cord: Provide orange jacket.
4. Laser Optimized 50 micron multimode fiber optic cable and patch cords: Provide aqua jacket.

E. Lightguide Interconnection Unit (LIU)

1. Attach nameplate to door of LIU. LIU label shall have building number, TR number, and numeric sequence.
2. List cable(s) and room number on LIU along with LIU name.
3. Provide continuous numbering sequence for individual fibers. Number individual fiber strands in LIU from 1 through 24, for cables with 24 fiber strands or less.
4. Use multiple LIUs for cables with greater than 24 fiber strands, and label sequentially according to number of fiber strands.

F. Telecommunication Cabinet: Floor-standing cabinet and wall-mounted cabinet.

1. Floor-standing cabinet nameplate shall have building number, color designation for classification of network, TR number, and sequential character.
2. Center label at top of front door of cabinet.

G. Fiber Termination Shelf

1. Label cable designation(s) on outside door of termination shelf.
2. Single shelf may hold more than one campus, backbone or horizontal cable. Do not split a single cable between shelves. Start numbering sequence from 1 within the shelf, and continue to last fiber strand within that cable, for cable larger than 4 fibers.
3. Label each individual coupler on coupler plate with appropriate sequential number for terminating shelves.
4. Each shelf shall contain either single-mode or multi-mode, not both.
5. Install multiple shelves for cables greater than 72 optical fibers. Label sequentially according to number of optical fibers.
6. Label 4-fiber user cables according to number of couplers in the shelf.
7. Include Rack Position identifier using. Alphanumeric coding.

H. Telecommunication Outlet: Voice/Data

1. Attach label with preassigned numeric value to outlet cover for appropriate outlet.

I. Backbone Conduit Pullbox: Install nameplate to cover of pullbox

J. Conduit: Label conduits with appropriate color-coded tape.

1. Install tie wrap label tag on each conduit end point that terminates in ER, MDF, TR, or stubbed through floor, ceiling or wall without pullbox.
2. Hand-letter with permanent black ink, in block type letters with clear, legible letters.

3. Match label information to information in nearest J-Box label that conduit leads to.
4. Provide all conduits greater than 1" with a label which includes the TO/FROM destination. Label to be located on each end of conduit and at 100' intervals. Label shall be white with black letters. Face label downward where visible and clear from below. Label to consists of the following font sizes:
   a. 1.25" – 2"conduit: ¼" Block letters with max 2 rows of text
   b. 2.25' – 3" conduit: ½" Block letters with max 2 rows of text
   c. Over 3" conduit: ¾" Block letters with max 2 rows of text

~~1.15 MOBILIZATION~~

~~A. The work covered under this item consists of preparatory work and operations, including but not limited to those necessary for the movement of personnel, equipment, supplies, and incidentals to the Project site; for the establishment of all offices, buildings, and other facilities necessary for work on the Project and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site.~~

~~B. The Contractor shall demobilize within 30 days after substantial completion of the work.~~

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 - MEASUREMENT AND PAYMENT

A. There is no separate measurement or payment for this section. Payment for items included in this section will be incidental with the item in which they are installed.

END OF SECTION

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SECTION 270526 - TELECOMMUNICATIONS GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

D. Communication system grounding.

E. Electrical equipment and raceway grounding and bonding.

F. Control equipment grounding.

1.2 REFERENCES

A. Related Specification Sections

1. Section 270500 Common Work Results for Communications
2. Section 270510 Telecommunication Administrative Requirements
3. Section 270543 Exterior Communication Pathways
4. Section 271100 Communication Cabinets and Equipment Rooms
5. Section 271300 Backbone and Riser Media Infrastructure
6. Section 271500 Horizontal Media Infrastructure

B. American Society for Testing and Materials (ASTM):

1. B 3 Soft or Annealed Copper Wires
2. B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, Soft
3. B 33 Tinned Soft or Annealed Copper Wire for Electrical Purposes

C. Institute of Electrical and Electronics Engineers (IEEE):

1. 142-82 Recommended Practice for Grounding of Industrial and Commercial Power Systems
2. 383-2.5 IEEE Standard for Type Test of Class IE Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations.
3. 1100 IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems.

D. Underwriters' Laboratories (UL):

1. 83 Thermoplastic Insulated Wire and Cables
2. 96 Lightning Protection Components
3. 96A System Installation
4. 467 Grounding and Bonding Equipment

E. National Fire Protection Association (NFPA):

1. 780 Lightning Protection Code
2. 70 National Electrical Code (NEC)
   a. NEC Article No. 250 - Grounding

F. American National Standards Institute/Telecommunications Industry Association/Electronic Industries Alliance (ANSI/TIA/EIA):

1. J-STD-607-A Commercial Building Grounding and Bonding Requirements.
2. Telcordia – Network Equipment Building Systems (NEBS) GR-1275.

G. Building Industry Consulting Services International (BICSI):

1. Telecommunications Distribution Methods Manual (Latest Issue)
2. Customer Owned Outside Plant Design Manual (Latest Issue)
3. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

H. Local, county, state and federal regulations and codes in effect as of date of “notice to proceed” shall be complied with.

I. Equipment of foreign manufacture must meet U.S. codes and standards. It shall be indicated in the proposal the components which may be of foreign manufacture, if any, and the country of origin.

J. Reference attached Figure 1 for general grounding infrastructure layout and connectivity.

K. Conflicts:

1. Between referenced requirements: Comply with the one establishing the more stringent requirements.
2. Between reference requirements and contract documents: Comply with the one establishing the more stringent requirements.

1.3 DESIGN REQUIREMENTS

A. Design grounding system following ANSI J-STD 607-A – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, BICSI Telecommunications Distribution Methods Manual, NECA/BICSI 607-2011, NEC Article No. 250 - Grounding, IEEE 1100 – Recommended Practices for Powering and Grounding Sensitive Electronic Equipment, and IEEE 142-82 - Recommended Practice for Grounding of Industrial and Commercial Power Systems, by a firm acceptable to Owner's insurance underwriter. All labeling shall follow standards set forth by ANSI/TIA/EIA-606 and Houston Airport System’s Information Technology (HAS-IT) requirements.

B. Design Standards:

1. Completely protect above-surface structures and equipment.
2. Calculate system on the basis of existing soil resistivity.
3. If cathodic protection for underground sewer pipe is installed (see applicable Division 2 Sections), ensure the pipe is not connected to the general grounding system, either directly through grounding cable or indirectly through grounded electrical devices connected to the pipe. Electrically isolate electrical devices from sewer pipe.

C. Radio Equipment

1. All Radio equipment/systems shall be grounded per Motorola Standard R56.

1.4 SUBMITTALS

A. Follow Section 013300 for the following:

B. Product Data:

1. Manufacturers catalog data and applicable special fabrication and installation details.
2. Installation, terminating and splicing procedures.
3. Instructions for handling and storage.
4. Dimensions and weights.
5. Conformance Certificate and Quality Assurance Release: Signed by QAP Manager. Specifically identify products and include purchase order number, supplements, and item number where applicable. Indicate that requirements are met and identify approved deviations.

1.5 QUALITY ASSURANCE

A. Furnish products of latest proven design, new and in current production. Do not use obsolete components or out-of-production products.

B. Tests for Insulated Cable: Pass vertical tray flame test following IEEE 383-2.5.

C. The Owner retains the right to inspect all work during the entire duration of the project and any items that do not adhere to the reference, contract, bid, or project documents will be corrected immediately at the expense of the contractor.

1.6 SHIPPING AND HANDLING

A. Ship on manufacturer's standard reel sizes of one continuous length. Where cut lengths are specified, mark reel quantity accordingly.

B. Protect wire wood lagging or suitable barrier across the traverse of reels. Provide heat-shrink self-sealing end caps on cable.

C. Equipment shall be delivered in original packages with labels intact and identification clearly marked. Equipment and components shall be protected from the weather,

humidity, temperature variations, dirt, dust, or other containments. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owners.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Cable Manufacturers/Suppliers:

1. Houston Wire and Cable Company
2. Okonite Company
3. Anixter
4. Graybar
5. CSC (Communication Supply Company)
6. Cablec Continental Cables Company
7. Pirelli Cable Corporation
8. Triangle Wire and Cable, Inc.

B. Ground Rod and Connector Manufacturers:

1. Copperweld
2. Thomas & Betts
3. Blackburn

C. Exothermic Connector Manufacturers:

1. Erico Products (Cadweld)
2. Burndy Corporation (Therm-O-Weld)
3. OZ Gedney

D. Grounding Connector Manufacturers:

1. Thomas & Betts
2. Burndy Corporation
3. O.Z. Gedney
4. Panduit

E. Telecommunications Busbars:

1. Erico Products
2. Cooper B-Line
3. CPI Chatsworth
4. Panduit

2.2 MATERIALS

A. Grounding Conductors: Bare or insulated copper AWG wire following ASTM-B3, ASTM-B8 and ASTM-B33, of following sizes:

1. A minimum of 6 AWG, stranded, insulated (green) copper conductor should be used for grounding connection to communications equipment such as racks,

cabletray, cabinets, etc.

2. Metallic cable shield shall NOT be used as a Telecommunication Bonding Backbone (TBB).
3. A minimum of #1/0 AWG shall be used for the TBB up to 50'. A minimum of #3/0AWG shall be used for a TBB greater than 50'. Route the TBB in conduit between equipment rooms. Size conduit per NEC requirements for 40% fill.

B. Grounding Connectors: It is recommended that connectors should be one of the following:

1. Zinc-plated copper.
2. All grounding connectors must be compression and 2-hole.Copper.
3. Copper alloy.

C. Ground Rods: A minimum of 10 feet long, 3/4-inch diameter, stainless steel.

D. Where single conductor insulated grounding conductors is required, furnish green color (or tape marking) insulation rated for 600 volts.

E. Telecommunications Main Grounding Busbar (TMGB):

1. The busbar shall be electrotin plated for reduced contact resistance.
2. The TMGB shall be a predrilled electro-tin plated copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors to be used. Provide with minimum 5 pairs of 7/16” pre-punched holes and 33 pairs of 5/16” pre-punched holes (Panduit #GB4B0624TPI-1).
3. The TMGB shall be sized for the immediate requirements and allow for 100% growth.
4. The minimum busbar dimensions are .25” thick x 4” wide x 20” long.
5. The busbar shall be mounted on the wall at 6‘-0” AFF unless otherwise noted on the contract drawings.
6. All ground busbars must be 2-hole compatible.
7. Furnish with plexiglass cover.

F. Telecommunications Grounding Busbar (TGB):

1. The TGB shall be a predrilled electro-tin plated copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors to be used. Provide with minimum 3 pairs of 7/16” pre-punched holes and 10 pairs of 5/16” pre-punched holes (Panduit #GB2B0312TPI-1).
2. The TGB shall be sized for the immediate requirements and allow for 100% growth
3. The minimum busbar dimensions are .25” thick x 2” wide x 12” long.
4. The busbar shall be electrotin plated for reduced contact resistance.
5. The busbar shall be mounted on the wall at 6’-0” AFF unless otherwise noted on the contract drawings.

G. Furnish with plexiglass cover.Rack-Mounted Grounding Busbar (RMGB):

1. Provide with grounding hardware:
   a. Panduit Jumper Rack Kit AWG #6 RGCBNJ66OP22

b.	Panduit Equipment Jumper Kit AWG #6	GJS66OU
c.	Panduit ESD Wrist Strap	RGESDWS
d.	Panduit Port Kit	RCESD2-1
e.	Panduit Grounding Strip	RGS134-1Y
f.	Panduit Compression Ground Tap Splice Cover	CLRCVR*-*
g.	Panduit Ground Kit	HTCT HTAPs
h.	20” 2-hole lug grounding busbar	40153-020

H. Busbar Insulators for TMGB and TGB

1. The insulators shall be manufactured of rugged polyamide reinforced with glass fiber meeting requirements of UL94 V-0 for self-extinguishing materials.
2. Minimum height is 2”.

I. Busbar Brackets for TMGB and TGB

1. The wall mounting brackets shall be minimum 1/8” thick type 304 stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Complete site preparation and soil compaction before trenching and driving ground rods for underground use.

B. Verify exact location of stub-up points for grounding of equipment, fences and building or steel structures.

C. Verify wiring for lighting systems is single conductor cable in conduit and each conduit contains a green-color insulated equipment-grounding conductor connected to lighting system. If no ground conductor is present, install conductors as required.

D. Copper and copper alloy connections should be cleaned prior to connection.

E. In new construction, the electrical contractor must provide accessible means to a direct electrical service ground, which is one of the best points for grounding communications systems. NEC Section 250.94 and 800.100 requires an intersystem bonding connection accessible at the electrical service equipment, such as:

1. Approved external connection on the power service panel. The NEC allows direct connection to a provided minimum 6 AWG copper conductor. See Chart 1
2. Exposed metallic service raceway (using an approved bonding connector).
3. Grounding electrode conductor.
4. For connectivity between buildings and rooms, all bonding conductors are to be placed in conduit end to end and conduit should be properly grounded. 3/0 conductor to be placed in 2 inch conduit and minimum 6 AWG to be placed in a 1 inch conduit run.

TBB Conductor Size vs. Length		
TBB/GE Linear Length	TBB/GE Size	Conduit Size
Feet (m)	(AWG)	Inch
Less than 13' (4) 6	6	1”
14–20' (4 -6)	4	1”
21–26' (6–8)	3	1”
27–33' (8–10)	2	1”
34–41' (10–13)	1	1”
42–52' (13–16)	1/0	1”
53–66' (16–20)	2/0	1”
37–84' (20–26)	3/0	1.5”
85–105' (26–32)	4/0	1.5”
106-125’	250	1.5”
126-150’	300	1.5”
151-175’	350	1.5”
176-250’	500	2”
257-300’	600	2”
>301’	750	2”
*Reference ANSI-J-STD-607-B for more information.		

Chart 1

3.2 INSTALLATION

A. Install work following drawings, manufacturer’s instructions and approved submittal data.

B. Bonding conductors shall be routed with minimum bends or changes in direction and should be made directly to the points being bonded, and shall be one continuous run NO splices.

C. Bonding connections should be made by using:

1. Double crimp connectors only for all horizontal runs (cabinet trays etc.). Use listed hardware that has been laboratory tested. For double crimp connectors use 2 hole type connector.
2. Exothermic welding (per NEC) within the ground electrode system, for parts of a grounding system that are subject to corrosion or that must carry high currents reliably, or for locations that require minimum maintenance. Exothermic-weld to be used on the Telecommunications Bonding Backbone (TBB) conductor for all connections.
3. All bolts and nuts used to attach to TMGB on TGB must be stainless steel

D. Install main ground loop minimum 18” (inches) below ground surface.

E. Drive grounding rods vertically, so at least 8 feet of rod is in contact with the soil. All connections shall be exothermic-weld. Install additional ground rods as required to pass resistance test.

F. Make connections only to dry surfaces with paint, rust, oxidation, scales, grease, dirt or other foreign material is removed. Ensure proper conductivity.

G. Make above-grade grounding connections with Exothermic-weld.

1. Ground small groups of isolated equipment with No. 3/0 minimum insulated conductor connected to the main loop.

H. Equipment Grounding:

1. Make grounding connections to electrical equipment, vessels, mechanical equipment, equipment enclosure, relay racks, and ground rods in accordance with NEC.
2. Make grounding connections to tanks and vessels to integral structural supports or to existing grounding lugs or pads, and not to the body of the tank or vessel.
3. All equipment grounding conductors must have green insulated jacket.

I. Telecommunications Raceway and Support Systems Grounding:

1. Bond and ground raceway, cable rack or tray and conduit together and permanently ground to the equipment grounding busbar. Connection to conduit may be with grounding bushing.
2. Connect ladder-type cable tray to grounding electrode system. Telecommunications cable tray that is located in the same room as the grounding busbar shall be connected to the grounding busbar.
3. Bond and ground raceway at low voltage motor control centers or other low voltage control equipment, except conduit which is effectively grounded to sheet metal enclosure by bonding bushing or hubs need not be otherwise bonded.
4. Where only grounding conductor is installed in a metal conduit, bond both ends of conduit to grounding conductors.
5. Provide flexible "jumpers" around raceway expansion joints and across cable tray joints parted to allow for expansion and hinged cable tray connections
6. For any painted surface with ground connections, thoroughly remove paint prior to connecting ground.
7. Provide copper bonding straps for steel conduit.

J. Telecommunications Grounding and Bonding Infrastructure:

1. Install the TMGB in the Telecommunications Entrance Facility (TEF) or Main Distribution Frame (MDF) as close to the panel-board as possible. The TMGB should also be located so that the bonding conductor is as short and straight as possible. Maintain clearances required by applicable electrical codes.
2. If a panel-board is not installed in the TEF or MDF, locate the TMGB near the backbone cabling and terminations.
3. The TMGB shall be insulated from its support with a recommended separation of 2 inches.

4. Connect the TMGB to the electrical service ground and telecommunications primary protectors.
5. The minimum Telecommunications Bonding Backbone (TBB) conductor size shall be No. 2 AWG. The TBB originates at the TMGB and extends throughout the building using the telecommunications backbone pathways, and connects to the TGB(s) in all telecommunication closets and equipment rooms.
6. Install the TGBs in the telecommunications closets and equipment rooms as close to the panel-board as possible. The TGB should also be located so that the bonding conductor is as short and straight as possible. Maintain clearances required by applicable electrical codes.
7. The TGB shall be insulated from its support with a recommended separation of 2 inches.
8. Properly bond and ground all communications cabinets, equipment racks, raceway, cable rack or tray, and conduit directly to TMGB or TGB. Daisy chaining of equipment is not permitted
9. Refer to the Telecom Grounding diagram in the design documentation (see figure 1).
10. Preparation: Copper and copper alloy connections shall be cleaned prior to connecting.
11. Bonding conductors shall be routed with minimum bends or changes in direction and should be made directly to the point being bonded. Change of direction shall be taken over as wide a radius as possible with a minimum radius of one foot.
12. Make connections only to dry surfaces with paint, rust, oxides, scales, grease and dirt removed. Ensure proper conductivity.
13. Grounding conductors, by gauge, shall be continuous, with splices, from a larger gauge feeder to the last frame or component served by the grounding lead (ex. 750 KCM to 500 KCM to 1/0, etc.).
14. C-Taps from Aisle equalizer to a frame can be the same gauge (ex. E.g., 6 AWG to 6 AWG).
15. Cable to Cable taps shall be made with exothermic weld, or listed compression connectors.
16. No aluminum conductors or connectors shall be used in any bonding and grounding system.
17. Ground bars not supplied as part of a standard assembly shall be copper or tinned copper.
18. Refer Telecommunications Grounding drawings for additional information.
19. Both ends of the grounding conductors shall be equipped with a printed destination label recording the far end termination. The label shall be applied within 6 inches of the termination and be visible from the floor.
20. All metallic items that interact electro-magnetically with Network/Telecommunications equipment shall have their framework bonded and grounded to the Telecommunications grounding system with a minimum #6 AWG grounding conductor. Example includes switch frames, power plants frames, battery stands, storage cabinets and other metallic objects, etc. “Daisy Chaining” or frame to frame connecting of these conductors is NOT permitted.
21. TMGB and TGB shall be furnished with stand-off plexiglass cover and shall be stenciled and labeled
22. Locate all TMGB and TGB at 6’-0” AFF unless otherwise noted. Do not locate lower than 54” AFF.
23. All ground cables must be labeled on each end. Label shall include TO and FROM designators and shall be wrapped around cable jacket and heat shrunk.

K. Fences and Gates in the equipment rooms:

1. Ground fences, fence posts and gates to nearest TMGB or TGB.

L. Telecommunications Cable Armored and/or Shielded:

1. Terminate and ground shield of shielded control cable at one end only, preferably at the control panel end for instrument and communication cable and at the supply end for electronic power cables. Maintain shield continuity by jumpering the ground shield across connection point where it is broken at junction boxes or other splice points.
2. Connect ground wire in power cable assemblies at each terminal point to a ground bus, if available, or to the equipment enclosure. Do not extend these ground wires through "doughnut" CTs used for ground fault relaying, but do extend ground leads from stress cones. Ground power cable armor and shield at each terminal point.
3. Bond and ground exposed cable shields and metallic sheaths according to the manufacturer's guidelines. They should also be grounded as close as possible to the point of entrance.
4. Intra-building telecommunications cabling that is armored or has a metallic shield must be bonded to the building grounding system at each end.

3.3 TESTING

A. Follow Section 270510 – Telecommunication Administrative Requirements.

B. Test grounding system before grid trenches are back-filled. Test for ground resistance after installation of underground grid and grounding connections.

C. Install ground access test wells at locations as required for testing, using a pipe surrounding the rod and connections with a cover placed on top at grade level.

D. Test system resistance at each test well and at each Telecommunication Grounding Busbar (TMGB, TGB) using "fall of potential" method: Maximum resistance of 5 ohms. When resistance is > 5 ohms, install additional ground rods and TBB as required to get resistance ≤ 5 ohms.

E. Upon completion of the electrical system, including all grounding, the Electrical Contractor shall test the system for stray currents, ground shorts, etc. Approved instruments, apparatus, service, and qualified personnel shall be utilized. If stray currents, shorts, etc., are detected, eliminate or correct as required. The test procedure shall be as follows:

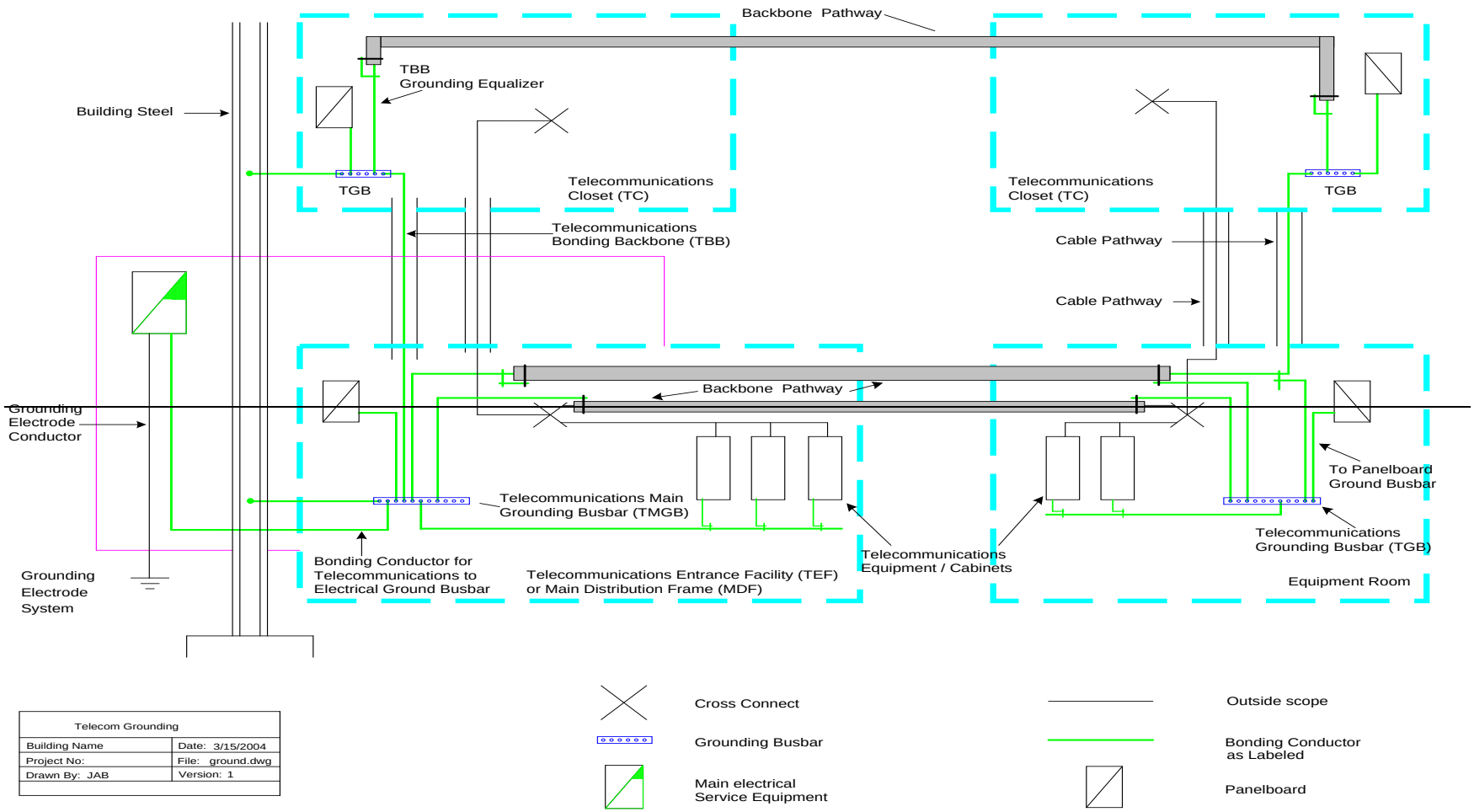
1. Open all main disconnects for the system being tested.
2. Disconnect the system neutral from the service entrance or step-down transformer neutral connection.
3. Connect a DC ohmmeter across the system neutral and equipment ground.
4. Submit all ground tests to engineer for review and approval.
5. An ohmmeter reading in excess of 100 ohms shall indicate that the system neutral and equipment ground are properly isolated.

6. An ohmmeter reading less than 100 ohms shall indicate that the system contains ground shorts (stray currents) at some point along the system neutral.
7. Grounded neutrals may be identified by disconnecting individual neutral conductors from the system, one at a time, while monitoring the ohmmeter.
8. The systems shall be re-tested after correction of all ground shorts is complete.

PART 4 - MEASUREMENT AND PAYMENT

A. There is no separate measurement or payment for this section. Payment for items included in this section will be incidental with the item in which they are installed.

END OF SECTION


Backbone Pathway
TBB
Grounding Equalizer
Building Steel
TGB
Telecommunications
Closet (TC)
Telecommunications
Bonding Backbone (TBB)
Telecommunications
Closet (TC)
TGB
Cable Pathway
Cable Pathway
Backbone Pathway
Grounding
Electrode
Conductor
To Panelboard
Ground Busbar
Telecommunications Main
Grounding Busbar (TMGB)
Telecommunications
Grounding Busbar (TGB)
Bonding Conductor for
Telecommunications to
Electrical Ground Busbar
Telecommunications Entrance Facility (TEF)
or Main Distribution Frame (MDF)
Telecommunications
Equipment / Cabinets
Equipment Room
Grounding
Electrode
System
Telecom Grounding
Building Name
Date: 3/15/2004
Project No:
File: ground.dwg
Drawn By: JAB
Version: 1
Cross Connect
Outside scope
Grounding Busbar
Bonding Conductor
as Labeled
Main electrical
Service Equipment
Panelboard

~~Figure 1~~