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ELECTRICAL AND LIGHTNING PROTECTION
LOUIS J. AGUIRRE AND ASSOCIATES, P.A.



SECURITY CONSULTING SERVICES
ROSS & BARUZZINI

Ross & Baruzzini



MIAMI DADE AVIATION DEPARTMENT (MDAD)

MDAD PROJECT -AA005A

- 1 – ‘CC E & SATELLITE E’ & ‘D TO E CONNECTOR’ – STUCCO AND PAINTING.
- 2 – CAMERAS, DOOR FRAMES, HARDWARE AND ACCESS CONTROL AT ‘SATELLITE E’ AND ‘LOWER E’.
- 3 – ‘SATELLITE E’ A-VDGS.
- 4 – NEW LIGHTNING PROTECTION SYSTEM AT ‘SATELLITE E’ & LOWER ‘E’

MIAMI INTERNATIONAL AIRPORT – MIAMI, FLORIDA

Phase 3D BID SET

PROJECT MANUAL – APRIL 01, 2022

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License No. AA26002724 . 6303 Blue Lagoon Drive, Suite 310, Miami, Florida 33126 . e. contact@mobioarchitecture.com

MIAMI DADE AVIATION DEPARTMENT (MDAD)

MDAD Project No. AA005A

1 – ‘CC E & Satellite E’ & ‘D to E Connector’ - Stucco and Painting.

2 – Cameras, Door Frames Hardware and Access Control at ‘Satellite E’ and ‘Lower E’.

3 – ‘Satellite E’ A-VDGS.

4 – New Lightning Protection System at ‘Satellite E’ & ‘Lower E’.

Phase 3D – BID SET

April 01, 2022

Miami International Airport – Miami, Florida

- ✓ Asbestos Report
- ✓ Structural Calculations
- ✓ Project Specifications Signature sheets (n/a)

DIVISION 0 - BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT

Not part of this submittal

DIVISION 1 – GENERAL REQUIREMENTS

Section 01 02 70	Applications for Payment
01 03 00	Alternates
01 04 00	Coordination
01 04 50	Cutting and Patching
01 05 00	Surveying and Field Engineering
01 06 10	Posting of Notices
01 09 00	Reference Standards
01 10 00	Existing Utilities
01 12 00	Hot Work Operations
01 12 00-01	Hot Work Permit Form
01 20 00	Project Meetings
01 30 00	Submittals
01 31 00	Construction Schedules
01 31 10	Construction Schedules (CPM Format) Lump Sum Contract
01 31 10-01	Time Impact Analysis Summary sheet (TIA)
01 31 40	Construction Scheduling Management System
01 34 00	Shop Drawings
01 37 00	Schedule of Values
01 40 50	Contract Quality Control
01 41 00	Project Testing Lab Services
01 44 00	Contractor Quality Control Program
01 50 50	Mobilization
01 50 60	Contractor Overhead
01 51 10	Temporary Electricity
01 51 20	Temporary Lighting

01 51 40	Temporary Telephone
01 51 50	Temporary Water
01 51 60	Temporary Sanitary Facilities
01 53 00	Barriers and Enclosures
01 53 50	Protection of Work and Property
01 55 00	Contractor's Access and Employee's Parking
01 56 30	Handling of Incidental Fuel Spillage during Construction
01 56 90	Construction Cleaning
01 57 00	Airfield Operational Safety During Construction
01 57 10	Maintenance of Airport Landside Traffic
01 59 00	Field Representative's Office & Testing Lab.
01 60 00	Material and Equipment
01 70 10	Contract Closeout procedures
01 71 00	Final Cleaning
01 72 00	Project Record Documents
01 74 00	Warranties and Guarantees
01 75 00	Measurement of Quantities

DIVISION 2 – EXISTING CONDITIONS

Section 02 11 17	Selective Demolition
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DIVISION 5 – METALS

Section 05 12 00	Structural Steel Framing
05 50 00	Metal Fabrications
05 52 13	Railings and Handrails

DIVISION 6 – CARPENTRY

Section 06 10 00	Rough Carpentry
06 16 00	Sheathing

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section 07 42 13.6	Modular Metal Wall Panels
07 62 00	Sheet Metal Flashing and Trim
07 81 23	Intumescent Fireproofing
07 84 00	Through-Penetration Firestop Systems
07 90 00	Joint Sealers
07 95 00	Expansion Control

DIVISION 8 – DOORS AND WINDOWS

Section 08 11 00	Steel Doors and Frames
08 30 50	Access Doors
08 46 20	Automatic Swinging Doors
08 71 00	Door Hardware
08 80 00	Glazing

DIVISION 9 – FINISHES

Section	09 22 00	Portland Cement Plaster (Stucco)
	09 22 16	Non-Structural Metal Framing
	09 25 00	Gypsum Wallboard Systems
	09 65 13	Resilient Base and Accessories
	09 90 00	Painting

DIVISION 10 – FINISHES

Section	10 52 00	Fire Extinguishers, Cabinets and Accessories
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DIVISION 26 – ELECTRICAL

Section	26 00 00	Basic Electrical Requirements
	26 05 00	Basic Electrical Materials and Methods
	26 05 19	Wires and Cables
	26 05 26	Grounding
	26 05 29	Supporting Devices
	26 05 33.13	Raceways
	26 05 33.16	Electrical Boxes and Fittings
	26 05 53	Electrical Identification
	26 05 83	Electrical Connections for Equipment
	26 08 00	Electrical Systems Commissioning
	26 08 02	Electrical Systems Functional Testing Requirements
	26 24 16	Panelboards
	26 27 26	Wiring Devices
	26 28 00	Circuit & Motor Disconnects
	26 28 13	Fuses
	26 29 13	Motor Starters/Controllers
	26 41 00	Lightning Protection System
	26 43 00	Surge Suppression System

DIVISION 27 – COMMUNICATIONS

Section	27 01 00	General Requirements for Communication Systems
	27 05 26	Grounding & Bonding for Communications Systems
	27 05 28	Pathways for Communications Systems
	27 05 44	Sleeve & Sleeve Seals for Communications Pathways & Cabling
	27 05 53	Identification for Communication Systems
	27 11 00	Communications Equipment Room Fittings
	27 13 00	Communications Backbone Cabling
	27 15 00	Communications Horizontal Cabling
	27 15 13	Communications Copper Horizontal Cabling
	27 15 43	Communications Faceplates and Connectors
	27 16 19	Communications Patch Cords, Station Cords, and Cross Connect Wire

DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY

Section	28 00 00	General Requirements for Communication Systems
	28 08 00	Commissioning of Access Control Doors
	28 23 00	CCTV Camera, Audio Intercom Installation and Programming Integration
	28 23 01	Advanced Visual Docking Guidance System (A-VDGS) Bulletin 001 (03.15.22)
	28 31 00	Fire Alarm Detection and Annunciation Systems

END OF DOCUMENT

**REPORT OF PRE-RENOVATION SURVEY,
INVASIVE SAMPLING AND ANALYSIS FOR
ASBESTOS-CONTAINING MATERIALS**

**CONCOURSE E RENOVATION AREAS
MIAMI INTERNATIONAL AIRPORT
MIAMI, FLORIDA 33122
EBS PROJECT NO.820-2001907.01A
September 11, 2020**



PREPARED FOR

**MIAMI-DADE AVIATION DEPARTMENT
4200 NW 36 STREET, BUILDING 5A
MIAMI, FLORIDA 33159**

PREPARED BY

**EBS ENGINEERING, INC.
4715 NW 157 ST. STE. 202
MIAMI, FLORIDA 33014
Tel. 305-625-5252 • Fax. 305-625-7110**

September 10, 2020

Mr. Foster Mack
Construction Manager, III
Miami-Dade Aviation Department
4200 NW 36 Street, Building 5A
Miami, Florida 33159

Subject: Report for Pre-Renovation Asbestos Survey
Concourse E Renovation Areas
Miami International Airport
Miami, Florida 33122
EBS Engineering Project No. 820-2001907.01A

Dear Mr. Mack

EBS Engineering, Inc. (EBS) has completed the pre-renovation survey, invasive sampling and analysis of suspect asbestos-containing materials (ACMs) in the renovation areas of Concourse E at Miami International Airport in Miami, Florida. The field sampling was performed on September 8, 2020, by Mr. Ronquavis Fulton of EBS. Authorization for our services was provided by you on August 26, 2020. This report presents the project information, bulk sampling procedures, the analytical results with recommendations for the removal of any ACMs identified, if any.

EBS appreciates the opportunity to be of service to you and looks forward to our continued association. If you should have any questions concerning this report, please contact us at your convenience.

Sincerely,

EBS ENGINEERING, INC.
Business License # ZA -0000069


Francisco E. Gomez
Senior Environmental Scientist

EBS\820-2001907.01A.REPORT

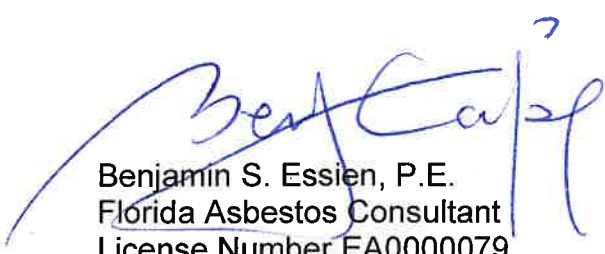

Benjamin S. Essien, P.E.
Florida Asbestos Consultant
License Number EA0000079

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I. BACKGROUND INFORMATION

EBS Engineering, Inc. was contacted by Mr. Foster Mack of Miami-Dade Aviation Department, concerning the pre-renovation survey, invasive sampling and analysis of suspect asbestos-containing building materials within the renovation areas of Concourse E located at Miami International Airport in Miami, Florida. It is our understanding that this sampling is necessary prior to the planned renovation of the area and for permitting purposes.

The purpose of the invasive sampling was to locate and identify asbestos-containing building materials in the renovation areas prior to any renovation or demolition activities which may disturb them. The sampling of the roof, other interior or exterior areas of Concourse E was not included in the scope of this survey.

II. FACILITY DESCRIPTION

The designated renovation areas are located on the Ramp Level, Second Level and Third Level of Concourse E at Miami International Airport in Miami, Florida and encompasses approximately 1,500 square feet of floor space. The interior finishes in the areas include; metal doors, glass doors, metal door frames and interior stucco. The exterior walls were observed to be finished with stucco treatment.

III. SURVEY PROCEDURES

General

The invasive survey was performed by observing accessible building materials in the Concourse E renovation areas. The primary purpose of the survey was to locate, identify and assess building materials which were suspected to contain asbestiform minerals. Friable and non-friable asbestos-containing materials (ACMs) encountered during the survey are addressed in this report. Friable materials, when dry, will crumble and release fibers under normal hand pressure, whereas non-friable materials will not.

The sampling protocol used in this asbestos survey is in general accordance with Title 40, Code of Federal Regulations (CFR), Part 763.86 and State of Florida Statutes.

Bulk Sampling Procedures

The bulk sampling procedures used for the collection of suspect materials first required the establishment of homogenous sampling areas, which are defined as areas of materials of the same type and applied during the same general time period. The homogenous sampling areas were then examined and representative samples of suspect materials were obtained from these areas. The U.S. Environmental Protection Agency (EPA) has published guidelines and recommendations for obtaining samples of asbestos-containing materials. These guidelines were followed during our survey, where

appropriate. Additionally, samples of these materials were obtained at the discretion of our personnel based on past experience.

Bulk samples collected during the site survey were analyzed by Polarized Light Microscopy (PLM) coupled with dispersion staining. PLM is an analytical method for asbestos identification which depends on the unique optical properties of mineral forms in the samples and specifically identifies the various asbestos types. The optical properties are a result of the mineral's chemical composition, physical atomic structure, and visual morphology. This is the recommended method of analysis by EPA for asbestos identification in bulk samples. EMSL Analytical, Inc. the laboratory that analyzed the samples has attained National Institute of Standards and Technology (NIST) accreditation through participation in the National Voluntary Laboratory Accreditation Program (NVLAP). Percentages of the identified types of asbestos are determined by visual estimation. Any material containing more than one percent (1%) of asbestos is considered by EPA and Occupational Safety and Health Administration (OSHA) to be ACM.

The following suspect materials were sampled in Concourse E Renovation Areas during our survey:

1. Gray Exterior Stucco
2. White Interior Stucco
3. Gray Interior Stucco

IV. RESULTS OF LABORATORY ANALYSIS

Laboratory results of the sampling revealed that **no asbestos was detected in the 15 materials samples obtained from the Concourse E Renovation Areas during our survey.** Asbestos concentrations expressed within the laboratory results are based on visual estimation. The point counting method of quantification is recommended for asbestos concentration below ten percent. The results of the 15 samples are summarized in Table 1. The PLM results of each sample obtained during the survey is included in Appendix A.

TABLE 1 - SUMMARY OF ANALYTICAL RESULTS Concourse E Renovation Areas Miami International Airport Miami, Florida 33122					
SEQUENTIAL NUMBER	SAMPLE NUMBER	HOMOGENOUS AREA	SAMPLE DESCRIPTION	SAMPLE LOCATION	RESULTS OF PLM ANALYSIS
01	01	HA-1	Gray Exterior Stucco	Ramp Level, N	No Asbestos Detected
02	02	HA-1	Gray Exterior Stucco	Ramp Level, S	No Asbestos Detected
03	03	HA-1	Gray Exterior Stucco	Ramp Level, W	No Asbestos Detected
04	04	HA-2	Gray Exterior Stucco	Connector D-E, N	No Asbestos Detected
05	05	HA-2	Gray Exterior Stucco	Connector D-E, S	No Asbestos Detected
06	06	HA-2	Gray Exterior Stucco	Connector D-E, W	No Asbestos Detected
07	07	HA-3	White Exterior Stucco	Ramp Level, N	No Asbestos Detected
08	08	HA-3	White Exterior Stucco	Ramp Level, S	No Asbestos Detected
09	09	HA-3	White Exterior Stucco	Ramp Level, W	No Asbestos Detected
10	10	HA-4	White Interior Stucco	Second Level, N	No Asbestos Detected
11	11	HA-4	White Interior Stucco	Second Level, S	No Asbestos Detected
12	12	HA-4	White Interior Stucco	Second Level, W	No Asbestos Detected
13	13	HA-5	Gray Interior Stucco	Third Level, N	No Asbestos Detected
14	14	HA-5	Gray Interior Stucco	Third Level, S	No Asbestos Detected
15	15	HA-5	Gray Interior Stucco	Third Level, W	No Asbestos Detected

V. FINDINGS AND RECOMMENDATIONS

Laboratory results of the invasive sampling revealed that **no asbestos was detected in the 15 materials samples obtained from the Concourse E Renovation Areas during our survey.** The PLM results of each sample obtained during the survey is included in Appendix A.

VI. QUALIFICATIONS

EBS observed the existing conditions in the Ramp Level, Second Level and Third Level Renovation Areas of Concourse E located at Miami International Airport in Miami, Florida using generally accepted procedures. However, there is always the possibility that some areas containing asbestos were not observed, inaccessible, or different from those at specific sample locations. Therefore, conditions at every location may not be as anticipated and as summarized in this report. In addition, renovation or demolition may uncover altered or differing conditions. We recommend that you notify EBS if any changed conditions are encountered so that we can assess the situation and its impact on this report.

Concourse E Renovation Areas
Miami International Airport, Miami, Florida
September 10, 2020



APPENDIX A

LABORATORY ANALYTICAL RESULTS



EMSL Analytical, Inc.

19501 NE 10th Ave. Bay A N. Miami Beach, FL 33179

Tel/Fax: (305) 650-0577 / (305) 650-0578

<http://www.EMSL.com> / miamilab@emsl.com

EMSL Order: 172005788

Customer ID: EBSE50

Customer PO:

Project ID:

Attention: Francisco Gomez
EBS Engineering, Inc.
4715 NW 157th St. Ste 202
Miami, FL 33014

Phone: (305) 625-5252

Fax: (305) 625-7110

Received Date: 09/08/2020 2:53 PM

Analysis Date: 09/09/2020

Collected Date:

Project: Mia. Airport (E)

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
01 <small>172005788-0001</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
02 <small>172005788-0002</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
03 <small>172005788-0003</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
04 <small>172005788-0004</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
05 <small>172005788-0005</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
06 <small>172005788-0006</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
07 <small>172005788-0007</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
08 <small>172005788-0008</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
09 <small>172005788-0009</small>	Exterior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
10 <small>172005788-0010</small>	Interior Stucco	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
11 <small>172005788-0011</small>	Interior Stucco	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
12 <small>172005788-0012</small>	Interior Stucco	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
13 <small>172005788-0013</small>	Interior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
14 <small>172005788-0014</small>	Interior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
15 <small>172005788-0015</small>	Interior Stucco	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 09/09/2020 08:25:21



EMSL Analytical, Inc.

19501 NE 10th Ave. Bay A N. Miami Beach, FL 33179

Tel/Fax: (305) 650-0577 / (305) 650-0578

<http://www.EMSL.com> / miamilab@emsl.com

EMSL Order: 172005788

Customer ID: EBSE50

Customer PO:

Project ID:

Analyst(s) _____

Kim Wallace (2)

Mary Hamel (13)

Kimberly Wallace, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. N. Miami Beach, FL NVLAP Lab Code 200204-0

Initial report from: 09/09/2020 08:25:21

Concourse E Renovation Areas
Miami International Airport, Miami, Florida
September 10, 2020



APPENDIX B

CERTIFICATIONS

Ron DeSantis, Governor



Halsey Beshears, Secretary



**STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION**

ASBESTOS LICENSING UNIT

THE ASBESTOS BUSINESS ORGANIZATION HEREIN IS LICENSED UNDER THE
PROVISIONS OF CHAPTER 469, FLORIDA STATUTES

EBS ENGINEERING INC

BENJAMIN S. ESSIE
4715 NW 157 ST STE 202
MIAMI FL 33014

LICENSE NUMBER: ZA0000069

EXPIRATION DATE: NOVEMBER 30, 2021

Always verify licenses online at MyFloridaLicense.com



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Asbestos Consulting & Training Systems

900 N.W. 5TH Avenue, Fort Lauderdale, Florida 33311 (954) 524-7208

This is to Certify that
Ronquavis Fulton



X X X - X X - 0 7 0 0

12921 nw 17 th ct, Miam, FL 33167

has successfully completed an English

Asbestos Building Inspection Refresher

28-Aug-20 TO 28-Aug-20

and has completed the requisite training for TSCA

Meets state requirements of FL49-0001020/CN-0006273 and UT (6.0 core).

NDAAC Provider #451

Trainer(s): Mark Knick

Training Address: 900 NW 5th Ave, Fort Lauderdale, FL 33311

Successful course completion based on exam score on: 28-Aug-20

This Certificate Expires:



28-Aug-21

08 / 28 / 21



Processed By:

UNDER AND CRIMINAL PENALTIES OF LAW, MAKING OR
ISSUING A FALSE OR MISLEADING STATEMENT, OR
VIOLATING ANY FEDERAL, STATE, OR LOCAL LAWS,
REGULATIONS, ORDINANCES, OR CONTRACTS, OR
OTHER APPLICABLE LAWS, THE ISSUING OF THIS
CERTIFICATE IS VOID AND INVALID. ANY HOLDER OF
THIS CERTIFICATE WHOSE TRAINING CANNOT BE
VERIFIED BY THE ISSUING ORGANIZATION SHALL
BE SUBJECT TO THE FOLLOWING PENALTIES:
1. THE HOLDER SHALL BE SUBJECT TO THE FOLLOWING
PENALTIES:
2. THE HOLDER SHALL BE SUBJECT TO THE FOLLOWING
PENALTIES:
3. THE HOLDER SHALL BE SUBJECT TO THE FOLLOWING
PENALTIES:

James F. Stump, Course Sponsor



Certificate Number: 184096

Course Number: SE2035

LEAD-BASED PAINT INSPECTION

CONCOURSE E RENOVATION AREAS
MIAMI INTERNATIONAL AIRPORT
MIAMI, FLORIDA 33122
EBS PROJECT NO.820-2001907.01L
September 10, 2020



PREPARED FOR

MIAMI-DADE AVIATION DEPARTMENT
4200 NW 36 STREET, BUILDING 5A
MIAMI, FLORIDA 33159

PREPARED BY

EBS ENGINEERING, INC.
4715 NW 157 ST. STE. 202
MIAMI, FLORIDA 33014
Tel. 305-625-5252 • Fax. 305-625-7110

September 10, 2020

Mr. Foster Mack
Construction Manager, III
Miami-Dade Aviation Department
4200 NW 36 Street, Building 5A
Miami, Florida 33159

Subject: Report for Lead-Based Paint Inspection
Concourse E Renovation Areas
Miami International Airport
Miami, Florida 33122
EBS Engineering Project No. 820-2001907.01L

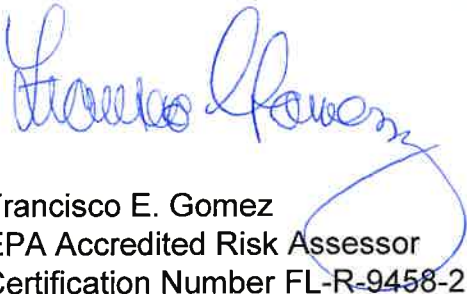
Dear Mr. Mack

EBS Engineering, Inc. (EBS) has completed the lead-based paint testing in the Renovation Areas in Concourse E of Miami International Airport in Miami, Florida. Mr. Francisco Gomez, an EPA certified Risk Assessor in the State of Florida, performed the testing on September 8, 2020. This report presents the project information, testing procedures and the summary of results with recommendations.


EBS appreciates the opportunity to be of service to you and looks forward to our continued association. If you should have any questions concerning this report, please contact EBS at your convenience.

Sincerely,

EBS ENGINEERING, INC.
Firm Certification # FL-1930-2



Francisco E. Gomez
EPA Accredited Risk Assessor
Certification Number FL-R-9458-2



Benjamin Essien, P.E.
Principal Engineer

EBS\820-2001907.01LREPORT

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SECTION 1: EXECUTIVE SUMMARY

1.1 INTRODUCTION

EBS was contacted by Mr. Foster Mack concerning lead-based paint testing of the Renovation Areas in Concourse E of Miami International Airport in Miami, Florida. It is our understanding that this lead-based paint inspection is necessary prior to renovation activities of the renovation areas in order to meet all the applicable federal, state and local regulatory requirements for handling of any lead-based paint components or surfaces in the areas.

A Lead-Based Paint Inspection was conducted on September 8, 2020 in the Renovation Areas in Concourse E of Miami International Airport in Miami. The **lead-based paint inspection** was performed to identify paint that contains lead above allowable levels and identifies conditions called lead-based paint hazards that could result in harm to workers. This evaluation report can help the Owner develop a plan for eliminating any lead-based paint hazards that were found, and may aid in establishing an ongoing lead-based paint maintenance and re-evaluation program, if needed.

1.2 SUMMARY OF THE RESULTS

The inspection found that no lead-based paint as defined by the U.S. Environmental Protection Agency (EPA), namely lead in amounts greater than or equal to 1.0 mg/cm² in paint was identified on the painted surfaces.

Table 1-1: Renovation Areas Testing Summary	
Lead-Based Paint Present	No
Lead-Based Paint Hazard Present	No
This building is exempt from HUD's Lead Safe Housing Rule. No further action is required.	

1.3 SUMMARY OF REGULATORY REQUIREMENTS AND RECOMMENDATIONS

Lead-based paint, as defined by EPA, was not identified on the on the painted surfaces of the Concourse E Renovation Areas. The results of this inspection indicate that no lead in amounts greater than or equal to 1.0 mg/cm² in paint was found, using the inspection protocol in Chapter 7 of the *HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (1997 Revision)*.

There are no paint-lead hazards and the owner is not required to take any further action.

Under the present Occupational Safety and Health Administration (OSHA) lead construction standard, all identified lead-containing materials affected by construction activities falls under the requirements of 29 CFR 1926. There are no current government guidelines defining a LBP or lead concentration that creates a hazardous atmosphere when disturbed. Based on current OSHA guidelines, for those employees who will be disturbing lead-containing paint, their employer must make an initial determination by monitoring employee exposure if any employee is exposed to lead at or above 30 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) for an 8-hour time weighted average. The employer must implement OSHA prescribed protective measures until they can demonstrate that the employee exposure is not in excess of the action level.

In general, whenever relatively low levels (less than $1.0 \text{ mg}/\text{cm}^2$) of lead were detected in the coated surfaces surveyed. Depending on the degree and type of disturbance of these surfaces (i.e. sanding, cutting, or demolishing), employers may be required to implement varying degrees of OSHA prescribed protective measures. These protective measures must be maintained until it can be demonstrated that employee exposures do not exceed the action level. The employer should also implement and maintain a written compliance program detailing the protective measures they will utilize to control lead exposure during renovation activities.

SECTION 2: LEAD-BASED PAINT INSPECTION REPORT

2.0 OVERVIEW OF THE INSPECTION

2.1 DESCRIPTION OF FACILITY

The inspected renovation areas built in the 1990s are located on Ramp Level, Second Level and Third Level at Concourse E of Miami International Airport in Miami, Florida. The renovation areas appeared to have the same painting history at the time of the inspection.

2.2 LEAD REGULATORY LEVELS

The lead regulatory levels provided below are those used when preparing this lead-based paint evaluation or when evaluating data collected. The EPA regulatory levels are the same as the state regulatory levels provided in the following table.

TABLE 2-1: LEAD REGULATORY LEVELS	
	EPA LEVELS
Lead-Based Paint	$\geq 1.0 \text{ mg/cm}^2$ or 0.5% by weight (or 5,000 ppm)
Lead in Dust	
Floor	$\geq 40 \text{ }\mu\text{g/ft}^2$
Window Sill	$\geq 250 \text{ }\mu\text{g/ft}^2$
Lead in Bare Soil	
Child-Play Areas (dwelling perimeter and yard)	400 ppm ($\mu\text{g/g}$)
Rest of the Yard (dwelling perimeter and yard)	1200 ppm ($\mu\text{g/g}$)

2.3 EQUIPMENT

Testing of the painted surfaces was performed using XRF Instrument; Heuresis Pb200i XRF Analyzer, Serial No. 1655. A State of Florida Radioactive Material License is not required. This instrument is a direct-read analytical device that does not require substrate correction and does not report inconclusive readings.

The calibration of the Heuresis XRF Analyzer is done in accordance with the Performance Characteristic Sheet (PCS) for this instrument. These XRF instruments are calibrated using a calibration standard block of known lead content. Three calibration readings are

taken before and after each home is tested to insure manufacturer's standards are met. If the inspection is longer than four (4) hours, a set of three (3) calibration readings must be taken before the four (4) hours expires, and then an additional three (3) calibration readings taken at the end of the inspection. If for any reason the instruments are not maintaining a consistent calibration reading within the manufacturer's standards for performance on the calibration block supplied by the manufacturer, manufacturer's recommendations are used to bring the instrument into calibration. If the instrument cannot be brought back into calibration it is taken off the site and sent back to the manufacturer for repair and/or re-calibration.

2.4 LEAD-BASED PAINT INSPECTION

This lead-based paint inspection is an investigation to identify all lead-based paint on a surface-by-surface basis. A lead-based paint inspection conforming to HUD guidelines was performed at the facility.

Forty-five (45) tests including calibrations were taken at all identified surfaces in the Concourse E Renovation Areas using an X-ray fluorescence (XRF) analyzer. There were a few instances when a painted surface could not be tested due to obstructions present during the time of this evaluation. These surfaces, in all cases, had the same painting history as other similar components. All practical efforts were made to test every painted surface in the renovation areas. Please refer to the XRF Testing Results in **Appendix A: XRF Sampling Data** for the detailed sequential analytical testing results for the building.

Deteriorated lead-based paint (lead hazards) as defined by EPA, were not identified at the facility at the time of this inspection.

Testing was performed by Francisco E. Gomez, a EPA certified LBP Risk Assessor. Credentials are provided in **Appendix B: Certifications, Licenses, and Accreditations**. The XRF analyzer is designed to measure the lead content of surface coatings on a variety of building surfaces, substrates, and components. The measurement is rapid and nondestructive and, according to the manufacturer, is capable of detecting lead concentrations that occur within numerous layers of various surface coatings.

2.4.1 Lead-Based Paint Inspection Findings

None of the 45 tests taken was found to contain lead (to have lead-based paint) above the EPA/State regulatory level of 1.0 mg/cm² at the renovation areas.

Some of the remaining XRF test locations exhibited lead-in-paint levels below the level that EPA identifies as lead-based paint, namely 1.0 mg/cm². Such surfaces could create dust-lead or soil-lead hazards if the paint is turned into dust by abrasion, scraping, or sanding. Should these or any lead containing components or surfaces be disturbed in any manner that generates dust, care should be taken to limit its spread.

2.5 CONCLUSIONS AND RECOMMENDATIONS

None of the tested components were determined to be positive for lead paint, as defined by EPA/State containing lead in concentrations greater than or equal to 1.0 mg/cm². The results of the visual assessment demonstrated that no deteriorated paint hazards exist.

Lead-safe work practices and lead-based hazard controls are not required since lead-based paint and lead-based paint hazards were not identified on the surfaces.

This inspection was done in accordance with Lead Safe Housing Rule 24 CFR Part 35 subpart F as amended June 21, 2004. The sample results are presented in Appendix A-1. The surface conditions were mostly intact at the time of the inspection.

2.6 CONDITIONS AND LIMITATIONS—DISCLAIMER

EBS has performed this lead-based paint inspection and visual assessment in a thorough and professional manner consistent with commonly accepted industry standards. EBS cannot guarantee and does not warrant that this evaluation has identified all adverse environmental factors and/or conditions affecting these renovation areas on the date of the evaluation.

The results reported and conclusions reached by EBS are solely for the benefit of the Owner. The results and opinions in this report, based solely on the conditions found at the facility on the date of the evaluation, are valid only on that date. EBS assumes no obligation to advise the client of any changes in any real or potential lead-based paint hazards at this facility beyond the date of the evaluation.

APPENDIX A: XRF TESTING DATA

Reading	Location	Room	Side	Structure	Component	Condition	Color	Substrate	PbC	Result
1	Calibration								1	NULL
2	Calibration								1.2	Positive
3	Calibration								1.1	Positive
4	Calibration								1.1	Positive
5	Ramp Level	Exterior	C	Door		Intact	Gray	Metal	0.3	Negative
6	Ramp Level	Exterior	C	Door	Jamb	Intact	Gray	Metal	0.5	Negative
7	Ramp Level	Exterior	C		Wall	Intact	White	Concrete	0	Negative
8	Ramp Level	Exterior	C	Window	Frame	Intact	Black	Metal	0	Negative
9	Ramp Level	Exterior	A	Door		Intact	Black	Metal	0.1	Negative
10	Ramp Level	Exterior	D		Wall	Intact	White	Concrete	0.6	Negative
11	2nd Level	Exterior	C		Wall	Intact	Beige	Concrete	0.1	Negative
12	2nd Level	Exterior	C	Door	---	Intact	Gray	Metal	0.1	Negative
13	2nd Level	Exterior	C	Door	Frame	Deteriorated	White	Metal	0.6	Negative
14	Ramp Level	Exterior	D	Door	Frame	Intact	Gray	Metal	0.3	Negative
15	Ramp Level	Exterior	D	Door	---	Intact	Gray	Metal	0.1	Negative
16	Ramp Level	Exterior	C	Door	---	Intact	Gray	Metal	0.2	Negative
17	Ramp Level	Exterior	C	Door	Frame	Intact	Gray	Metal	0.6	Negative
18	Ramp Level	Common	D		Wall	Intact	Beige	Concrete	-0.1	Negative
19	Ramp Level	Common	A	Door	Jamb	Intact	Black	Metal	0.7	Negative
20	Ramp Level	Exterior	C	Door	Jamb	Intact	Gray	Metal	0.6	Negative
21	Ramp Level	Exterior	C	Door	---	Intact	Gray	Metal	0.1	Negative
22	2nd Level	Common	B	Door	---	Intact	Gray	Metal	0.1	Negative
23	2nd Level	Common	B	Door	Frame	Intact	Gray	Metal	0.6	Negative
24	2nd Level	Common	B		Wall	Intact	White	Concrete	0	Negative
25	2nd Level	Common	B	Door		Intact	Black	Metal	0.1	Negative
26	2nd Level	Common	D	Door		Intact	Black	Metal	0.2	Negative
27	3rd Level	Common	B	Door		Intact	Gray	Metal	0.1	Negative
28	3rd Level	Common	B	Door	Frame	Intact	Gray	Metal	0.5	Negative
29	3rd Level	Common	B		Wall	Intact	White	Concrete	-0.1	Negative
30	3rd Level	Common	C	Door	---	Intact	Gray	Concrete	0.2	Negative
31	3rd Level	Common	C	Door	Frame	Intact	Black	Concrete	0.5	Negative
32	3rd Level	Common	C		Wall	Intact	White	Concrete	0	Negative
33	3rd Level	Common	D		Wall	Intact	White	Concrete	0	Negative
34	3rd Level	Common	D	Door	---	Intact	Gray	Metal	0.2	Negative
35	3rd Level	Common	D	Door	Frame	Intact	Black	Metal	0.6	Negative
36	3rd Level	Common	B	Door	Frame	Intact	Black	Metal	0.6	Negative
37	3rd Level	Common	B	Door	---	Intact	Gray	Metal	0.1	Negative
38	3rd Level	Common	B		Wall	Intact	White	Concrete	-0.1	Negative

Reading	Location	Room	Side	Structure	Component	Condition	Color	Substrate	PbC	Result
39	3rd Level	Common	B		Wall	Intact	White	Concrete	0.1	Negative
40	3rd Level	Common	C		Wall	Intact	White	Concrete	0.1	Negative
41	3rd Level	Common	D		Wall	Intact	White	Concrete	0	Negative
42	3rd Level	Common	A		Wall	Intact	White	Concrete	-0.1	Negative
43	Calibration								1.1	Positive
44	Calibration								1.1	Positive
45	Calibration								1.1	Positive

APPENDIX B: LICENSES AND CERTIFICATIONS

United States Environmental Protection Agency

This is to certify that

EBS Engineering, Inc.

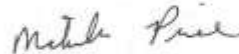
has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires December 03, 2022

LBP-1930-2
Certification #
September 25, 2019
Issued On



Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that

Francisco E Gomez

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

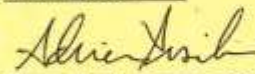
Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires October 19, 2022

LBP-R-9458-2
Certification #
July 17, 2019
Issued On



Adrienne Prisela, Manager, Toxics Office
Land Division

MIA: SATELLITE E A-VGDS

MDAD Project Number: AA005A

RS&H Project Number: 206-5201-002

STRUCTURAL DATA MAUAL: 2020-10-15



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1. STRUCTURAL DESIGN AND SYSTEM SUMMARY

This project involves the design of the structural supports of the new A-VGDS at Satellite E Terminal at Miami International Airport. The existing facility consist of a 3-story reinforced concrete frame building having masonry in-fill walls. Generally, the new A-VGDS supports are attached to the existing concrete structure on the exterior of the facility. Under the 2017 Florida Existing Building Code 6th Edition (2017) – Existing Building, the proposed work qualifies as a Level 2 Alternation in Section 504. New structural elements including connections and anchorage comply with the Florida Building Code, 6th Edition (2017) – Building as required by Section 807.2

2. DESIGN CRITERIA

2.1. Codes and References

- 2017 Florida Building Code
- ASCE 7-10 Minimum Design Loads for Building and Other Structures
- ACI 318-14
- AISC 360-10
- ACI 530-13

2.2. Existing Drawings

- Miami International Airport Expansion and Modifications to International Concourse As Built Drawings dated September 22, 1977 by HOR

2.3. Computer Programs Used

- STAAD.Pro V8i Select Series 6 Version 20.07.11.90
- Enercalc
- Dewalt Design Assist Version 1.4.9.0
- Mathcad 15

2.4. A-VGDS Equipment Basis of Design

- ADB Safegate: Safedock Type 1
 - Size = 72" High x 43" wide x 28.5" deep
 - Weight = 342 lbs

3. MATERIAL SPECIFICATIONS

- Structural Steel
 - Pipe ASTM A53 Type S, Grade B
 - Plates ASTM A36
 - Welding Electrodes ASTM E70XX
 - Threaded Rods ASTM A193 Gr B7
 - Nuts ASTM A563 Gr DH



- Bolts ASTM F3125 Gr A325
- Angles ASTM A36
- Concrete (Existing)
 - Beams $f'c = 3,000$ psi – Per Structural Notes on Drawing S-21 of Existing Drawings
- Reinforcing Steel (Existing)
 - Reinforcement Grade 60 – Per Structural Notes on Drawing S-21 of Existing Drawings
 - Cover
 - Level 2 – 1.5" –Per Structural Notes on Drawing S-21 of Existing Drawings
 - Level 3 – 1.5" –Per Structural Notes on Drawing S-21 of Existing Drawings
- Masonry (Existing)
 - Weight (8" CMU - NW) 55 psf – 8" CMU grouted @ 48" OC per Structural Notes on Drawings
 - CMU Assembly Strength $f'm = 1,350$ psi
 - Grout Minimum Compressive Strength = 3000 psi
 - Mortar Type S

4. LOADS

4.1. Dead

- Self-Weight (See Section 2.4 for A-VDGS weight)
 - Assumed 150 pcf for existing concrete

4.2. Live

- Floors – All occupied floors – 100 psf

5. STRUCTURAL STEEL SUPPORT DESIGN

5.1. Type 1: E-20, E-22, E-23, E-21, E-31, E-30



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CONNECTED User: Aaron Jackson

Job No MIA: A-VGDS S	Sheet No 1	Rev
Part		
Ref		
By ARJ	Date 10/14/20	Chd
Client MDAD	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:05

Job Information

	Engineer	Checked	Approved
Name:	ARJ		
Date:	10/14/20		

Project ID	
Project Name	

Structure Type	SPACE FRAME
-----------------------	-------------

Number of Nodes	6	Highest Node	8
Number of Elements	5	Highest Beam	7

Number of Basic Load Cases	6
Number of Combination Load Cases	28

Included in this printout are data for:

All	The Whole Structure
------------	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DEAD (SW)
Primary	2	DEAD (APPLIED)
Primary	3	W1
Primary	4	W2
Primary	5	W3
Primary	6	W4
Combination	100	1.4D
Combination	101	1.2D+.8W1
Combination	102	1.2D+.8W2
Combination	103	1.2D+.8W3
Combination	104	1.2D+.8W4
Combination	105	1.2D+1.6W1
Combination	106	1.2D+1.6W2
Combination	107	1.2D+1.6W3
Combination	108	1.2D+1.6W4
Combination	109	.9D+W1
Combination	110	.9D+W2
Combination	111	.9D+W3
Combination	112	.9D+W4
Combination	113	.9D
Combination	201	D
Combination	202	D+W1
Combination	203	D+W2
Combination	204	D+W3
Combination	205	D+W4



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Job Information Cont...

Type	L/C	Name
Combination	209	D+.75W4
Combination	210	.6D+W1
Combination	211	.6D+W2
Combination	212	.6D+W3
Combination	213	.6D+W4
Combination	214	.6D

Nodes

Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	1.250	0.000	0.000
5	1.250	11.667	0.000
6	2.500	4.667	0.000
7	1.250	4.667	0.000
8	0.000	11.667	0.000

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
1	1	2	1.250	2	0
4	2	7	4.667	2	0
5	7	6	1.250	1	0
6	7	5	7.000	2	0
7	8	5	1.250	2	0

Section Properties

Prop	Section	Area (in ²)	I _{yy} (in ⁴)	I _{zz} (in ⁴)	J (in ⁴)	Material
1	HSSP1.660X0.14	0.625	0.184	0.184	0.368	STEEL
2	HSSP5.500X0.375	5.650	18.800	18.800	37.634	STEEL

Materials

Mat	Name	E (kip/in ²)	ν	Density (kip/in ³)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E-6
2	STAINLESSSTEEL	28E+3	0.300	0.000	10E-6
3	ALUMINUM	10E+3	0.330	0.000	13E-6
4	CONCRETE	3.15E+3	0.170	0.000	5E-6



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Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip*ft/deg)	rY (kip*ft/deg)	rZ (kip*ft/deg)
1	Fixed	Fixed	Fixed	-	-	-
8	Fixed	-	Fixed	-	-	-

Releases

There is no data of this type.

Primary Load Cases

Number	Name	Type
1	DEAD (SW)	Dead
2	DEAD (APPLIED)	Dead
3	W1	Wind
4	W2	Wind
5	W3	Wind
6	W4	Wind

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
100	1.4D	1	DEAD (SW)	1.40
		2	DEAD (APPLIED)	1.40
101	1.2D+.8W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	0.80
102	1.2D+.8W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	0.80
103	1.2D+.8W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		5	W3	0.80
104	1.2D+.8W4	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		6	W4	0.80
105	1.2D+1.6W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	1.60
106	1.2D+1.6W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	1.60
107	1.2D+1.6W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20



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Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		5	W3	1.60
108	1.2D+1.6W4	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		6	W4	1.60
109	.9D+W1	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		3	W1	1.60
110	.9D+W2	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		4	W2	1.60
111	.9D+W3	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		5	W3	1.60
112	.9D+W4	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		6	W4	1.60
113	.9D	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
201	D	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
202	D+W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	1.00
203	D+W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	1.00
204	D+W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	1.00
205	D+W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	1.00
206	D+.75W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	0.75
207	D+.75W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	0.75
208	D+.75W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	0.75
209	D+.75W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	0.75
210	.6D+W1	1	DEAD (SW)	0.60



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Job No MIA: A-VGDS S	Sheet No 5	Rev
Part		
Ref		
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File MIA A-VGDS - Bracket Ty		Date/Time 14-Oct-2020 12:05

Job Title
Client MDAD

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		2	DEAD (APPLIED)	0.60
		3	W1	1.00
211	.6D+W2	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		4	W2	1.00
212	.6D+W3	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		5	W3	1.00
213	.6D+W4	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		6	W4	1.00
214	.6D	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60

Load Generators

There is no data of this type.

1 DEAD (SW) : Selfweight

Direction	Factor	Assigned Geometry
Y	-1.000	ALL

2 DEAD (APPLIED) : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
6	-	-0.400	-	-	-	-

3 W1 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
6	-2.300	-	-	-	-	-

4 W2 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
6	2.300	-	-	-	-	-



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CONNECTED User: Aaron Jackson

Job No MIA: A-VGDS S	Sheet No 6	Rev
Part		
Ref		
By ARJ	Date 10/14/20	Chd
Client MDAD	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:05

5 W3 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
6	-	-	1.300	-	-	-

6 W4 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
6	-	-	-1.300	-	-	-



Software licensed to RS&H Inc.
CONNECTED User: Aaron Jackson

Job No MIA: A-VGDS S	Sheet No 7	Rev
Part		
Ref		
By ARJ	Date 10/14/20	Chd
Client MDAD	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:05

Steel Design (Track 2) Beam 1 Check 1

<check>

1 ST HSSP5.500X0.375 (AISC SECTIONS)
 PASS Eq. H1-1b 0.088 107
 0.14 C -1.56 -0.99 1.25

SLENDERNESS

Actual Slenderness Ratio : 8.223 L/C : 214
 Allowable Slenderness Ratio : 200.000 LOC : 0.00

STRENGTH CHECKS

Critical L/C : 107 Ratio : 0.088 (PASS)
 Loc : 1.25 Condition : Eq. H1-1b

DESIGN FORCES

Fx: 1.352E-01 (C) Fy: 7.806E-01 Fz: -1.248E+00
 Mx: 0.000E+00 My: -1.560E+00 Mz: -9.937E-01

SECTION PROPERTIES (UNIT: INCH)

Azz: 3.035E+00 Ayy: 3.035E+00 Cw: 0.000E+00
 Szz: 6.836E+00 Syy: 6.836E+00
 Izz: 1.880E+01 Iyy: 1.880E+01 Ix: 3.760E+01

MATERIAL PROPERTIES

Fyld: 6047.999 Fu: 8351.999

Actual Member Length: 1.250

Design Parameters

Kz: 1.00 Ky: 1.00 NSF: 1.00 SLF: 1.00 CSP: 12.00

SECTION CLASS	UNSTIFFENED / STIFFENED	·l·	·lp	·lr	CASE
Compression :	Non-Slender	16.95	N/A	75.95	T.B4.1(a)-9
	Non-Slender	16.95	N/A	75.95	T.B4.1(a)-9
Flexure :	Compact	16.95	48.33	214.05	T.B4.1(b)-20
	Compact	16.95	48.33	214.05	T.B4.1(b)-20

CHECK FOR AXIAL TENSION

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Yield	2.11E+00	2.14E+02	0.010	Eq. D2-1	110	0.00
Rupture	2.11E+00	2.46E+02	0.009	Eq. D2-2	110	0.00

CHECK FOR AXIAL COMPRESSION

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Maj Buck	2.34E+00	2.13E+02	0.011	Eq. E3-1	105	0.00
Min Buck	2.34E+00	2.13E+02	0.011	Eq. E3-1	105	0.00
Intermediate Results	Eff Area	KL/r	Fcr	Fe	Pn	
Maj Buck	3.92E-02	8.22	6.02E+03	6.10E+05	2.36E+02	
Min Buck	3.92E-02	8.22	6.02E+03	6.10E+05	2.36E+02	

CHECK FOR SHEAR

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Local-Z	1.25E+00	6.41E+01	0.019	Eq. G6-1	107	0.00
Local-Y	9.44E-01	6.41E+01	0.015	Eq. G6-1	100	0.00
Intermediate Results	Aw	Cv	Kv	h/tw	Vn	
Local-Z	3.92E-02	0.00	0.00	0.00	7.12E+01	
Local-Y	3.92E-02	0.00	0.00	0.00	7.12E+01	

CHECK FOR TORSION

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Intermediate For	0.00E+00	2.59E+01	0.000	Eq. H3-1	1	0.00



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Job No MIA: A-VGDS S	Sheet No 8	Rev
Part		
Ref		
By ARJ	Date 10/14/20	Chd
File MIAA-VGDS - Bracket Ty		Date/Time 14-Oct-2020 12:05

Job Title
Client MDAD

Reaction Summary

	Node	L/C	Horizontal	Vertical	Horizontal	Moment		
			FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
Max FX	1	105:1.2D+1.6W	2.343	0.809	0.000	0.000	0.000	0.000
Min FX	1	110:.9D+W2	-2.107	0.607	0.000	0.000	0.000	0.000
Max FY	1	100:1.4D	0.158	0.944	0.000	0.000	0.000	0.000
Min FY	8	1:DEAD (SW)	-0.027	0.000	0.000	0.000	0.000	0.000
Max FZ	1	108:1.2D+1.6W	0.135	0.809	1.248	0.000	0.000	0.000
Min FZ	1	107:1.2D+1.6W	0.135	0.809	-1.248	0.000	0.000	0.000
Max MX	1	1:DEAD (SW)	0.027	0.274	0.000	0.000	0.000	0.000
Min MX	1	1:DEAD (SW)	0.027	0.274	0.000	0.000	0.000	0.000
Max MY	1	1:DEAD (SW)	0.027	0.274	0.000	0.000	0.000	0.000
Min MY	1	1:DEAD (SW)	0.027	0.274	0.000	0.000	0.000	0.000
Max MZ	1	1:DEAD (SW)	0.027	0.274	0.000	0.000	0.000	0.000
Min MZ	1	1:DEAD (SW)	0.027	0.274	0.000	0.000	0.000	0.000

Reaction Envelope

Node	Env	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
1	+ve	2.343	0.944	1.248	0.000	0.000	0.000
1	+ve	Load: 105	Load: 100	Load: 108	-	-	-
1	-ve	-2.107	0.000	-1.248	0.000	0.000	0.000
1	-ve	Load: 110	-	Load: 107	-	-	-
8	+ve	1.371	0.000	0.832	0.000	0.000	0.000
8	+ve	Load: 109	-	Load: 108	-	-	-
8	-ve	-1.607	0.000	-0.832	0.000	0.000	0.000
8	-ve	Load: 106	-	Load: 107	-	-	-

Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
1	1:DEAD (SW)	0.027	0.274	0.000	0.000	0.000	0.000
	2:DEAD (APPL)	0.086	0.400	0.000	0.000	0.000	0.000
	3:W1	1.380	0.000	0.000	0.000	0.000	0.000
	4:W2	-1.380	0.000	0.000	0.000	0.000	0.000
	5:W3	0.000	0.000	-0.780	0.000	0.000	0.000
	6:W4	0.000	0.000	0.780	0.000	0.000	0.000
	100:1.4D	0.158	0.944	0.000	0.000	0.000	0.000
	101:1.2D+.8W	1.239	0.809	0.000	0.000	0.000	0.000
	102:1.2D+.8W	-0.969	0.809	0.000	0.000	0.000	0.000
	103:1.2D+.8W	0.135	0.809	-0.624	0.000	0.000	0.000
	104:1.2D+.8W	0.135	0.809	0.624	0.000	0.000	0.000



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Job Title
Client MDAD

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	105:1.2D+1.6W	2.343	0.809	0.000	0.000	0.000	0.000
	106:1.2D+1.6W	-2.073	0.809	0.000	0.000	0.000	0.000
	107:1.2D+1.6W	0.135	0.809	-1.248	0.000	0.000	0.000
	108:1.2D+1.6W	0.135	0.809	1.248	0.000	0.000	0.000
	109:.9D+W1	2.309	0.607	0.000	0.000	0.000	0.000
	110:.9D+W2	-2.107	0.607	0.000	0.000	0.000	0.000
	111:.9D+W3	0.101	0.607	-1.248	0.000	0.000	0.000
	112:.9D+W4	0.101	0.607	1.248	0.000	0.000	0.000
	113:.9D	0.101	0.607	0.000	0.000	0.000	0.000
	201:D	0.113	0.674	0.000	0.000	0.000	0.000
	202:D+W1	1.493	0.674	0.000	0.000	0.000	0.000
	203:D+W2	-1.267	0.674	0.000	0.000	0.000	0.000
	204:D+W3	0.113	0.674	-0.780	0.000	0.000	0.000
	205:D+W4	0.113	0.674	0.780	0.000	0.000	0.000
	206:D+.75W1	1.148	0.674	0.000	0.000	0.000	0.000
	207:D+.75W2	-0.922	0.674	0.000	0.000	0.000	0.000
	208:D+.75W3	0.113	0.674	-0.585	0.000	0.000	0.000
	209:D+.75W4	0.113	0.674	0.585	0.000	0.000	0.000
	210:.6D+W1	1.448	0.405	0.000	0.000	0.000	0.000
	211:.6D+W2	-1.312	0.405	0.000	0.000	0.000	0.000
	212:.6D+W3	0.068	0.405	-0.780	0.000	0.000	0.000
	213:.6D+W4	0.068	0.405	0.780	0.000	0.000	0.000
	214:.6D	0.068	0.405	0.000	0.000	0.000	0.000
8	1:DEAD (SW)	-0.027	0.000	0.000	0.000	0.000	0.000
	2:DEAD (APPL	-0.086	0.000	0.000	0.000	0.000	0.000
	3:W1	0.920	0.000	0.000	0.000	0.000	0.000
	4:W2	-0.920	0.000	0.000	0.000	0.000	0.000
	5:W3	0.000	0.000	-0.520	0.000	0.000	0.000
	6:W4	0.000	0.000	0.520	0.000	0.000	0.000
	100:1.4D	-0.158	0.000	0.000	0.000	0.000	0.000
	101:1.2D+.8W	0.601	0.000	0.000	0.000	0.000	0.000
	102:1.2D+.8W	-0.871	0.000	0.000	0.000	0.000	0.000
	103:1.2D+.8W	-0.135	0.000	-0.416	0.000	0.000	0.000
	104:1.2D+.8W	-0.135	0.000	0.416	0.000	0.000	0.000
	105:1.2D+1.6W	1.337	0.000	0.000	0.000	0.000	0.000
	106:1.2D+1.6W	-1.607	0.000	0.000	0.000	0.000	0.000
	107:1.2D+1.6W	-0.135	0.000	-0.832	0.000	0.000	0.000
	108:1.2D+1.6W	-0.135	0.000	0.832	0.000	0.000	0.000
	109:.9D+W1	1.371	0.000	0.000	0.000	0.000	0.000
	110:.9D+W2	-1.573	0.000	0.000	0.000	0.000	0.000
	111:.9D+W3	-0.101	0.000	-0.832	0.000	0.000	0.000
	112:.9D+W4	-0.101	0.000	0.832	0.000	0.000	0.000
	113:.9D	-0.101	0.000	0.000	0.000	0.000	0.000
	201:D	-0.113	0.000	0.000	0.000	0.000	0.000



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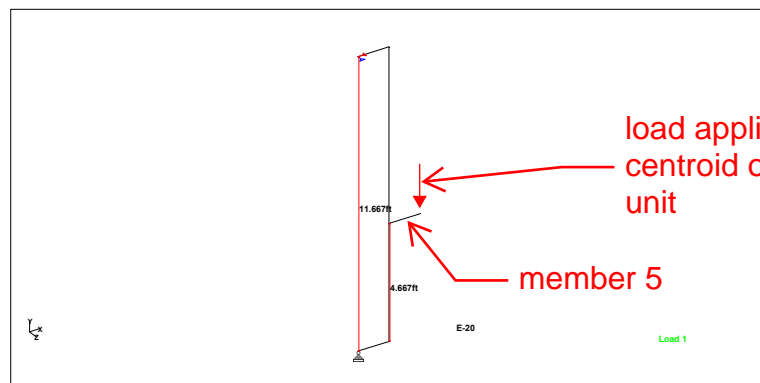
Job Title
Client MDAD

Reactions Cont...

Node	L/C	Horizontal		Vertical	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
	202:D+W1	0.807	0.000	0.000	0.000	0.000	0.000
	203:D+W2	-1.033	0.000	0.000	0.000	0.000	0.000
	204:D+W3	-0.113	0.000	-0.520	0.000	0.000	0.000
	205:D+W4	-0.113	0.000	0.520	0.000	0.000	0.000
	206:D+.75W1	0.577	0.000	0.000	0.000	0.000	0.000
	207:D+.75W2	-0.803	0.000	0.000	0.000	0.000	0.000
	208:D+.75W3	-0.113	0.000	-0.390	0.000	0.000	0.000
	209:D+.75W4	-0.113	0.000	0.390	0.000	0.000	0.000
	210:.6D+W1	0.852	0.000	0.000	0.000	0.000	0.000
	211:.6D+W2	-0.988	0.000	0.000	0.000	0.000	0.000
	212:.6D+W3	-0.068	0.000	-0.520	0.000	0.000	0.000
	213:.6D+W4	-0.068	0.000	0.520	0.000	0.000	0.000
	214:.6D	-0.068	0.000	0.000	0.000	0.000	0.000

Utilization Ratio

Beam	Analysis Property	Design Property	Actual Allowable		Ratio (Act./Allow.)	Clause	L/C	Ax (in ²)	Iz (in ⁴)	Iy (in ⁴)	Ix (in ⁴)
			Ratio	Ratio							
1	HSSP5.500	HSSP5.500	0.088	1.000	0.088	Eq. H1-1b	107	5.650	18.800	18.800	37.600
4	HSSP5.500	HSSP5.500	0.367	1.000	0.367	Eq. H1-1b	106	5.650	18.800	18.800	37.600
5	HSSP1.660	HSSP1.660	3.333	1.000	3.333	Eq. H1-1b	107	0.625	0.184	0.184	0.368
6	HSSP5.500	HSSP5.500	0.386	1.000	0.386	Eq. H1-1b	106	5.650	18.800	18.800	37.600
7	HSSP5.500	HSSP5.500	0.178	1.000	0.178	Eq. H1-1b	107	5.650	18.800	18.800	37.600



temp member used for analysis only

load applied at centroid of A-VGDS unit

member 5

Whole Structure (Input data was modified after picture taken)

5.1. Type 2: E-33



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Job No	Sheet No 1	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Job Information

	Engineer	Checked	Approved
Name:			
Date:	01-Sep-20		

Project ID	
Project Name	

Structure Type	SPACE FRAME
-----------------------	-------------

Number of Nodes	17	Highest Node	128
Number of Elements	18	Highest Beam	118

Number of Basic Load Cases	6
Number of Combination Load Cases	28

Included in this printout are data for:

All	The Whole Structure
------------	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DEAD (SW)
Primary	2	DEAD (APPLIED)
Primary	3	W1
Primary	4	W2
Primary	5	W3
Primary	6	W4
Combination	100	1.4D
Combination	101	1.2D+.8W1
Combination	102	1.2D+.8W2
Combination	103	1.2D+.8W3
Combination	104	1.2D+.8W4
Combination	105	1.2D+1.6W1
Combination	106	1.2D+1.6W2
Combination	107	1.2D+1.6W3
Combination	108	1.2D+1.6W4
Combination	109	.9D+W1
Combination	110	.9D+W2
Combination	111	.9D+W3
Combination	112	.9D+W4
Combination	113	.9D
Combination	201	D
Combination	202	D+W1
Combination	203	D+W2
Combination	204	D+W3
Combination	205	D+W4



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Job No	Sheet No 2	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Job Information Cont...

Type	L/C	Name
Combination	209	D+.75W4
Combination	210	.6D+W1
Combination	211	.6D+W2
Combination	212	.6D+W3
Combination	213	.6D+W4
Combination	214	.6D

Nodes

Node	X (ft)	Y (ft)	Z (ft)
112	10.750	0.000	-20.000
113	12.000	4.250	-20.000
114	10.750	4.250	-20.000
115	10.750	7.500	-20.000
116	10.000	0.000	-22.500
117	10.750	0.000	-22.500
118	10.000	-1.000	-22.500
119	10.750	-1.000	-22.500
120	10.750	7.500	-22.500
121	10.000	0.000	-17.500
122	10.750	0.000	-17.500
123	10.000	-1.000	-17.500
124	10.750	-1.000	-17.500
125	10.750	7.500	-17.500
126	10.000	0.000	-20.000
127	10.000	-1.000	-20.000
128	10.750	-1.000	-20.000

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
101	112	114	4.250	2	0
102	114	113	1.250	1	0
103	114	115	3.250	2	0
104	116	117	0.750	2	0
105	117	120	7.500	2	0
106	118	119	0.750	2	0
107	119	117	1.000	2	0
108	121	122	0.750	2	0
109	122	125	7.500	2	0
110	123	124	0.750	2	0
111	124	122	1.000	2	0



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Job No	Sheet No 3	Rev
Part	Ref	
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Beams Cont...

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
112	120	115	2.500	2	0
113	115	125	2.500	2	0
114	117	112	2.500	2	0
115	112	122	2.500	2	0
116	126	112	0.750	2	0
117	127	128	0.750	2	0
118	128	112	1.000	2	0

Section Properties

Prop	Section	Area (in ²)	I _{yy} (in ⁴)	I _{zz} (in ⁴)	J (in ⁴)	Material
1	HSSP1.660X0.14	0.625	0.184	0.184	0.368	STEEL
2	HSSP5.500X0.375	5.650	18.800	18.800	37.634	STEEL

Materials

Mat	Name	E (kip/in ²)	ν	Density (kip/in ³)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E-6
2	STAINLESSSTEEL	28E+3	0.300	0.000	10E-6
3	ALUMINUM	10E+3	0.330	0.000	13E-6
4	CONCRETE	3.15E+3	0.170	0.000	5E-6

Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip·ft/deg)	rY (kip·ft/deg)	rZ (kip·ft/deg)
116	Fixed	Fixed	Fixed	-	-	-
118	Fixed	Fixed	Fixed	-	-	-
121	Fixed	Fixed	Fixed	-	-	-
123	Fixed	Fixed	Fixed	-	-	-
126	Fixed	Fixed	Fixed	-	-	-
127	Fixed	Fixed	Fixed	-	-	-

Releases

There is no data of this type.



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Job No	Sheet No 4	Rev
Part		
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Primary Load Cases

Number	Name	Type
1	DEAD (SW)	Dead
2	DEAD (APPLIED)	Dead
3	W1	Wind
4	W2	Wind
5	W3	Wind
6	W4	Wind

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
100	1.4D	1	DEAD (SW)	1.40
		2	DEAD (APPLIED)	1.40
101	1.2D+.8W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	0.80
102	1.2D+.8W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	0.80
103	1.2D+.8W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		5	W3	0.80
104	1.2D+.8W4	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		6	W4	0.80
105	1.2D+1.6W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	1.60
106	1.2D+1.6W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	1.60
107	1.2D+1.6W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		5	W3	1.60
108	1.2D+1.6W4	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		6	W4	1.60
109	.9D+W1	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		3	W1	1.60
110	.9D+W2	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		4	W2	1.60
111	.9D+W3	1	DEAD (SW)	0.90



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Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		2	DEAD (APPLIED)	0.90
		5	W3	1.60
112	.9D+W4	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		6	W4	1.60
113	.9D	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
201	D	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
202	D+W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	1.00
203	D+W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	1.00
204	D+W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	1.00
205	D+W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	1.00
206	D+.75W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	0.75
207	D+.75W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	0.75
208	D+.75W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	0.75
209	D+.75W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	0.75
210	.6D+W1	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		3	W1	1.00
211	.6D+W2	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		4	W2	1.00
212	.6D+W3	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		5	W3	1.00
213	.6D+W4	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		6	W4	1.00



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Job No	Sheet No 6	Rev
Part		
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Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
214	.6D	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60

Load Generators

There is no data of this type.

1 DEAD (SW) : Selfweight

Direction	Factor	Assigned Geometry
Y	-1.000	ALL

2 DEAD (APPLIED) : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
113	-	-0.400	-	-	-	-

3 W1 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
113	-2.300	-	-	-	-	-

4 W2 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
113	2.300	-	-	-	-	-

5 W3 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
113	-	-	1.300	-	-	-

6 W4 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
113	-	-	-1.300	-	-	-



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Job No	Sheet No 7	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
116	1:DEAD (SW)	-0.174	0.122	-0.003	0.000	0.000	0.000
	2:DEAD (APPL)	-0.266	-0.054	-0.010	0.000	0.000	0.000
	3:W1	3.197	0.906	0.122	0.000	0.000	0.000
	4:W2	-3.197	-0.906	-0.122	0.000	0.000	0.000
	5:W3	-0.181	-0.640	-0.674	0.000	0.000	0.000
	6:W4	0.181	0.640	0.674	0.000	0.000	0.000
	100:1.4D	-0.616	0.096	-0.017	0.000	0.000	0.000
	101:1.2D+.8W1	2.029	0.806	0.082	0.000	0.000	0.000
	102:1.2D+.8W2	-3.085	-0.643	-0.112	0.000	0.000	0.000
	103:1.2D+.8W3	-0.672	-0.430	-0.554	0.000	0.000	0.000
	104:1.2D+.8W4	-0.383	0.594	0.525	0.000	0.000	0.000
	105:1.2D+1.6W1	4.587	1.531	0.180	0.000	0.000	0.000
	106:1.2D+1.6W2	-5.642	-1.367	-0.209	0.000	0.000	0.000
	107:1.2D+1.6W3	-0.817	-0.942	-1.094	0.000	0.000	0.000
	108:1.2D+1.6W4	-0.239	1.106	1.064	0.000	0.000	0.000
	109:.9D+W1	4.719	1.510	0.183	0.000	0.000	0.000
	110:.9D+W2	-5.510	-1.387	-0.206	0.000	0.000	0.000
	111:.9D+W3	-0.685	-0.962	-1.090	0.000	0.000	0.000
	112:.9D+W4	-0.107	1.085	1.068	0.000	0.000	0.000
	113:.9D	-0.396	0.061	-0.011	0.000	0.000	0.000
	201:D	-0.440	0.068	-0.012	0.000	0.000	0.000
	202:D+W1	2.757	0.974	0.109	0.000	0.000	0.000
	203:D+W2	-3.636	-0.837	-0.134	0.000	0.000	0.000
	204:D+W3	-0.621	-0.572	-0.687	0.000	0.000	0.000
	205:D+W4	-0.259	0.708	0.662	0.000	0.000	0.000
	206:D+.75W1	1.958	0.747	0.079	0.000	0.000	0.000
	207:D+.75W2	-2.837	-0.611	-0.104	0.000	0.000	0.000
	208:D+.75W3	-0.575	-0.412	-0.518	0.000	0.000	0.000
	209:D+.75W4	-0.304	0.548	0.493	0.000	0.000	0.000
	210:.6D+W1	2.933	0.946	0.114	0.000	0.000	0.000
	211:.6D+W2	-3.461	-0.865	-0.129	0.000	0.000	0.000
	212:.6D+W3	-0.445	-0.599	-0.682	0.000	0.000	0.000
	213:.6D+W4	-0.083	0.681	0.667	0.000	0.000	0.000
	214:.6D	-0.264	0.041	-0.007	0.000	0.000	0.000
118	1:DEAD (SW)	0.174	0.120	0.004	0.000	0.000	0.000
	2:DEAD (APPL)	0.240	0.096	0.006	0.000	0.000	0.000
	3:W1	-2.801	-1.047	-0.026	0.000	0.000	0.000
	4:W2	2.801	1.047	0.026	0.000	0.000	0.000
	5:W3	-0.339	-0.334	0.169	0.000	0.000	0.000
	6:W4	0.339	0.334	-0.169	0.000	0.000	0.000
	100:1.4D	0.579	0.302	0.014	0.000	0.000	0.000
	101:1.2D+.8W1	-1.744	-0.578	-0.009	0.000	0.000	0.000
	102:1.2D+.8W2	2.737	1.097	0.033	0.000	0.000	0.000
	103:1.2D+.8W3	0.225	-0.008	0.147	0.000	0.000	0.000



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Job No	Sheet No 8	Rev
Part		
Job Title	Ref	
Client	By	Date 01-Sep-20 Chd
	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	104:1.2D+.8W ₂	0.767	0.527	-0.123	0.000	0.000	0.000
	105:1.2D+1.6W	-3.985	-1.416	-0.030	0.000	0.000	0.000
	106:1.2D+1.6W	4.977	1.934	0.054	0.000	0.000	0.000
	107:1.2D+1.6W	-0.047	-0.275	0.282	0.000	0.000	0.000
	108:1.2D+1.6W	1.039	0.794	-0.258	0.000	0.000	0.000
	109:.9D+W1	-4.109	-1.480	-0.033	0.000	0.000	0.000
	110:.9D+W2	4.853	1.869	0.051	0.000	0.000	0.000
	111:.9D+W3	-0.171	-0.340	0.279	0.000	0.000	0.000
	112:.9D+W4	0.915	0.729	-0.261	0.000	0.000	0.000
	113:.9D	0.372	0.194	0.009	0.000	0.000	0.000
	201:D	0.413	0.216	0.010	0.000	0.000	0.000
	202:D+W1	-2.387	-0.831	-0.016	0.000	0.000	0.000
	203:D+W2	3.214	1.263	0.036	0.000	0.000	0.000
	204:D+W3	0.074	-0.118	0.179	0.000	0.000	0.000
	205:D+W4	0.753	0.550	-0.159	0.000	0.000	0.000
	206:D+.75W1	-1.687	-0.569	-0.009	0.000	0.000	0.000
	207:D+.75W2	2.514	1.001	0.030	0.000	0.000	0.000
	208:D+.75W3	0.159	-0.035	0.137	0.000	0.000	0.000
	209:D+.75W4	0.668	0.467	-0.116	0.000	0.000	0.000
	210:.6D+W1	-2.553	-0.917	-0.020	0.000	0.000	0.000
	211:.6D+W2	3.049	1.176	0.032	0.000	0.000	0.000
	212:.6D+W3	-0.091	-0.205	0.175	0.000	0.000	0.000
	213:.6D+W4	0.587	0.464	-0.163	0.000	0.000	0.000
	214:.6D	0.248	0.130	0.006	0.000	0.000	0.000
121	1:DEAD (SW)	-0.174	0.122	0.003	0.000	0.000	0.000
	2:DEAD (APPL)	-0.266	-0.054	0.010	0.000	0.000	0.000
	3:W1	3.197	0.906	-0.122	0.000	0.000	0.000
	4:W2	-3.197	-0.906	0.122	0.000	0.000	0.000
	5:W3	0.181	0.640	-0.674	0.000	0.000	0.000
	6:W4	-0.181	-0.640	0.674	0.000	0.000	0.000
	100:1.4D	-0.616	0.096	0.017	0.000	0.000	0.000
	101:1.2D+.8W ₁	2.029	0.806	-0.082	0.000	0.000	0.000
	102:1.2D+.8W ₂	-3.085	-0.643	0.112	0.000	0.000	0.000
	103:1.2D+.8W ₃	-0.383	0.594	-0.525	0.000	0.000	0.000
	104:1.2D+.8W ₄	-0.672	-0.430	0.554	0.000	0.000	0.000
	105:1.2D+1.6W	4.587	1.531	-0.180	0.000	0.000	0.000
	106:1.2D+1.6W	-5.642	-1.367	0.209	0.000	0.000	0.000
	107:1.2D+1.6W	-0.239	1.106	-1.064	0.000	0.000	0.000
	108:1.2D+1.6W	-0.817	-0.942	1.094	0.000	0.000	0.000
	109:.9D+W1	4.719	1.510	-0.183	0.000	0.000	0.000
	110:.9D+W2	-5.510	-1.387	0.206	0.000	0.000	0.000
	111:.9D+W3	-0.107	1.085	-1.068	0.000	0.000	0.000
	112:.9D+W4	-0.685	-0.962	1.090	0.000	0.000	0.000
	113:.9D	-0.396	0.061	0.011	0.000	0.000	0.000



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Job No	Sheet No 9	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	201:D	-0.440	0.068	0.012	0.000	0.000	0.000
	202:D+W1	2.757	0.974	-0.109	0.000	0.000	0.000
	203:D+W2	-3.636	-0.837	0.134	0.000	0.000	0.000
	204:D+W3	-0.259	0.708	-0.662	0.000	0.000	0.000
	205:D+W4	-0.621	-0.572	0.687	0.000	0.000	0.000
	206:D+.75W1	1.958	0.747	-0.079	0.000	0.000	0.000
	207:D+.75W2	-2.837	-0.611	0.104	0.000	0.000	0.000
	208:D+.75W3	-0.304	0.548	-0.493	0.000	0.000	0.000
	209:D+.75W4	-0.575	-0.412	0.518	0.000	0.000	0.000
	210:.6D+W1	2.933	0.946	-0.114	0.000	0.000	0.000
	211:.6D+W2	-3.461	-0.865	0.129	0.000	0.000	0.000
	212:.6D+W3	-0.083	0.681	-0.667	0.000	0.000	0.000
	213:.6D+W4	-0.445	-0.599	0.682	0.000	0.000	0.000
	214:.6D	-0.264	0.041	0.007	0.000	0.000	0.000
123	1:DEAD (SW)	0.174	0.120	-0.004	0.000	0.000	0.000
	2:DEAD (APPL	0.240	0.096	-0.006	0.000	0.000	0.000
	3:W1	-2.801	-1.047	0.026	0.000	0.000	0.000
	4:W2	2.801	1.047	-0.026	0.000	0.000	0.000
	5:W3	0.339	0.334	0.169	0.000	0.000	0.000
	6:W4	-0.339	-0.334	-0.169	0.000	0.000	0.000
	100:1.4D	0.579	0.302	-0.014	0.000	0.000	0.000
	101:1.2D+.8W1	-1.744	-0.578	0.009	0.000	0.000	0.000
	102:1.2D+.8W2	2.737	1.097	-0.033	0.000	0.000	0.000
	103:1.2D+.8W3	0.767	0.527	0.123	0.000	0.000	0.000
	104:1.2D+.8W4	0.225	-0.008	-0.147	0.000	0.000	0.000
	105:1.2D+1.6W1	-3.985	-1.416	0.030	0.000	0.000	0.000
	106:1.2D+1.6W2	4.977	1.934	-0.054	0.000	0.000	0.000
	107:1.2D+1.6W3	1.039	0.794	0.258	0.000	0.000	0.000
	108:1.2D+1.6W4	-0.047	-0.275	-0.282	0.000	0.000	0.000
	109:.9D+W1	-4.109	-1.480	0.033	0.000	0.000	0.000
	110:.9D+W2	4.853	1.869	-0.051	0.000	0.000	0.000
	111:.9D+W3	0.915	0.729	0.261	0.000	0.000	0.000
	112:.9D+W4	-0.171	-0.340	-0.279	0.000	0.000	0.000
	113:.9D	0.372	0.194	-0.009	0.000	0.000	0.000
	201:D	0.413	0.216	-0.010	0.000	0.000	0.000
	202:D+W1	-2.387	-0.831	0.016	0.000	0.000	0.000
	203:D+W2	3.214	1.263	-0.036	0.000	0.000	0.000
	204:D+W3	0.753	0.550	0.159	0.000	0.000	0.000
	205:D+W4	0.074	-0.118	-0.179	0.000	0.000	0.000
	206:D+.75W1	-1.687	-0.569	0.009	0.000	0.000	0.000
	207:D+.75W2	2.514	1.001	-0.030	0.000	0.000	0.000
	208:D+.75W3	0.668	0.467	0.116	0.000	0.000	0.000
	209:D+.75W4	0.159	-0.035	-0.137	0.000	0.000	0.000
	210:.6D+W1	-2.553	-0.917	0.020	0.000	0.000	0.000



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Job No	Sheet No 10	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	211:.6D+W2	3.049	1.176	-0.032	0.000	0.000	0.000
	212:.6D+W3	0.587	0.464	0.163	0.000	0.000	0.000
	213:.6D+W4	-0.091	-0.205	-0.175	0.000	0.000	0.000
	214:.6D	0.248	0.130	-0.006	0.000	0.000	0.000
126	1:DEAD (SW)	-0.200	0.147	0.000	0.000	0.000	0.000
	2:DEAD (APPL)	-0.267	0.131	0.000	0.000	0.000	0.000
	3:W1	5.683	1.736	-0.000	0.000	0.000	0.000
	4:W2	-5.683	-1.736	0.000	0.000	0.000	0.000
	5:W3	0.000	-0.000	-0.606	0.000	0.000	0.000
	6:W4	-0.000	0.000	0.606	0.000	0.000	0.000
	100:1.4D	-0.654	0.389	0.000	0.000	0.000	0.000
	101:1.2D+.8W1	3.985	1.722	-0.000	0.000	0.000	0.000
	102:1.2D+.8W2	-5.107	-1.055	0.000	0.000	0.000	0.000
	103:1.2D+.8W3	-0.561	0.334	-0.485	0.000	0.000	0.000
	104:1.2D+.8W4	-0.561	0.334	0.485	0.000	0.000	0.000
	105:1.2D+1.6W1	8.531	3.111	-0.000	0.000	0.000	0.000
	106:1.2D+1.6W2	-9.653	-2.444	0.000	0.000	0.000	0.000
	107:1.2D+1.6W3	-0.561	0.334	-0.970	0.000	0.000	0.000
	108:1.2D+1.6W4	-0.561	0.334	0.970	0.000	0.000	0.000
	109:.9D+W1	8.672	3.028	-0.000	0.000	0.000	0.000
	110:.9D+W2	-9.512	-2.527	0.000	0.000	0.000	0.000
	111:.9D+W3	-0.420	0.250	-0.970	0.000	0.000	0.000
	112:.9D+W4	-0.420	0.250	0.970	0.000	0.000	0.000
	113:.9D	-0.420	0.250	0.000	0.000	0.000	0.000
	201:D	-0.467	0.278	0.000	0.000	0.000	0.000
	202:D+W1	5.215	2.014	-0.000	0.000	0.000	0.000
	203:D+W2	-6.150	-1.458	0.000	0.000	0.000	0.000
	204:D+W3	-0.467	0.278	-0.606	0.000	0.000	0.000
	205:D+W4	-0.467	0.278	0.606	0.000	0.000	0.000
	206:D+.75W1	3.795	1.580	-0.000	0.000	0.000	0.000
	207:D+.75W2	-4.729	-1.024	0.000	0.000	0.000	0.000
	208:D+.75W3	-0.467	0.278	-0.455	0.000	0.000	0.000
	209:D+.75W4	-0.467	0.278	0.455	0.000	0.000	0.000
	210:.6D+W1	5.402	1.903	-0.000	0.000	0.000	0.000
	211:.6D+W2	-5.963	-1.569	0.000	0.000	0.000	0.000
	212:.6D+W3	-0.280	0.167	-0.606	0.000	0.000	0.000
	213:.6D+W4	-0.280	0.167	0.606	0.000	0.000	0.000
	214:.6D	-0.280	0.167	0.000	0.000	0.000	0.000
127	1:DEAD (SW)	0.199	0.139	0.000	0.000	0.000	0.000
	2:DEAD (APPL)	0.321	0.185	-0.000	0.000	0.000	0.000
	3:W1	-4.174	-1.453	-0.000	0.000	0.000	0.000
	4:W2	4.174	1.453	0.000	0.000	0.000	0.000
	5:W3	-0.000	-0.000	0.318	0.000	0.000	0.000
	6:W4	0.000	0.000	-0.318	0.000	0.000	0.000



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Job No

Sheet No

11

Rev

Part

Job Title

Ref

By

Date 01-Sep-20

Chd

Client

File MIAA-VGDS - Bracket Ty

Date/Time 14-Oct-2020 12:44

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	100:1.4D	0.728	0.453	-0.000	0.000	0.000	0.000
	101:1.2D+.8W1	-2.715	-0.774	-0.000	0.000	0.000	0.000
	102:1.2D+.8W2	3.964	1.551	0.000	0.000	0.000	0.000
	103:1.2D+.8W3	0.624	0.388	0.254	0.000	0.000	0.000
	104:1.2D+.8W4	0.624	0.388	-0.254	0.000	0.000	0.000
	105:1.2D+1.6W1	-6.055	-1.937	-0.000	0.000	0.000	0.000
	106:1.2D+1.6W2	7.303	2.714	0.000	0.000	0.000	0.000
	107:1.2D+1.6W3	0.624	0.388	0.508	0.000	0.000	0.000
	108:1.2D+1.6W4	0.624	0.388	-0.508	0.000	0.000	0.000
	109:.9D+W1	-6.211	-2.034	-0.000	0.000	0.000	0.000
	110:.9D+W2	7.147	2.617	0.000	0.000	0.000	0.000
	111:.9D+W3	0.468	0.291	0.508	0.000	0.000	0.000
	112:.9D+W4	0.468	0.291	-0.508	0.000	0.000	0.000
	113:.9D	0.468	0.291	-0.000	0.000	0.000	0.000
	201:D	0.520	0.324	-0.000	0.000	0.000	0.000
	202:D+W1	-3.654	-1.130	-0.000	0.000	0.000	0.000
	203:D+W2	4.694	1.777	0.000	0.000	0.000	0.000
	204:D+W3	0.520	0.324	0.318	0.000	0.000	0.000
	205:D+W4	0.520	0.324	-0.318	0.000	0.000	0.000
	206:D+.75W1	-2.611	-0.767	-0.000	0.000	0.000	0.000
	207:D+.75W2	3.651	1.414	0.000	0.000	0.000	0.000
	208:D+.75W3	0.520	0.324	0.238	0.000	0.000	0.000
	209:D+.75W4	0.520	0.324	-0.238	0.000	0.000	0.000
	210:.6D+W1	-3.862	-1.259	-0.000	0.000	0.000	0.000
	211:.6D+W2	4.486	1.647	0.000	0.000	0.000	0.000
	212:.6D+W3	0.312	0.194	0.318	0.000	0.000	0.000
	213:.6D+W4	0.312	0.194	-0.318	0.000	0.000	0.000
	214:.6D	0.312	0.194	-0.000	0.000	0.000	0.000



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Job No	Sheet No 12	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Reaction Summary

	Node	L/C	Horizontal	Vertical	Horizontal	Moment		
			FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
Max FX	126	109:9D+W1	8.672	3.028	-0.000	0.000	0.000	0.000
Min FX	126	106:1.2D+1.6W	-9.653	-2.444	0.000	0.000	0.000	0.000
Max FY	126	105:1.2D+1.6W	8.531	3.111	-0.000	0.000	0.000	0.000
Min FY	126	110:9D+W2	-9.512	-2.527	0.000	0.000	0.000	0.000
Max FZ	121	108:1.2D+1.6W	-0.817	-0.942	1.094	0.000	0.000	0.000
Min FZ	116	107:1.2D+1.6W	-0.817	-0.942	-1.094	0.000	0.000	0.000
Max MX	116	1:DEAD (SW)	-0.174	0.122	-0.003	0.000	0.000	0.000
Min MX	116	1:DEAD (SW)	-0.174	0.122	-0.003	0.000	0.000	0.000
Max MY	116	1:DEAD (SW)	-0.174	0.122	-0.003	0.000	0.000	0.000
Min MY	116	1:DEAD (SW)	-0.174	0.122	-0.003	0.000	0.000	0.000
Max MZ	116	1:DEAD (SW)	-0.174	0.122	-0.003	0.000	0.000	0.000
Min MZ	116	1:DEAD (SW)	-0.174	0.122	-0.003	0.000	0.000	0.000

Reaction Envelope

Node	Env	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
116	+ve	4.719	1.531	1.068	0.000	0.000	0.000
116	+ve	Load: 109	Load: 105	Load: 112	-	-	-
116	-ve	-5.642	-1.387	-1.094	0.000	0.000	0.000
116	-ve	Load: 106	Load: 110	Load: 107	-	-	-
118	+ve	4.977	1.934	0.282	0.000	0.000	0.000
118	+ve	Load: 106	Load: 106	Load: 107	-	-	-
118	-ve	-4.109	-1.480	-0.261	0.000	0.000	0.000
118	-ve	Load: 109	Load: 109	Load: 112	-	-	-
121	+ve	4.719	1.531	1.094	0.000	0.000	0.000
121	+ve	Load: 109	Load: 105	Load: 108	-	-	-
121	-ve	-5.642	-1.387	-1.068	0.000	0.000	0.000
121	-ve	Load: 106	Load: 110	Load: 111	-	-	-
123	+ve	4.977	1.934	0.261	0.000	0.000	0.000
123	+ve	Load: 106	Load: 106	Load: 111	-	-	-
123	-ve	-4.109	-1.480	-0.282	0.000	0.000	0.000
123	-ve	Load: 109	Load: 109	Load: 108	-	-	-
126	+ve	8.672	3.111	0.970	0.000	0.000	0.000
126	+ve	Load: 109	Load: 105	Load: 108	-	-	-
126	-ve	-9.653	-2.527	-0.970	0.000	0.000	0.000
126	-ve	Load: 106	Load: 110	Load: 107	-	-	-
127	+ve	7.303	2.714	0.508	0.000	0.000	0.000
127	+ve	Load: 106	Load: 106	Load: 107	-	-	-
127	-ve	-6.211	-2.034	-0.508	0.000	0.000	0.000
127	-ve	Load: 109	Load: 109	Load: 108	-	-	-

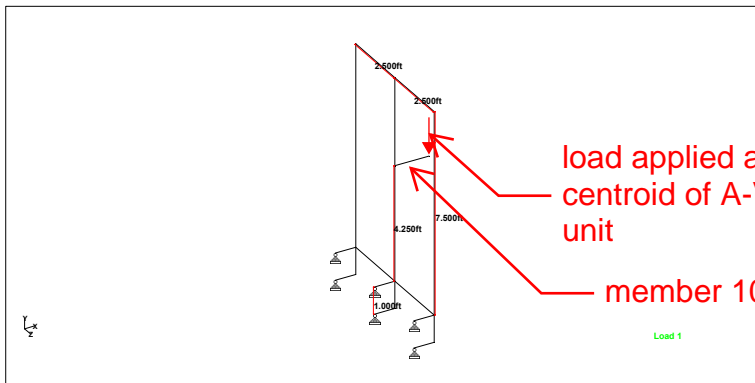


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Job No	Sheet No 13	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:44

Utilization Ratio

Beam	Analysis Property	Design Property	Actual Allowable		Ratio (Act./Allow.)	Clause	L/C	Ax (in ²)	Iz (in ⁴)	Iy (in ⁴)	Ix (in ⁴)
			Ratio	Ratio							
101	HSSP5.500	HSSP5.500	0.263	1.000	0.263	Eq. H1-1b	106	5.650	18.800	18.800	37.600
102	HSSP1.660	HSSP1.660	3.333	1.000	3.333	Eq. H1-1b	107	0.625	0.184	0.184	0.368
103	HSSP5.500	HSSP5.500	0.096	1.000	0.096	Eq. H1-1b	106	5.650	18.800	18.800	37.600
104	HSSP5.500	HSSP5.500	0.056	1.000	0.056	Eq. H1-1b	108	5.650	18.800	18.800	37.600
105	HSSP5.500	HSSP5.500	0.151	1.000	0.151	Eq. H1-1b	106	5.650	18.800	18.800	37.600
106	HSSP5.500	HSSP5.500	0.061	1.000	0.061	Eq. H1-1b	106	5.650	18.800	18.800	37.600
107	HSSP5.500	HSSP5.500	0.125	1.000	0.125	Eq. H1-1b	106	5.650	18.800	18.800	37.600
108	HSSP5.500	HSSP5.500	0.056	1.000	0.056	Eq. H1-1b	107	5.650	18.800	18.800	37.600
109	HSSP5.500	HSSP5.500	0.151	1.000	0.151	Eq. H1-1b	106	5.650	18.800	18.800	37.600
110	HSSP5.500	HSSP5.500	0.061	1.000	0.061	Eq. H1-1b	106	5.650	18.800	18.800	37.600
111	HSSP5.500	HSSP5.500	0.125	1.000	0.125	Eq. H1-1b	106	5.650	18.800	18.800	37.600
112	HSSP5.500	HSSP5.500	0.060	1.000	0.060	Eq. H1-1b	106	5.650	18.800	18.800	37.600
113	HSSP5.500	HSSP5.500	0.060	1.000	0.060	Eq. H1-1b	106	5.650	18.800	18.800	37.600
114	HSSP5.500	HSSP5.500	0.082	1.000	0.082	Eq. H1-1b	108	5.650	18.800	18.800	37.600
115	HSSP5.500	HSSP5.500	0.082	1.000	0.082	Eq. H1-1b	107	5.650	18.800	18.800	37.600
116	HSSP5.500	HSSP5.500	0.100	1.000	0.100	Eq. H1-1b	105	5.650	18.800	18.800	37.600
117	HSSP5.500	HSSP5.500	0.087	1.000	0.087	Eq. H1-1b	106	5.650	18.800	18.800	37.600
118	HSSP5.500	HSSP5.500	0.187	1.000	0.187	Eq. H1-1b	106	5.650	18.800	18.800	37.600



Member 102 is temp member used for analysis only

load applied at centroid of A-VGDS unit

member 102

Whole Structure

5.2. Type 3: E-25



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Job No	Sheet No 1	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Job Information

	Engineer	Checked	Approved
Name:			
Date:	01-Sep-20		

Project ID	
Project Name	

Structure Type	SPACE FRAME
-----------------------	-------------

Number of Nodes	12	Highest Node	86
Number of Elements	13	Highest Beam	78

Number of Basic Load Cases	6
Number of Combination Load Cases	28

Included in this printout are data for:

All	The Whole Structure
------------	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DEAD (SW)
Primary	2	DEAD (APPLIED)
Primary	3	W1
Primary	4	W2
Primary	5	W3
Primary	6	W4
Combination	100	1.4D
Combination	101	1.2D+.8W1
Combination	102	1.2D+.8W2
Combination	103	1.2D+.8W3
Combination	104	1.2D+.8W4
Combination	105	1.2D+1.6W1
Combination	106	1.2D+1.6W2
Combination	107	1.2D+1.6W3
Combination	108	1.2D+1.6W4
Combination	109	.9D+W1
Combination	110	.9D+W2
Combination	111	.9D+W3
Combination	112	.9D+W4
Combination	113	.9D
Combination	201	D
Combination	202	D+W1
Combination	203	D+W2
Combination	204	D+W3
Combination	205	D+W4



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Job No	Sheet No 2	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Job Information Cont...

Type	L/C	Name
Combination	209	D+.75W4
Combination	210	.6D+W1
Combination	211	.6D+W2
Combination	212	.6D+W3
Combination	213	.6D+W4
Combination	214	.6D

Nodes

Node	X (ft)	Y (ft)	Z (ft)
48	2.500	4.666	-30.000
49	1.250	4.666	-30.000
75	0.000	0.666	-34.500
76	1.250	0.666	-34.500
77	1.250	8.666	-34.500
79	0.000	8.666	-34.500
80	0.000	0.666	-25.500
81	1.250	0.666	-25.500
82	1.250	8.666	-25.500
84	0.000	8.666	-25.500
85	1.250	8.666	-30.000
86	1.250	0.666	-30.000

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
40	49	48	1.250	1	0
63	75	76	1.250	2	0
64	76	77	8.000	2	0
66	79	77	1.250	2	0
67	80	81	1.250	2	0
68	81	82	8.000	2	0
70	84	82	1.250	2	0
73	77	85	4.500	2	0
74	85	82	4.500	2	0
75	76	86	4.500	2	0
76	86	81	4.500	2	0
77	86	49	4.000	2	0
78	49	85	4.000	2	0



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Job No	Sheet No 3	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Section Properties

Prop	Section	Area (in ²)	I _{yy} (in ⁴)	I _{zz} (in ⁴)	J (in ⁴)	Material
1	HSSP1.660X0.14	0.625	0.184	0.184	0.368	STEEL
2	HSSP5.500X0.375	5.650	18.800	18.800	37.634	STEEL

Materials

Mat	Name	E (kip/in ²)	v	Density (kip/in ³)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E-6
2	STAINLESSSTEEL	28E+3	0.300	0.000	10E-6
3	ALUMINUM	10E+3	0.330	0.000	13E-6
4	CONCRETE	3.15E+3	0.170	0.000	5E-6

Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip·ft/deg)	rY (kip·ft/deg)	rZ (kip·ft/deg)
75	Fixed	Fixed	Fixed	-	-	-
79	Fixed	Fixed	Fixed	-	-	-
80	Fixed	Fixed	Fixed	-	-	-
84	Fixed	Fixed	Fixed	-	-	-

Releases

There is no data of this type.

Primary Load Cases

Number	Name	Type
1	DEAD (SW)	Dead
2	DEAD (APPLIED)	Dead
3	W1	Wind
4	W2	Wind
5	W3	Wind
6	W4	Wind



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Job No	Sheet No 4	Rev
Part		
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Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
100	1.4D	1	DEAD (SW)	1.40
		2	DEAD (APPLIED)	1.40
101	1.2D+.8W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	0.80
102	1.2D+.8W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	0.80
103	1.2D+.8W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		5	W3	0.80
104	1.2D+.8W4	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		6	W4	0.80
105	1.2D+1.6W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	1.60
106	1.2D+1.6W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	1.60
107	1.2D+1.6W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		5	W3	1.60
108	1.2D+1.6W4	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		6	W4	1.60
109	.9D+W1	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		3	W1	1.60
110	.9D+W2	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		4	W2	1.60
111	.9D+W3	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		5	W3	1.60
112	.9D+W4	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		6	W4	1.60
113	.9D	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
201	D	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
202	D+W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	1.00



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Job No	Sheet No 5	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
203	D+W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	1.00
204	D+W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	1.00
205	D+W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	1.00
206	D+.75W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	0.75
207	D+.75W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	0.75
208	D+.75W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	0.75
209	D+.75W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	0.75
210	.6D+W1	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		3	W1	1.00
211	.6D+W2	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		4	W2	1.00
212	.6D+W3	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		5	W3	1.00
213	.6D+W4	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		6	W4	1.00
214	.6D	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60

Load Generators

There is no data of this type.



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Job No	Sheet No 6	Rev
Part		
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1 DEAD (SW) : Selfweight

Direction	Factor	Assigned Geometry
Y	-1.000	ALL
Y	-1.000	68
Y	-1.000	64

2 DEAD (APPLIED) : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
48	-	-0.400	-	-	-	-

3 W1 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
48	-2.300	-	-	-	-	-

4 W2 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
48	2.300	-	-	-	-	-

5 W3 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
48	-	-	1.300	-	-	-

6 W4 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
48	-	-	-1.300	-	-	-



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Job No	Sheet No 7	Rev
Part		
Job Title	Ref	
	By	Date 01-Sep-20 Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Reactions

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
75	1:DEAD (SW)	0.091	0.303	0.018	0.000	0.000	0.000
	2:DEAD (APPL	0.063	0.100	0.055	0.000	0.000	0.000
	3:W1	0.575	0.450	0.918	0.000	0.000	0.000
	4:W2	-0.575	-0.450	-0.918	0.000	0.000	0.000
	5:W3	-0.181	-0.003	-0.325	0.000	0.000	0.000
	6:W4	0.181	0.003	0.325	0.000	0.000	0.000
	100:1.4D	0.215	0.564	0.102	0.000	0.000	0.000
	101:1.2D+.8W1	0.644	0.843	0.822	0.000	0.000	0.000
	102:1.2D+.8W2	-0.276	0.124	-0.647	0.000	0.000	0.000
	103:1.2D+.8W3	0.040	0.481	-0.172	0.000	0.000	0.000
	104:1.2D+.8W4	0.329	0.486	0.348	0.000	0.000	0.000
	105:1.2D+1.6W1	1.104	1.203	1.557	0.000	0.000	0.000
	106:1.2D+1.6W2	-0.736	-0.236	-1.381	0.000	0.000	0.000
	107:1.2D+1.6W3	-0.105	0.479	-0.432	0.000	0.000	0.000
	108:1.2D+1.6W4	0.473	0.488	0.608	0.000	0.000	0.000
	109:.9D+W1	1.058	1.082	1.535	0.000	0.000	0.000
	110:.9D+W2	-0.782	-0.357	-1.403	0.000	0.000	0.000
	111:.9D+W3	-0.151	0.358	-0.454	0.000	0.000	0.000
	112:.9D+W4	0.427	0.367	0.586	0.000	0.000	0.000
	113:.9D	0.138	0.363	0.066	0.000	0.000	0.000
	201:D	0.154	0.403	0.073	0.000	0.000	0.000
	202:D+W1	0.729	0.853	0.991	0.000	0.000	0.000
	203:D+W2	-0.421	-0.047	-0.845	0.000	0.000	0.000
	204:D+W3	-0.027	0.400	-0.252	0.000	0.000	0.000
	205:D+W4	0.334	0.406	0.398	0.000	0.000	0.000
	206:D+.75W1	0.585	0.740	0.762	0.000	0.000	0.000
	207:D+.75W2	-0.278	0.066	-0.616	0.000	0.000	0.000
	208:D+.75W3	0.018	0.401	-0.171	0.000	0.000	0.000
	209:D+.75W4	0.289	0.405	0.317	0.000	0.000	0.000
	210:.6D+W1	0.667	0.691	0.962	0.000	0.000	0.000
	211:.6D+W2	-0.483	-0.208	-0.874	0.000	0.000	0.000
	212:.6D+W3	-0.088	0.239	-0.281	0.000	0.000	0.000
	213:.6D+W4	0.273	0.245	0.369	0.000	0.000	0.000
	214:.6D	0.092	0.242	0.044	0.000	0.000	0.000
79	1:DEAD (SW)	-0.091	0.303	-0.018	0.000	0.000	0.000
	2:DEAD (APPL	-0.063	0.100	-0.055	0.000	0.000	0.000
	3:W1	0.575	-0.450	0.918	0.000	0.000	0.000
	4:W2	-0.575	0.450	-0.918	0.000	0.000	0.000
	5:W3	-0.181	0.003	-0.325	0.000	0.000	0.000
	6:W4	0.181	-0.003	0.325	0.000	0.000	0.000
	100:1.4D	-0.215	0.564	-0.102	0.000	0.000	0.000
	101:1.2D+.8W1	0.276	0.124	0.647	0.000	0.000	0.000
	102:1.2D+.8W2	-0.644	0.843	-0.822	0.000	0.000	0.000
	103:1.2D+.8W3	-0.329	0.486	-0.348	0.000	0.000	0.000



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Job No	Sheet No 8	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	104:1.2D+.8W ₂	-0.040	0.481	0.172	0.000	0.000	0.000
	105:1.2D+1.6W	0.736	-0.236	1.381	0.000	0.000	0.000
	106:1.2D+1.6W	-1.104	1.203	-1.557	0.000	0.000	0.000
	107:1.2D+1.6W	-0.473	0.488	-0.608	0.000	0.000	0.000
	108:1.2D+1.6W	0.105	0.479	0.432	0.000	0.000	0.000
	109:.9D+W1	0.782	-0.357	1.403	0.000	0.000	0.000
	110:.9D+W2	-1.058	1.082	-1.535	0.000	0.000	0.000
	111:.9D+W3	-0.427	0.367	-0.586	0.000	0.000	0.000
	112:.9D+W4	0.151	0.358	0.454	0.000	0.000	0.000
	113:.9D	-0.138	0.363	-0.066	0.000	0.000	0.000
	201:D	-0.154	0.403	-0.073	0.000	0.000	0.000
	202:D+W1	0.421	-0.047	0.845	0.000	0.000	0.000
	203:D+W2	-0.729	0.853	-0.991	0.000	0.000	0.000
	204:D+W3	-0.334	0.406	-0.398	0.000	0.000	0.000
	205:D+W4	0.027	0.400	0.252	0.000	0.000	0.000
	206:D+.75W1	0.278	0.066	0.616	0.000	0.000	0.000
	207:D+.75W2	-0.585	0.740	-0.762	0.000	0.000	0.000
	208:D+.75W3	-0.289	0.405	-0.317	0.000	0.000	0.000
	209:D+.75W4	-0.018	0.401	0.171	0.000	0.000	0.000
	210:.6D+W1	0.483	-0.208	0.874	0.000	0.000	0.000
	211:.6D+W2	-0.667	0.691	-0.962	0.000	0.000	0.000
	212:.6D+W3	-0.273	0.245	-0.369	0.000	0.000	0.000
	213:.6D+W4	0.088	0.239	0.281	0.000	0.000	0.000
	214:.6D	-0.092	0.242	-0.044	0.000	0.000	0.000
80	1:DEAD (SW)	0.091	0.303	-0.018	0.000	0.000	0.000
	2:DEAD (APPL)	0.063	0.100	-0.055	0.000	0.000	0.000
	3:W1	0.575	0.450	-0.918	0.000	0.000	0.000
	4:W2	-0.575	-0.450	0.918	0.000	0.000	0.000
	5:W3	0.181	0.003	-0.325	0.000	0.000	0.000
	6:W4	-0.181	-0.003	0.325	0.000	0.000	0.000
	100:1.4D	0.215	0.564	-0.102	0.000	0.000	0.000
	101:1.2D+.8W ₁	0.644	0.843	-0.822	0.000	0.000	0.000
	102:1.2D+.8W ₂	-0.276	0.124	0.647	0.000	0.000	0.000
	103:1.2D+.8W ₃	0.329	0.486	-0.348	0.000	0.000	0.000
	104:1.2D+.8W ₄	0.040	0.481	0.172	0.000	0.000	0.000
	105:1.2D+1.6W	1.104	1.203	-1.557	0.000	0.000	0.000
	106:1.2D+1.6W	-0.736	-0.236	1.381	0.000	0.000	0.000
	107:1.2D+1.6W	0.473	0.488	-0.608	0.000	0.000	0.000
	108:1.2D+1.6W	-0.105	0.479	0.432	0.000	0.000	0.000
	109:.9D+W1	1.058	1.082	-1.535	0.000	0.000	0.000
	110:.9D+W2	-0.782	-0.357	1.403	0.000	0.000	0.000
	111:.9D+W3	0.427	0.367	-0.586	0.000	0.000	0.000
	112:.9D+W4	-0.151	0.358	0.454	0.000	0.000	0.000
	113:.9D	0.138	0.363	-0.066	0.000	0.000	0.000



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Job No	Sheet No 9	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	201:D	0.154	0.403	-0.073	0.000	0.000	0.000
	202:D+W1	0.729	0.853	-0.991	0.000	0.000	0.000
	203:D+W2	-0.421	-0.047	0.845	0.000	0.000	0.000
	204:D+W3	0.334	0.406	-0.398	0.000	0.000	0.000
	205:D+W4	-0.027	0.400	0.252	0.000	0.000	0.000
	206:D+.75W1	0.585	0.740	-0.762	0.000	0.000	0.000
	207:D+.75W2	-0.278	0.066	0.616	0.000	0.000	0.000
	208:D+.75W3	0.289	0.405	-0.317	0.000	0.000	0.000
	209:D+.75W4	0.018	0.401	0.171	0.000	0.000	0.000
	210:.6D+W1	0.667	0.691	-0.962	0.000	0.000	0.000
	211:.6D+W2	-0.483	-0.208	0.874	0.000	0.000	0.000
	212:.6D+W3	0.273	0.245	-0.369	0.000	0.000	0.000
	213:.6D+W4	-0.088	0.239	0.281	0.000	0.000	0.000
	214:.6D	0.092	0.242	-0.044	0.000	0.000	0.000
84	1:DEAD (SW)	-0.091	0.303	0.018	0.000	0.000	0.000
	2:DEAD (APPL)	-0.063	0.100	0.055	0.000	0.000	0.000
	3:W1	0.575	-0.450	-0.918	0.000	0.000	0.000
	4:W2	-0.575	0.450	0.918	0.000	0.000	0.000
	5:W3	0.181	-0.003	-0.325	0.000	0.000	0.000
	6:W4	-0.181	0.003	0.325	0.000	0.000	0.000
	100:1.4D	-0.215	0.564	0.102	0.000	0.000	0.000
	101:1.2D+.8W1	0.276	0.124	-0.647	0.000	0.000	0.000
	102:1.2D+.8W2	-0.644	0.843	0.822	0.000	0.000	0.000
	103:1.2D+.8W3	-0.040	0.481	-0.172	0.000	0.000	0.000
	104:1.2D+.8W4	-0.329	0.486	0.348	0.000	0.000	0.000
	105:1.2D+1.6W1	0.736	-0.236	-1.381	0.000	0.000	0.000
	106:1.2D+1.6W2	-1.104	1.203	1.557	0.000	0.000	0.000
	107:1.2D+1.6W3	0.105	0.479	-0.432	0.000	0.000	0.000
	108:1.2D+1.6W4	-0.473	0.488	0.608	0.000	0.000	0.000
	109:.9D+W1	0.782	-0.357	-1.403	0.000	0.000	0.000
	110:.9D+W2	-1.058	1.082	1.535	0.000	0.000	0.000
	111:.9D+W3	0.151	0.358	-0.454	0.000	0.000	0.000
	112:.9D+W4	-0.427	0.367	0.586	0.000	0.000	0.000
	113:.9D	-0.138	0.363	0.066	0.000	0.000	0.000
	201:D	-0.154	0.403	0.073	0.000	0.000	0.000
	202:D+W1	0.421	-0.047	-0.845	0.000	0.000	0.000
	203:D+W2	-0.729	0.853	0.991	0.000	0.000	0.000
	204:D+W3	0.027	0.400	-0.252	0.000	0.000	0.000
	205:D+W4	-0.334	0.406	0.398	0.000	0.000	0.000
	206:D+.75W1	0.278	0.066	-0.616	0.000	0.000	0.000
	207:D+.75W2	-0.585	0.740	0.762	0.000	0.000	0.000
	208:D+.75W3	-0.018	0.401	-0.171	0.000	0.000	0.000
	209:D+.75W4	-0.289	0.405	0.317	0.000	0.000	0.000
	210:.6D+W1	0.483	-0.208	-0.874	0.000	0.000	0.000



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Job No	Sheet No 10	Rev
Part		
Job Title	Ref	
	By	Date 01-Sep-20 Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	211:.6D+W2	-0.667	0.691	0.962	0.000	0.000	0.000
	212:.6D+W3	0.088	0.239	-0.281	0.000	0.000	0.000
	213:.6D+W4	-0.273	0.245	0.369	0.000	0.000	0.000
	214:.6D	-0.092	0.242	0.044	0.000	0.000	0.000

Reaction Summary

	Node	L/C	Horizontal	Vertical	Horizontal	Moment		
			FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
Max FX	75	105:1.2D+1.6W	1.104	1.203	1.557	0.000	0.000	0.000
Min FX	79	106:1.2D+1.6W	-1.104	1.203	-1.557	0.000	0.000	0.000
Max FY	75	105:1.2D+1.6W	1.104	1.203	1.557	0.000	0.000	0.000
Min FY	79	3:W1	0.575	-0.450	0.918	0.000	0.000	0.000
Max FZ	84	106:1.2D+1.6W	-1.104	1.203	1.557	0.000	0.000	0.000
Min FZ	79	106:1.2D+1.6W	-1.104	1.203	-1.557	0.000	0.000	0.000
Max MX	75	1:DEAD (SW)	0.091	0.303	0.018	0.000	0.000	0.000
Min MX	75	1:DEAD (SW)	0.091	0.303	0.018	0.000	0.000	0.000
Max MY	75	1:DEAD (SW)	0.091	0.303	0.018	0.000	0.000	0.000
Min MY	75	1:DEAD (SW)	0.091	0.303	0.018	0.000	0.000	0.000
Max MZ	75	1:DEAD (SW)	0.091	0.303	0.018	0.000	0.000	0.000
Min MZ	75	1:DEAD (SW)	0.091	0.303	0.018	0.000	0.000	0.000

Reaction Envelope

Node	Env	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
75	+ve	1.104	1.203	1.557	0.000	0.000	0.000
75	+ve	Load: 105	Load: 105	Load: 105	-	-	-
75	-ve	-0.782	-0.450	-1.403	0.000	0.000	0.000
75	-ve	Load: 110	Load: 4	Load: 110	-	-	-
79	+ve	0.782	1.203	1.403	0.000	0.000	0.000
79	+ve	Load: 109	Load: 106	Load: 109	-	-	-
79	-ve	-1.104	-0.450	-1.557	0.000	0.000	0.000
79	-ve	Load: 106	Load: 3	Load: 106	-	-	-
80	+ve	1.104	1.203	1.403	0.000	0.000	0.000
80	+ve	Load: 105	Load: 105	Load: 110	-	-	-
80	-ve	-0.782	-0.450	-1.557	0.000	0.000	0.000
80	-ve	Load: 110	Load: 4	Load: 105	-	-	-
84	+ve	0.782	1.203	1.557	0.000	0.000	0.000
84	+ve	Load: 109	Load: 106	Load: 106	-	-	-
84	-ve	-1.104	-0.450	-1.403	0.000	0.000	0.000



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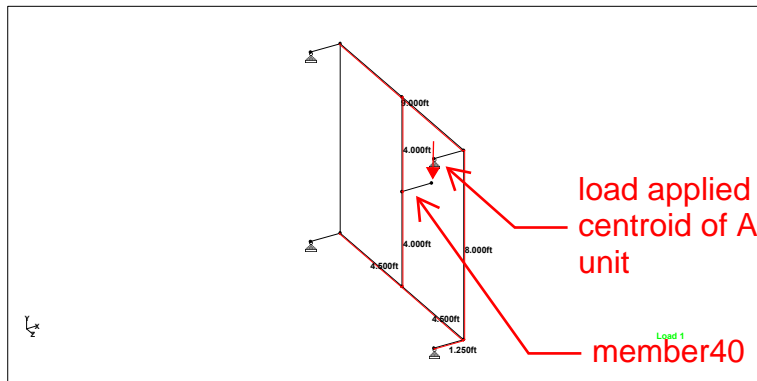
Job No	Sheet No 11	Rev
Part		
Job Title	Ref	
	By	Date 01-Sep-20 Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 12:57

Reaction Envelope Cont...

Node	Env	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
84	-ve	Load: 106	Load: 3	Load: 109	-	-	-

Utilization Ratio

Beam	Analysis Property	Design Property	Actual Allowable		Ratio (Act./Allow.)	Clause	L/C	Ax (in ²)	Iz (in ⁴)	Iy (in ⁴)	Ix (in ⁴)
			Ratio	Ratio							
40	HSSP1.660	HSSP1.660	3.333	1.000	3.333	Eq. H1-1b	107	0.625	0.184	0.184	0.368
63	HSSP5.500	HSSP5.500	0.120	1.000	0.120	Eq. H1-1b	105	5.650	18.800	18.800	37.600
64	HSSP5.500	HSSP5.500	0.037	1.000	0.037	Eq. H1-1b	100	5.650	18.800	18.800	37.600
66	HSSP5.500	HSSP5.500	0.120	1.000	0.120	Eq. H1-1b	106	5.650	18.800	18.800	37.600
67	HSSP5.500	HSSP5.500	0.120	1.000	0.120	Eq. H1-1b	105	5.650	18.800	18.800	37.600
68	HSSP5.500	HSSP5.500	0.037	1.000	0.037	Eq. H1-1b	100	5.650	18.800	18.800	37.600
70	HSSP5.500	HSSP5.500	0.120	1.000	0.120	Eq. H1-1b	106	5.650	18.800	18.800	37.600
73	HSSP5.500	HSSP5.500	0.107	1.000	0.107	Eq. H1-1b	106	5.650	18.800	18.800	37.600
74	HSSP5.500	HSSP5.500	0.107	1.000	0.107	Eq. H1-1b	106	5.650	18.800	18.800	37.600
75	HSSP5.500	HSSP5.500	0.108	1.000	0.108	Eq. H1-1b	105	5.650	18.800	18.800	37.600
76	HSSP5.500	HSSP5.500	0.108	1.000	0.108	Eq. H1-1b	105	5.650	18.800	18.800	37.600
77	HSSP5.500	HSSP5.500	0.193	1.000	0.193	Eq. H1-1b	105	5.650	18.800	18.800	37.600
78	HSSP5.500	HSSP5.500	0.193	1.000	0.193	Eq. H1-1b	106	5.650	18.800	18.800	37.600



Member 40 is temp member used for analysis only

load applied at centroid of A-VGDS unit

member40

Whole Structure

5.1. Type 4: E-24



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Job No	Sheet No 1	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 13:11

Job Information

	Engineer	Checked	Approved
Name:			
Date:	01-Sep-20		

Project ID	
Project Name	

Structure Type	SPACE FRAME
-----------------------	-------------

Number of Nodes	7	Highest Node	94
Number of Elements	6	Highest Beam	81

Number of Basic Load Cases	6
Number of Combination Load Cases	28

Included in this printout are data for:

All	The Whole Structure
------------	---------------------

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DEAD (SW)
Primary	2	DEAD (APPLIED)
Primary	3	W1
Primary	4	W2
Primary	5	W3
Primary	6	W4
Combination	100	1.4D
Combination	101	1.2D+.8W1
Combination	102	1.2D+.8W2
Combination	103	1.2D+.8W3
Combination	104	1.2D+.8W4
Combination	105	1.2D+1.6W1
Combination	106	1.2D+1.6W2
Combination	107	1.2D+1.6W3
Combination	108	1.2D+1.6W4
Combination	109	.9D+W1
Combination	110	.9D+W2
Combination	111	.9D+W3
Combination	112	.9D+W4
Combination	113	.9D
Combination	201	D
Combination	202	D+W1
Combination	203	D+W2
Combination	204	D+W3
Combination	205	D+W4



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Job No	Sheet No 2	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 13:11

Job Information Cont...

Type	L/C	Name
Combination	209	D+.75W4
Combination	210	.6D+W1
Combination	211	.6D+W2
Combination	212	.6D+W3
Combination	213	.6D+W4
Combination	214	.6D

Nodes

Node	X (ft)	Y (ft)	Z (ft)
85	0.000	0.000	-40.000
86	1.250	0.000	-40.000
87	1.250	11.667	-40.000
90	0.000	11.667	-40.000
92	1.250	17.000	-40.000
93	2.500	13.500	-40.000
94	1.250	13.500	-40.000

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
73	85	86	1.250	2	0
74	86	87	11.667	2	0
77	90	87	1.250	2	0
79	87	94	1.833	2	0
80	94	92	3.500	2	0
81	94	93	1.250	1	0

Section Properties

Prop	Section	Area (in ²)	I _{yy} (in ⁴)	I _{zz} (in ⁴)	J (in ⁴)	Material
1	HSSP1.660X0.14	0.625	0.184	0.184	0.368	STEEL
2	HSSP5.500X0.375	5.650	18.800	18.800	37.634	STEEL



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Job No	Sheet No 3	Rev
Part		
Ref		
By	Date 01-Sep-20	Chd
Client	File MIAA-VGDS - Bracket Ty	Date/Time 14-Oct-2020 13:11

Materials

Mat	Name	E (kip/in ²)	v	Density (kip/in ³)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E-6
2	STAINLESSSTEEL	28E+3	0.300	0.000	10E-6
3	ALUMINUM	10E+3	0.330	0.000	13E-6
4	CONCRETE	3.15E+3	0.170	0.000	5E-6

Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip·ft/deg)	rY (kip·ft/deg)	rZ (kip·ft/deg)
85	Fixed	Fixed	Fixed	-	-	-
90	Fixed	-	Fixed	-	-	-

Releases

There is no data of this type.

Primary Load Cases

Number	Name	Type
1	DEAD (SW)	Dead
2	DEAD (APPLIED)	Dead
3	W1	Wind
4	W2	Wind
5	W3	Wind
6	W4	Wind

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
100	1.4D	1	DEAD (SW)	1.40
		2	DEAD (APPLIED)	1.40
101	1.2D+.8W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	0.80
102	1.2D+.8W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	0.80
103	1.2D+.8W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		5	W3	0.80
104	1.2D+.8W4	1	DEAD (SW)	1.20



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Job No	Sheet No 4	Rev
Part		
Job Title	Ref	
	By	Date 01-Sep-20 Chd
Client	File MIA A-VGDS - Bracket Ty	Date/Time 14-Oct-2020 13:11

Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
		2	DEAD (APPLIED)	1.20
		6	W4	0.80
105	1.2D+1.6W1	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		3	W1	1.60
106	1.2D+1.6W2	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		4	W2	1.60
107	1.2D+1.6W3	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		5	W3	1.60
108	1.2D+1.6W4	1	DEAD (SW)	1.20
		2	DEAD (APPLIED)	1.20
		6	W4	1.60
109	.9D+W1	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		3	W1	1.60
110	.9D+W2	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		4	W2	1.60
111	.9D+W3	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		5	W3	1.60
112	.9D+W4	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
		6	W4	1.60
113	.9D	1	DEAD (SW)	0.90
		2	DEAD (APPLIED)	0.90
201	D	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
202	D+W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	1.00
203	D+W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	1.00
204	D+W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	1.00
205	D+W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	1.00
206	D+.75W1	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		3	W1	0.75



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Combination Load Cases Cont...

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
207	D+.75W2	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		4	W2	0.75
208	D+.75W3	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		5	W3	0.75
209	D+.75W4	1	DEAD (SW)	1.00
		2	DEAD (APPLIED)	1.00
		6	W4	0.75
210	.6D+W1	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		3	W1	1.00
211	.6D+W2	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		4	W2	1.00
212	.6D+W3	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		5	W3	1.00
213	.6D+W4	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60
		6	W4	1.00
214	.6D	1	DEAD (SW)	0.60
		2	DEAD (APPLIED)	0.60

Load Generators

There is no data of this type.

1 DEAD (SW) : Selfweight

Direction	Factor	Assigned Geometry
Y	-1.000	ALL

2 DEAD (APPLIED) : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
93	-	-0.400	-	-	-	-



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3 W1 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
93	-2.300	-	-	-	-	-

4 W2 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
93	2.300	-	-	-	-	-

5 W3 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
93	-	-	1.300	-	-	-

6 W4 : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
93	-	-	-1.300	-	-	-

Reactions

Node	L/C	Horizontal		Vertical	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
85	1:DEAD (SW)	0.038	0.377	0.000	0.000	0.000	0.000
	2:DEAD (APPL)	0.086	0.400	0.000	0.000	0.000	0.000
	3:W1	-0.361	0.000	0.000	0.000	0.000	0.000
	4:W2	0.361	-0.000	0.000	0.000	0.000	0.000
	5:W3	0.000	0.000	0.204	0.000	0.000	0.000
	6:W4	0.000	0.000	-0.204	0.000	0.000	0.000
	100:1.4D	0.173	1.088	0.000	0.000	0.000	0.000
	101:1.2D+.8W1	-0.141	0.932	0.000	0.000	0.000	0.000
	102:1.2D+.8W2	0.437	0.932	0.000	0.000	0.000	0.000
	103:1.2D+.8W3	0.148	0.932	0.163	0.000	0.000	0.000
	104:1.2D+.8W4	0.148	0.932	-0.163	0.000	0.000	0.000
	105:1.2D+1.6V1	-0.430	0.932	0.000	0.000	0.000	0.000
	106:1.2D+1.6V2	0.726	0.932	0.000	0.000	0.000	0.000
	107:1.2D+1.6V3	0.148	0.932	0.327	0.000	0.000	0.000
	108:1.2D+1.6V4	0.148	0.932	-0.327	0.000	0.000	0.000
	109:.9D+W1	-0.467	0.699	0.000	0.000	0.000	0.000
	110:.9D+W2	0.689	0.699	0.000	0.000	0.000	0.000
	111:.9D+W3	0.111	0.699	0.327	0.000	0.000	0.000



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Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip·ft)	MY (kip·ft)	MZ (kip·ft)
	112:.9D+W4	0.111	0.699	-0.327	0.000	0.000	0.000
	113:.9D	0.111	0.699	0.000	0.000	0.000	0.000
	201:D	0.124	0.777	0.000	0.000	0.000	0.000
	202:D+W1	-0.238	0.777	0.000	0.000	0.000	0.000
	203:D+W2	0.485	0.777	0.000	0.000	0.000	0.000
	204:D+W3	0.124	0.777	0.204	0.000	0.000	0.000
	205:D+W4	0.124	0.777	-0.204	0.000	0.000	0.000
	206:D+.75W1	-0.147	0.777	0.000	0.000	0.000	0.000
	207:D+.75W2	0.395	0.777	0.000	0.000	0.000	0.000
	208:D+.75W3	0.124	0.777	0.153	0.000	0.000	0.000
	209:D+.75W4	0.124	0.777	-0.153	0.000	0.000	0.000
	210:.6D+W1	-0.287	0.466	0.000	0.000	0.000	0.000
	211:.6D+W2	0.435	0.466	0.000	0.000	0.000	0.000
	212:.6D+W3	0.074	0.466	0.204	0.000	0.000	0.000
	213:.6D+W4	0.074	0.466	-0.204	0.000	0.000	0.000
	214:.6D	0.074	0.466	0.000	0.000	0.000	0.000
90	1:DEAD (SW)	-0.038	0.000	0.000	0.000	0.000	0.000
	2:DEAD (APPL)	-0.086	0.000	0.000	0.000	0.000	0.000
	3:W1	2.661	0.000	0.000	0.000	0.000	0.000
	4:W2	-2.661	0.000	0.000	0.000	0.000	0.000
	5:W3	0.000	0.000	-1.504	0.000	0.000	0.000
	6:W4	0.000	0.000	1.504	0.000	0.000	0.000
	100:1.4D	-0.173	0.000	0.000	0.000	0.000	0.000
	101:1.2D+.8W1	1.981	0.000	0.000	0.000	0.000	0.000
	102:1.2D+.8W2	-2.277	0.000	0.000	0.000	0.000	0.000
	103:1.2D+.8W3	-0.148	0.000	-1.203	0.000	0.000	0.000
	104:1.2D+.8W4	-0.148	0.000	1.203	0.000	0.000	0.000
	105:1.2D+1.6W1	4.110	0.000	0.000	0.000	0.000	0.000
	106:1.2D+1.6W2	-4.406	0.000	0.000	0.000	0.000	0.000
	107:1.2D+1.6W3	-0.148	0.000	-2.407	0.000	0.000	0.000
	108:1.2D+1.6W4	-0.148	0.000	2.407	0.000	0.000	0.000
	109:.9D+W1	4.147	0.000	0.000	0.000	0.000	0.000
	110:.9D+W2	-4.369	0.000	0.000	0.000	0.000	0.000
	111:.9D+W3	-0.111	0.000	-2.407	0.000	0.000	0.000
	112:.9D+W4	-0.111	0.000	2.407	0.000	0.000	0.000
	113:.9D	-0.111	0.000	0.000	0.000	0.000	0.000
	201:D	-0.124	0.000	0.000	0.000	0.000	0.000
	202:D+W1	2.538	0.000	0.000	0.000	0.000	0.000
	203:D+W2	-2.785	0.000	0.000	0.000	0.000	0.000
	204:D+W3	-0.124	0.000	-1.504	0.000	0.000	0.000
	205:D+W4	-0.124	0.000	1.504	0.000	0.000	0.000
	206:D+.75W1	1.872	0.000	0.000	0.000	0.000	0.000
	207:D+.75W2	-2.120	0.000	0.000	0.000	0.000	0.000
	208:D+.75W3	-0.124	0.000	-1.128	0.000	0.000	0.000



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Reactions Cont...

Node	L/C	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
	209:D+.75W4	-0.124	0.000	1.128	0.000	0.000	0.000
	210:.6D+W1	2.587	0.000	0.000	0.000	0.000	0.000
	211:.6D+W2	-2.735	0.000	0.000	0.000	0.000	0.000
	212:.6D+W3	-0.074	0.000	-1.504	0.000	0.000	0.000
	213:.6D+W4	-0.074	0.000	1.504	0.000	0.000	0.000
	214:.6D	-0.074	0.000	0.000	0.000	0.000	0.000

Reaction Summary

	Node	L/C	Horizontal	Vertical	Horizontal	Moment		
			FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
Max FX	90	109:.9D+W1	4.147	0.000	0.000	0.000	0.000	0.000
Min FX	90	106:1.2D+1.6W	-4.406	0.000	0.000	0.000	0.000	0.000
Max FY	85	100:1.4D	0.173	1.088	0.000	0.000	0.000	0.000
Min FY	85	4:W2	0.361	-0.000	0.000	0.000	0.000	0.000
Max FZ	90	108:1.2D+1.6W	-0.148	0.000	2.407	0.000	0.000	0.000
Min FZ	90	107:1.2D+1.6W	-0.148	0.000	-2.407	0.000	0.000	0.000
Max MX	85	1:DEAD (SW)	0.038	0.377	0.000	0.000	0.000	0.000
Min MX	85	1:DEAD (SW)	0.038	0.377	0.000	0.000	0.000	0.000
Max MY	85	1:DEAD (SW)	0.038	0.377	0.000	0.000	0.000	0.000
Min MY	85	1:DEAD (SW)	0.038	0.377	0.000	0.000	0.000	0.000
Max MZ	85	1:DEAD (SW)	0.038	0.377	0.000	0.000	0.000	0.000
Min MZ	85	1:DEAD (SW)	0.038	0.377	0.000	0.000	0.000	0.000

Reaction Envelope

Node	Env	Horizontal	Vertical	Horizontal	Moment		
		FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
85	+ve	0.726	1.088	0.327	0.000	0.000	0.000
85	+ve	Load: 106	Load: 100	Load: 107	-	-	-
85	-ve	-0.467	-0.000	-0.327	0.000	0.000	0.000
85	-ve	Load: 109	Load: 4	Load: 108	-	-	-
90	+ve	4.147	0.000	2.407	0.000	0.000	0.000
90	+ve	Load: 109	-	Load: 108	-	-	-
90	-ve	-4.406	0.000	-2.407	0.000	0.000	0.000
90	-ve	Load: 106	-	Load: 107	-	-	-



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Job No

Sheet No

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Rev

Part

Job Title

Ref

By

Date 01-Sep-20

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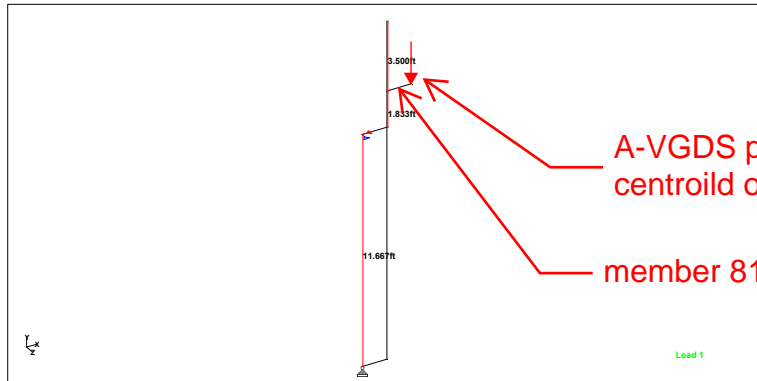
Client

File MIAA-VGDS - Bracket Ty

Date/Time 14-Oct-2020 13:11

Utilization Ratio

Beam	Analysis Property	Design Property	Actual Allowable		Ratio (Act./Allow.)	Clause	L/C	Ax (in ²)	Iz (in ⁴)	Iy (in ⁴)	Ix (in ⁴)
			Ratio	Ratio							
73	HSSP5.500	HSSP5.500	0.053	1.000	0.053	Eq. H1-1b	107	5.650	18.800	18.800	37.600
74	HSSP5.500	HSSP5.500	0.253	1.000	0.253	Eq. H1-1b	106	5.650	18.800	18.800	37.600
77	HSSP5.500	HSSP5.500	0.104	1.000	0.104	Eq. H1-1b	107	5.650	18.800	18.800	37.600
79	HSSP5.500	HSSP5.500	0.253	1.000	0.253	Eq. H1-1b	106	5.650	18.800	18.800	37.600
80	HSSP5.500	HSSP5.500	0.000	1.000	0.000	Sec. E1	100	5.650	18.800	18.800	37.600
81	HSSP1.660	HSSP1.660	3.333	1.000	3.333	Eq. H1-1b	107	0.625	0.184	0.184	0.368



Whole Structure

temp member for analysis

A-VGDS point load at centroid of unit

member 81

6. EXISTING CONCRETE BEAM DESIGN

6.1. GATE E-20

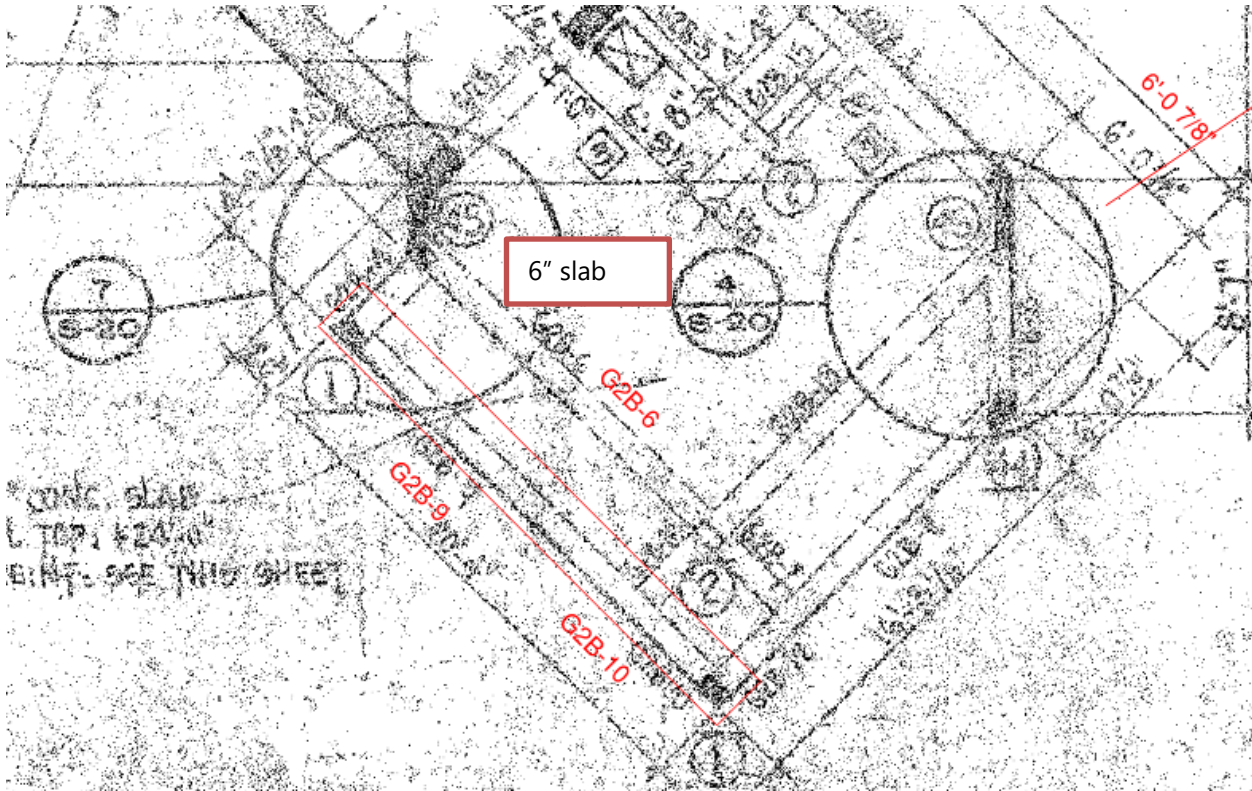


FIGURE 1: PARTIAL FLOOR PLAN

BEAM SCHEDULE (2ND FLOOR)									
MARK	ELEV. TOP OF BEAM	SIZE	REINFORCING				#3 TIES		REMARKS
			BOTTOM	TOP	'C'	'E'	Nº	SPACING (EACH END)	
G2B-8		12 x 24	* 2-11	* 3-11				@12"½	* SEE DETAILS (4) & (5)
G2B-9			*	*				@12"½	* SEE DETAILS (4) & (5)
G2B-10			* 2-6	* 2-9				@10"½	* CONT. THRU G2B-9

FIGURE 2: EXISTING BEAM

MIA: A-VGDS - GATE E-20

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad \text{k} \equiv 1000 \cdot \text{lb} \quad \text{klf} \equiv \frac{\text{k}}{\text{ft}}$$

Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live}_{\text{Floor}} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \cdot \text{psf} & d_{9_bar} &:= 1.127 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{cmu_wall_height}_{\text{E20}} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{\text{E20}} &= 11.667 \cdot \text{ft} \\ \text{cmu_wall_weight}_{\text{E20}} &:= \text{CMU} \cdot \text{cmu_wall_height}_{\text{E20}} & \text{cmu_wall_weight}_{\text{E20}} &= 0.642 \cdot \text{klf} \\ \text{Slab_Span_to_adj_beam} &:= 3 \cdot \text{ft} + 6 \cdot \text{in} \\ \text{slab_weight}_{\text{E20}} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Slab}_6_{\text{in}} & \text{slab_weight}_{\text{E20}} &= 0.263 \cdot \text{klf} \\ \text{Live}_{\text{E20}} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Live}_{\text{Floor}} & \text{Live}_{\text{E20}} &= 0.35 \cdot \text{klf} \\ & & P_{\text{steel_support}} &:= 944 \cdot \text{lb} \\ \text{dist}_{\text{top}} &:= \text{cover} + \frac{d_{9_bar}}{2} & \text{dist}_{\text{top}} &= 2.063 \cdot \text{in} \\ \text{dist}_{\text{bot}} &:= \text{cover} + \frac{d_{6_bar}}{2} & \text{dist}_{\text{bot}} &= 1.875 \cdot \text{in} \end{aligned}$$

(From Stadd Model MIA
A-VGDS - Bracket Type 1 -
Max Vertical from Node #1)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ec6
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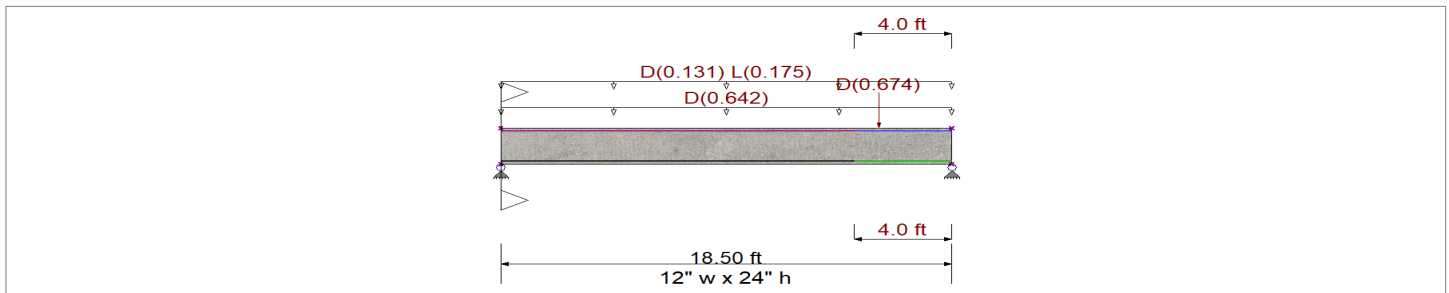
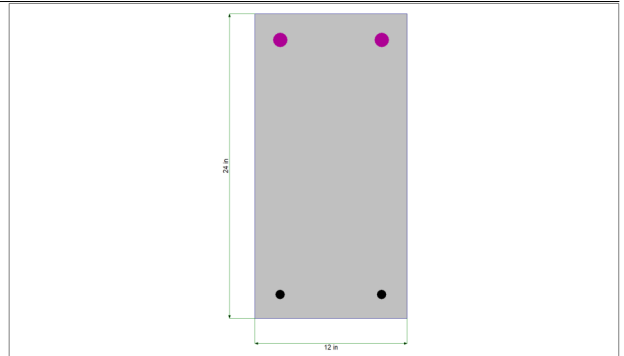
DESCRIPTION: Gate E20 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : ASCE 7-16

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup =	=	1.0



Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in

Span #1 Reinforcing....

2-#9 at 2.063 in from Top, from 0.0 to 18.50 ft in this span
 2-#9 at 2.063 in from Top, from 0.0 to 14.50 ft in this span

2-#6 at 1.875 in from Bottom, from 0.0 to 18.50 ft in this span
 2-#6 at 1.875 in from Bottom, from 0.0 to 14.50 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)

Uniform Load : D = 0.1310, L = 0.1750 k/ft, Tributary Width = 1.0 ft, (6" Floor)

Point Load : D = 0.6740 k @ 15.50 ft, (A-VGDS bottom bracket)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.563 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.011 in Ratio = 20780 >=360
Mu : Applied	47.443 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
Mn * Phi : Allowable	84.215 k-ft	Max Downward Total Deflection	0.108 in Ratio = 2052 >=180
Location of maximum on span	14.490 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	11.653	12.109
Overall MINimum	1.619	1.619
+D+H	10.035	10.490
+D+L+H	11.653	12.109
+D+Lr+H	10.035	10.490
+D+S+H	10.035	10.490
+D+0.750Lr+0.750L+H	11.249	11.704
+D+0.750L+0.750S+H	11.249	11.704
+D+0.60W+H	10.035	10.490

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E20 - Level 2

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750Lr+0.750L+0.450W+H	11.249	11.704
+D+0.750L+0.750S+0.450W+H	11.249	11.704
+0.60D+0.60W+0.60H	6.021	6.294
+D+0.70E+0.60H	10.035	10.490
+D+0.750L+0.750S+0.5250E+H	11.249	11.704
+0.60D+0.70E+H	6.021	6.294
D Only	10.035	10.490
L Only	1.619	1.619
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	22.13	14.63	14.63	0.00	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.20	22.13	14.31	14.31	2.93	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.40	22.13	14.00	14.00	5.79	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.61	22.13	13.68	13.68	8.59	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.81	22.13	13.36	13.36	11.32	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.01	22.13	13.05	13.05	13.99	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.21	22.13	12.73	12.73	16.60	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.42	22.13	12.41	12.41	19.14	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.62	22.13	12.10	12.10	21.62	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.82	22.13	11.78	11.78	24.03	0.90	23.70	Vu < PhiVc/2	lot Req'd 9.6.3	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.02	22.13	11.46	11.46	26.38	0.80	23.37	Vu < PhiVc/2	lot Req'd 9.6.3	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.22	22.13	11.15	11.15	28.66	0.72	23.09	Vu < PhiVc/2	lot Req'd 9.6.3	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.43	22.13	10.83	10.83	30.89	0.65	22.86	Vu < PhiVc/2	lot Req'd 9.6.3	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.63	22.13	10.51	10.51	33.04	0.59	22.66	Vu < PhiVc/2	lot Req'd 9.6.3	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.83	22.13	10.19	10.19	35.14	0.53	22.49	Vu < PhiVc/2	lot Req'd 9.6.3	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.03	22.13	9.88	9.88	37.16	0.49	22.34	Vu < PhiVc/2	lot Req'd 9.6.3	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.23	22.13	9.56	9.56	39.13	0.45	22.21	Vu < PhiVc/2	lot Req'd 9.6.3	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.44	22.13	9.24	9.24	41.03	0.42	22.09	Vu < PhiVc/2	lot Req'd 9.6.3	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.64	22.13	8.93	8.93	42.87	0.38	21.99	Vu < PhiVc/2	lot Req'd 9.6.3	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.84	22.13	8.61	8.61	44.64	0.36	21.90	Vu < PhiVc/2	lot Req'd 9.6.3	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.04	22.13	8.29	8.29	46.35	0.33	21.81	Vu < PhiVc/2	lot Req'd 9.6.3	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.25	22.13	7.98	7.98	47.99	0.31	21.73	Vu < PhiVc/2	lot Req'd 9.6.3	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.45	22.13	7.66	7.66	49.57	0.28	21.66	Vu < PhiVc/2	lot Req'd 9.6.3	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.65	22.13	7.34	7.34	51.09	0.26	21.60	Vu < PhiVc/2	lot Req'd 9.6.3	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.85	22.13	7.02	7.02	52.54	0.25	21.54	Vu < PhiVc/2	lot Req'd 9.6.3	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.05	22.13	6.71	6.71	53.93	0.23	21.48	Vu < PhiVc/2	lot Req'd 9.6.3	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.26	22.13	6.39	6.39	55.26	0.21	21.43	Vu < PhiVc/2	lot Req'd 9.6.3	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.46	22.13	6.07	6.07	56.52	0.20	21.38	Vu < PhiVc/2	lot Req'd 9.6.3	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.66	22.13	5.76	5.76	57.71	0.18	21.33	Vu < PhiVc/2	lot Req'd 9.6.3	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.86	22.13	5.44	5.44	58.84	0.17	21.28	Vu < PhiVc/2	lot Req'd 9.6.3	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.07	22.13	5.12	5.12	59.91	0.16	21.24	Vu < PhiVc/2	lot Req'd 9.6.3	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.27	22.13	4.81	4.81	60.92	0.15	21.20	Vu < PhiVc/2	lot Req'd 9.6.3	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.47	22.13	4.49	4.49	61.85	0.13	21.16	Vu < PhiVc/2	lot Req'd 9.6.3	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.67	22.13	4.17	4.17	62.73	0.12	21.13	Vu < PhiVc/2	lot Req'd 9.6.3	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.87	22.13	3.86	3.86	63.54	0.11	21.09	Vu < PhiVc/2	lot Req'd 9.6.3	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.08	22.13	3.54	3.54	64.29	0.10	21.06	Vu < PhiVc/2	lot Req'd 9.6.3	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.28	22.13	3.22	3.22	64.97	0.09	21.02	Vu < PhiVc/2	lot Req'd 9.6.3	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.48	22.13	2.90	2.90	65.59	0.08	20.99	Vu < PhiVc/2	lot Req'd 9.6.3	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.68	22.13	2.59	2.59	66.15	0.07	20.96	Vu < PhiVc/2	lot Req'd 9.6.3	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.89	22.13	2.27	2.27	66.64	0.06	20.93	Vu < PhiVc/2	lot Req'd 9.6.3	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.09	22.13	1.95	1.95	67.07	0.05	20.90	Vu < PhiVc/2	lot Req'd 9.6.3	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.29	22.13	1.64	1.64	67.43	0.04	20.87	Vu < PhiVc/2	lot Req'd 9.6.3	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.49	22.13	1.32	1.32	67.73	0.04	20.84	Vu < PhiVc/2	lot Req'd 9.6.3	20.8	0.0	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E20 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	1	8.69	22.13	1.00	1.00	67.96	0.03	20.81	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.90	22.13	0.69	0.69	68.13	0.02	20.78	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.40D+1.60H	1	9.10	22.13	0.38	0.38	65.64	0.01	20.76	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.40D+1.60H	1	9.30	22.13	0.08	0.08	65.69	0.00	20.73	Vu < PhiVc/2	lot Req'd 9.6.:	20.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	9.50	22.13	-0.27	0.27	68.26	0.01	20.75	Vu < PhiVc/2	lot Req'd 9.6.:	20.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	9.70	22.13	-0.58	0.58	68.17	0.02	20.77	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	9.91	22.13	-0.90	0.90	68.02	0.02	20.80	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.11	22.13	-1.22	1.22	67.81	0.03	20.83	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.31	22.13	-1.53	1.53	67.53	0.04	20.86	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.51	22.13	-1.85	1.85	67.19	0.05	20.89	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.72	22.13	-2.17	2.17	66.79	0.06	20.92	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.92	22.13	-2.48	2.48	66.32	0.07	20.95	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.12	22.13	-2.80	2.80	65.78	0.08	20.98	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.32	22.13	-3.12	3.12	65.18	0.09	21.01	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.52	22.13	-3.43	3.43	64.52	0.10	21.05	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.73	22.13	-3.75	3.75	63.79	0.11	21.08	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.93	22.13	-4.07	4.07	63.00	0.12	21.12	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.13	22.13	-4.39	4.39	62.15	0.13	21.15	Vu < PhiVc/2	lot Req'd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.33	22.13	-4.70	4.70	61.23	0.14	21.19	Vu < PhiVc/2	lot Req'd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.54	22.13	-5.02	5.02	60.25	0.15	21.23	Vu < PhiVc/2	lot Req'd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.74	22.13	-5.34	5.34	59.20	0.17	21.27	Vu < PhiVc/2	lot Req'd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.94	22.13	-5.65	5.65	58.09	0.18	21.31	Vu < PhiVc/2	lot Req'd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.14	22.13	-5.97	5.97	56.91	0.19	21.36	Vu < PhiVc/2	lot Req'd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.34	22.13	-6.29	6.29	55.68	0.21	21.41	Vu < PhiVc/2	lot Req'd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.55	22.13	-6.60	6.60	54.37	0.22	21.46	Vu < PhiVc/2	lot Req'd 9.6.:	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.75	22.13	-6.92	6.92	53.00	0.24	21.52	Vu < PhiVc/2	lot Req'd 9.6.:	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.95	22.13	-7.24	7.24	51.57	0.26	21.58	Vu < PhiVc/2	lot Req'd 9.6.:	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.15	22.13	-7.55	7.55	50.08	0.28	21.64	Vu < PhiVc/2	lot Req'd 9.6.:	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.36	22.13	-7.87	7.87	48.52	0.30	21.71	Vu < PhiVc/2	lot Req'd 9.6.:	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.56	22.13	-8.19	8.19	46.89	0.32	21.78	Vu < PhiVc/2	lot Req'd 9.6.:	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.76	22.13	-8.51	8.51	45.21	0.35	21.87	Vu < PhiVc/2	lot Req'd 9.6.:	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.96	22.13	-8.82	8.82	43.46	0.37	21.96	Vu < PhiVc/2	lot Req'd 9.6.:	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.16	22.13	-9.14	9.14	41.64	0.40	22.06	Vu < PhiVc/2	lot Req'd 9.6.:	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.37	22.13	-9.46	9.46	39.76	0.44	22.17	Vu < PhiVc/2	lot Req'd 9.6.:	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.57	22.13	-10.58	10.58	37.76	0.52	22.43	Vu < PhiVc/2	lot Req'd 9.6.:	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.77	22.13	-10.90	10.90	35.59	0.56	22.59	Vu < PhiVc/2	lot Req'd 9.6.:	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.97	22.13	-11.22	11.22	33.35	0.62	22.77	Vu < PhiVc/2	lot Req'd 9.6.:	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	16.17	22.13	-11.53	11.53	31.05	0.68	22.98	PhiVc/2 < Vu <=	Min 11.5.6.3	32.9	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.38	22.13	-11.85	11.85	28.69	0.76	23.24	PhiVc/2 < Vu <=	Min 11.5.6.3	33.2	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.58	22.13	-12.17	12.17	26.26	0.85	23.54	PhiVc/2 < Vu <=	Min 11.5.6.3	33.5	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.78	22.13	-12.48	12.48	23.77	0.97	23.92	PhiVc/2 < Vu <=	Min 11.5.6.3	33.9	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.98	22.13	-12.80	12.80	21.21	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.19	22.13	-13.12	13.12	18.59	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.39	22.13	-13.43	13.43	15.91	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.59	22.13	-13.75	13.75	13.16	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.79	22.13	-14.07	14.07	10.35	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.99	22.13	-14.39	14.39	7.47	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	18.20	22.13	-14.70	14.70	4.53	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	18.40	22.13	-15.02	15.02	1.53	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope	Span # 1	1	18.500	47.44	84.21	0.56

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E20 - Level 2

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
+1.40D+1.60H Span # 1	1	18.500	45.86	84.21	0.54
+1.20D+0.50Lr+1.60L+1.60H Span # 1	1	18.500	47.44	84.21	0.56
+1.20D+1.60L+0.50S+1.60H Span # 1	1	18.500	47.44	84.21	0.56
+1.20D+1.60Lr+L+1.60H Span # 1	1	18.500	44.39	84.21	0.53
+1.20D+1.60Lr+0.50W+1.60H Span # 1	1	18.500	39.31	84.21	0.47
+1.20D+L+1.60S+1.60H Span # 1	1	18.500	44.39	84.21	0.53
+1.20D+1.60S+0.50W+1.60H Span # 1	1	18.500	39.31	84.21	0.47
+1.20D+0.50Lr+L+W+1.60H Span # 1	1	18.500	44.39	84.21	0.53
+1.20D+L+0.50S+W+1.60H Span # 1	1	18.500	44.39	84.21	0.53
+0.90D+W+1.60H Span # 1	1	18.500	29.48	84.21	0.35
+1.20D+L+0.20S+E+1.60H Span # 1	1	18.500	44.39	84.21	0.53
+0.90D+E+0.90H Span # 1	1	18.500	29.48	84.21	0.35

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.1082	9.250		0.0000	0.000

6.2. GATE E-22

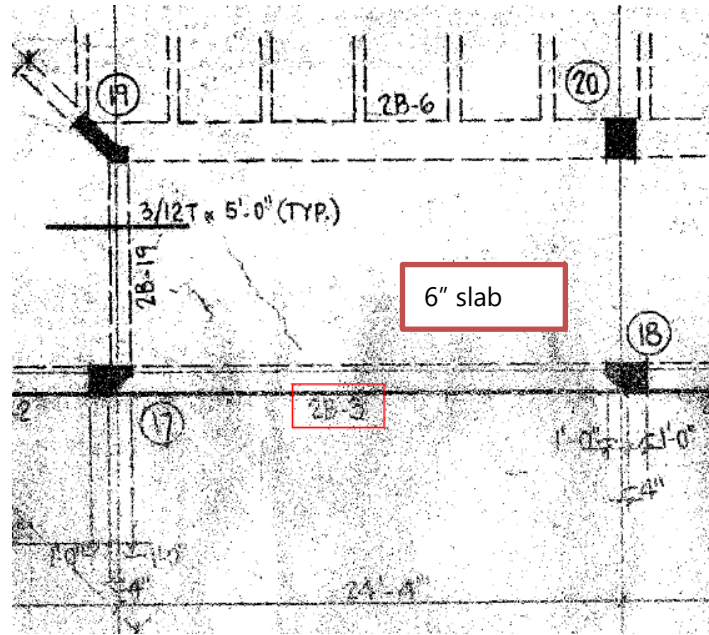
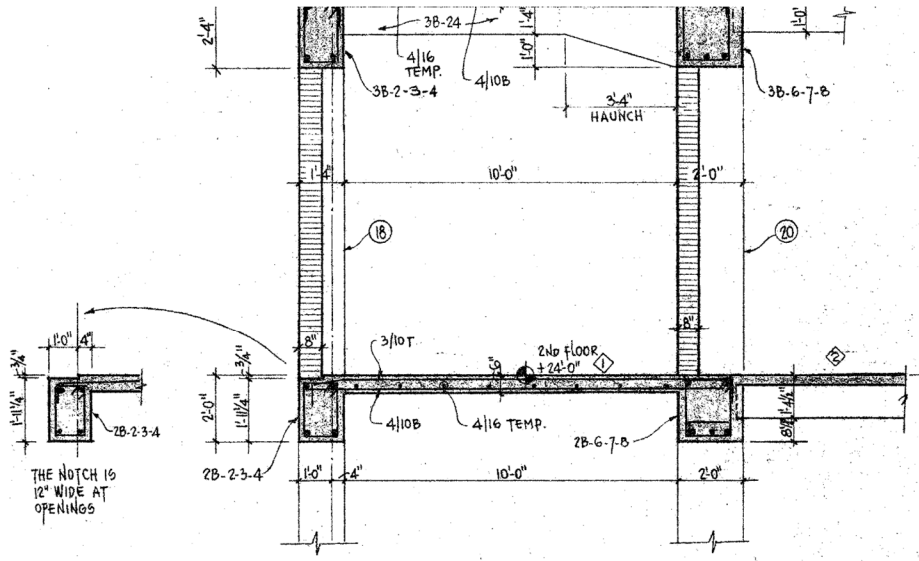


FIGURE 3: PARTIAL FLOOR PLAN

BEAM SCHEDULE (2ND FLOOR)									
MARK	ELEV. TOP OF BEAM	SIZE	REINFORCING				#3 TIES		REMARKS
			BOTTOM	TOP	'C'	'E'	Nº	SPACING (EACH END)	
2B-3		16x24	2-9	1-9					2@5", 10" @ TO 4

FIGURE 4: EXISTING BEAM



(B)

SECTION $\frac{1}{S-17}$
 SCALE: 3/8"=1'-0"

MIA: A-VGDS - GATE E-22

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad \text{k} \equiv 1000 \cdot \text{lb} \quad \text{klf} \equiv \frac{\text{k}}{\text{ft}}$$

Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live}_{\text{Floor}} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \cdot \text{psf} & d_{9_bar} &:= 1.127 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{cmu_wall_height}_{E22} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{E22} &= 11.667 \cdot \text{ft} \\ \text{cmu_wall_weight}_{E22} &:= \text{CMU} \cdot \text{cmu_wall_height}_{E22} & \text{cmu_wall_weight}_{E22} &= 0.642 \cdot \text{klf} \\ \text{Slab_Span_to_adj_beam} &:= \frac{10 \cdot \text{ft} + 0 \cdot \text{in}}{2} \\ \text{slab_weight}_{E22} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Slab}_6_{\text{in}} & \text{slab_weight}_{E22} &= 0.375 \cdot \text{klf} \\ \text{Live}_{E22} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Live}_{\text{Floor}} & \text{Live}_{E22} &= 0.5 \cdot \text{klf} \\ & & P_{\text{steel_support}} &:= 644 \cdot \text{lb} \\ \text{dist}_{\text{top}} &:= \text{cover} + \frac{d_{9_bar}}{2} & \text{dist}_{\text{top}} &= 2.063 \cdot \text{in} & & \text{(From Stadd Model MIA} \\ & & & & & \text{A-VGDS - Bracket Type 1 -} \\ & & & & & \text{Max Vertical from Node \#1)} \\ \text{dist}_{\text{bot}} &:= \text{cover} + \frac{d_{6_bar}}{2} & \text{dist}_{\text{bot}} &= 1.875 \cdot \text{in} \end{aligned}$$

Concrete Beam

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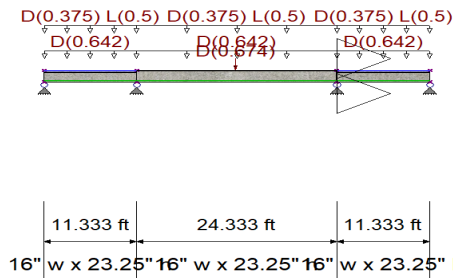
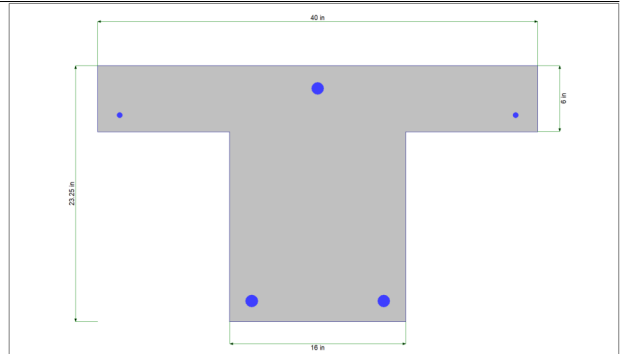
DESCRIPTION: Gate E22 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : IBC 2015

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	1.0



Cross Section & Reinforcing Details

Tee Section, Stem Width = 16.0 in, Total Height = 23.250 in, Top Flange Width = 40.0 in, Flange Thickness = 6.0 in

Span #1 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 11.333 ft in this span
 2-#4 at 4.50 in from Top, from 0.0 to 11.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 11.333 ft in this span

Span #2 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 24.333 ft in this span
 2-#4 at 1.50 in from Top, from 0.0 to 24.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 24.333 ft in this span

Span #3 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 11.333 ft in this span
 2-#4 at 4.50 in from Top, from 0.0 to 11.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 11.333 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)

Load for Span Number 2

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)
 Point Load : D = 0.6740 k @ 12.0 ft, (A-VGDS)

Load for Span Number 3

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)

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DESCRIPTION: Gate E22 - Level 2

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.916 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.017 in Ratio = 17607 >=360
Mu : Applied	-112.353 k-ft	Max Upward Transient Deflection	-0.002 in Ratio = 86367 >=360
Mn * Phi : Allowable	122.625 k-ft	Max Downward Total Deflection	0.086 in Ratio = 3403 >=180
Location of maximum on span	0.000 ft	Max Upward Total Deflection	-0.007 in Ratio = 20912 >=180
Span # where maximum occurs	Span # 3		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	4.343	44.279	44.268	4.344
Overall MINimum	1.004	10.745	10.745	1.004
+D+H	2.996	33.876	33.863	2.998
+D+L+H	4.343	44.279	44.268	4.344
+D+Lr+H	2.996	33.876	33.863	2.998
+D+S+H	2.996	33.876	33.863	2.998
+D+0.750Lr+0.750L+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+H	4.030	41.654	41.643	4.031
+D+0.60W+H	2.996	33.876	33.863	2.998
+D+0.70E+H	2.996	33.876	33.863	2.998
+D+0.750Lr+0.750L+0.450W+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+0.450W+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+0.5250E+H	4.030	41.654	41.643	4.031
+0.60D+0.60W+0.60H	1.790	20.334	20.325	1.791
+0.60D+0.70E+0.60H	1.790	20.334	20.325	1.791
D Only	2.996	33.876	33.863	2.998
L Only	1.004	10.745	10.745	1.004
H Only				

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	21.38	5.19	5.19	0.00	1.00	30.44	Vu < PhiVc/2	lot Reqd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.45	21.38	3.98	3.98	2.08	1.00	30.44	Vu < PhiVc/2	lot Reqd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.91	21.38	2.77	2.77	3.61	1.00	30.44	Vu < PhiVc/2	lot Reqd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.36	21.38	1.56	1.56	4.59	0.61	28.97	Vu < PhiVc/2	lot Reqd 9.6.:	29.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.81	21.38	0.35	0.35	5.02	0.13	27.16	Vu < PhiVc/2	lot Reqd 9.6.:	27.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.27	21.38	-0.85	0.85	4.91	0.31	27.86	Vu < PhiVc/2	lot Reqd 9.6.:	27.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.72	21.38	-2.06	2.06	4.25	0.87	29.94	Vu < PhiVc/2	lot Reqd 9.6.:	29.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.17	21.38	-3.27	3.27	3.04	1.00	30.44	Vu < PhiVc/2	lot Reqd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.63	21.38	-4.48	4.48	1.28	1.00	30.44	Vu < PhiVc/2	lot Reqd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.08	21.19	-5.69	5.69	1.02	1.00	29.08	Vu < PhiVc/2	lot Reqd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.53	21.19	-6.90	6.90	3.87	1.00	29.08	Vu < PhiVc/2	lot Reqd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.99	21.19	-8.10	8.10	7.27	1.00	29.08	Vu < PhiVc/2	lot Reqd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.44	21.19	-9.31	9.31	11.22	1.00	29.08	Vu < PhiVc/2	lot Reqd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.89	21.19	-10.52	10.52	15.72	1.00	29.08	Vu < PhiVc/2	lot Reqd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.35	21.19	-11.73	11.73	20.76	1.00	29.08	Vu < PhiVc/2	lot Reqd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.80	21.19	-12.94	12.94	26.35	0.87	28.73	Vu < PhiVc/2	lot Reqd 9.6.:	28.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.25	21.19	-14.15	14.15	32.49	0.77	28.48	Vu < PhiVc/2	lot Reqd 9.6.:	28.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.71	21.19	-15.35	15.35	39.18	0.69	28.27	PhiVc/2 < Vu <=	Min 11.5.6.3	41.4	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	8.16	21.19	-16.56	16.56	46.41	0.63	28.11	PhiVc/2 < Vu <=	Min 11.5.6.3	41.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	8.61	21.19	-17.77	17.77	54.19	0.58	27.98	PhiVc/2 < Vu <=	Min 11.5.6.3	41.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.07	21.19	-18.98	18.98	62.52	0.54	27.87	PhiVc/2 < Vu <=	Min 11.5.6.3	41.0	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.52	21.19	-20.19	20.19	71.40	0.50	27.77	PhiVc/2 < Vu <=	Min 11.5.6.3	40.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.97	21.19	-21.40	21.40	80.83	0.47	27.69	PhiVc/2 < Vu <=	Min 11.5.6.3	40.8	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	10.43	21.19	-22.60	22.60	90.80	0.44	27.61	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	10.88	21.19	-23.81	23.81	101.32	0.41	27.55	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	11.33	21.75	32.84	32.84	112.39	0.53	28.55	PhiVc < Vu	4.288	39.3	10.0	10.0
+1.20D+1.60L+0.50S+1.60H	2	12.31	21.75	30.25	30.25	81.69	0.67	28.92	PhiVc < Vu	1.322	39.7	10.0	10.0

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DESCRIPTION: Gate E22 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	2	13.28	21.75	27.65	27.65	53.51	0.94	29.62	PhiVc/2 < Vu <=	Min 11.5.6.3	43.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	14.25	21.75	25.06	25.06	27.86	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	15.23	21.75	22.46	22.46	4.73	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	16.20	21.38	19.87	19.87	15.87	1.00	30.44	PhiVc/2 < Vu <=	Min 11.5.6.3	43.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	17.17	21.38	17.27	17.27	33.94	0.91	30.09	PhiVc/2 < Vu <=	Min 11.5.6.3	43.3	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	18.15	21.38	14.68	14.68	49.49	0.53	28.67	PhiVc/2 < Vu <=	Min 11.5.6.3	41.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	19.12	21.38	12.09	12.09	62.52	0.34	27.98	Vu < PhiVc/2	lot Req'd 9.6.3	28.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	20.09	21.38	9.49	9.49	73.02	0.23	27.56	Vu < PhiVc/2	lot Req'd 9.6.3	27.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	21.07	21.38	6.90	6.90	81.00	0.15	27.26	Vu < PhiVc/2	lot Req'd 9.6.3	27.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	22.04	21.38	4.30	4.30	86.45	0.09	27.03	Vu < PhiVc/2	lot Req'd 9.6.3	27.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	23.01	21.38	1.71	1.71	89.37	0.03	26.82	Vu < PhiVc/2	lot Req'd 9.6.3	26.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	23.99	21.38	-1.69	1.69	89.25	0.03	26.82	Vu < PhiVc/2	lot Req'd 9.6.3	26.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	24.96	21.38	-4.29	4.29	86.33	0.09	27.03	Vu < PhiVc/2	lot Req'd 9.6.3	27.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	25.93	21.38	-6.88	6.88	80.90	0.15	27.26	Vu < PhiVc/2	lot Req'd 9.6.3	27.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	26.91	21.38	-9.48	9.48	72.93	0.23	27.56	Vu < PhiVc/2	lot Req'd 9.6.3	27.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	27.88	21.38	-12.07	12.07	62.45	0.34	27.98	Vu < PhiVc/2	lot Req'd 9.6.3	28.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	28.85	21.38	-14.67	14.67	49.43	0.53	28.67	PhiVc/2 < Vu <=	Min 11.5.6.3	41.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	29.83	21.38	-17.26	17.26	33.90	0.91	30.09	PhiVc/2 < Vu <=	Min 11.5.6.3	43.3	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	30.80	21.38	-19.85	19.85	15.84	1.00	30.44	PhiVc/2 < Vu <=	Min 11.5.6.3	43.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	31.77	21.75	-22.45	22.45	4.75	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	32.75	21.75	-25.04	25.04	27.86	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	33.72	21.75	-27.64	27.64	53.50	0.94	29.62	PhiVc/2 < Vu <=	Min 11.5.6.3	43.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	34.69	21.75	-30.23	30.23	81.66	0.67	28.92	PhiVc < Vu	1.309	39.7	10.0	10.0
+1.20D+1.60L+0.50S+1.60H	3	35.67	21.19	25.02	25.02	112.35	0.39	27.49	PhiVc/2 < Vu <=	Min 11.5.6.3	40.6	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	36.12	21.19	23.81	23.81	101.29	0.42	27.55	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	36.57	21.19	22.60	22.60	90.77	0.44	27.61	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.03	21.19	21.39	21.39	80.79	0.47	27.69	PhiVc/2 < Vu <=	Min 11.5.6.3	40.8	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.48	21.19	20.18	20.18	71.37	0.50	27.77	PhiVc/2 < Vu <=	Min 11.5.6.3	40.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.93	21.19	18.98	18.98	62.50	0.54	27.87	PhiVc/2 < Vu <=	Min 11.5.6.3	41.0	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	38.39	21.19	17.77	17.77	54.17	0.58	27.98	PhiVc/2 < Vu <=	Min 11.5.6.3	41.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	38.84	21.19	16.56	16.56	46.39	0.63	28.11	PhiVc/2 < Vu <=	Min 11.5.6.3	41.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	39.29	21.19	15.35	15.35	39.15	0.69	28.28	PhiVc/2 < Vu <=	Min 11.5.6.3	41.4	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	39.75	21.19	14.14	14.14	32.47	0.77	28.48	Vu < PhiVc/2	lot Req'd 9.6.3	28.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	40.20	21.19	12.93	12.93	26.33	0.87	28.74	Vu < PhiVc/2	lot Req'd 9.6.3	28.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	40.65	21.19	11.73	11.73	20.74	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	41.11	21.19	10.52	10.52	15.70	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	41.56	21.19	9.31	9.31	11.21	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.01	21.19	8.10	8.10	7.26	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.47	21.19	6.89	6.89	3.86	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.92	21.19	5.68	5.68	1.01	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	43.37	21.38	4.48	4.48	1.29	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	43.83	21.38	3.27	3.27	3.05	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	44.28	21.38	2.06	2.06	4.26	0.86	29.93	Vu < PhiVc/2	lot Req'd 9.6.3	29.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	44.73	21.38	0.85	0.85	4.92	0.31	27.85	Vu < PhiVc/2	lot Req'd 9.6.3	27.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	45.19	21.38	-0.36	0.36	5.03	0.13	27.17	Vu < PhiVc/2	lot Req'd 9.6.3	27.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	45.64	21.38	-1.56	1.56	4.59	0.61	28.97	Vu < PhiVc/2	lot Req'd 9.6.3	29.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	46.09	21.38	-2.77	2.77	3.61	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	46.55	21.38	-3.98	3.98	2.08	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	47.00	21.38	-5.19	5.19	0.00	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope	Span # 1	1	11.333	-110.50	122.62	0.90

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E22 - Level 2

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.40D+1.60H					
Span # 1	1	11.333	-90.89	122.62	0.74
Span # 2	2	24.333	-92.43	128.02	0.72
Span # 3	3	11.333	-92.39	122.62	0.75
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	11.333	-110.50	122.62	0.90
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	11.333	-110.50	122.62	0.90
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	11.333	-77.90	122.62	0.64
Span # 2	2	24.333	-79.22	128.02	0.62
Span # 3	3	11.333	-79.19	122.62	0.65
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	11.333	-77.90	122.62	0.64
Span # 2	2	24.333	-79.22	128.02	0.62
Span # 3	3	11.333	-79.19	122.62	0.65
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+0.50L+0.70S+E+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+0.90D+W+0.90H					
Span # 1	1	11.333	-58.43	122.62	0.48
Span # 2	2	24.333	-59.42	128.02	0.46
Span # 3	3	11.333	-59.39	122.62	0.48
+0.90D+E+0.90H					
Span # 1	1	11.333	-58.43	122.62	0.48
Span # 2	2	24.333	-59.42	128.02	0.46
Span # 3	3	11.333	-59.39	122.62	0.48

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.0033	11.820	+D+L+H	-0.0065	7.933
+D+L+H	2	0.0858	12.167	+D+L+H	-0.0011	24.560
+D+L+H	3	0.0000	11.333	+D+L+H	-0.0065	3.400

6.3. GATE E-24

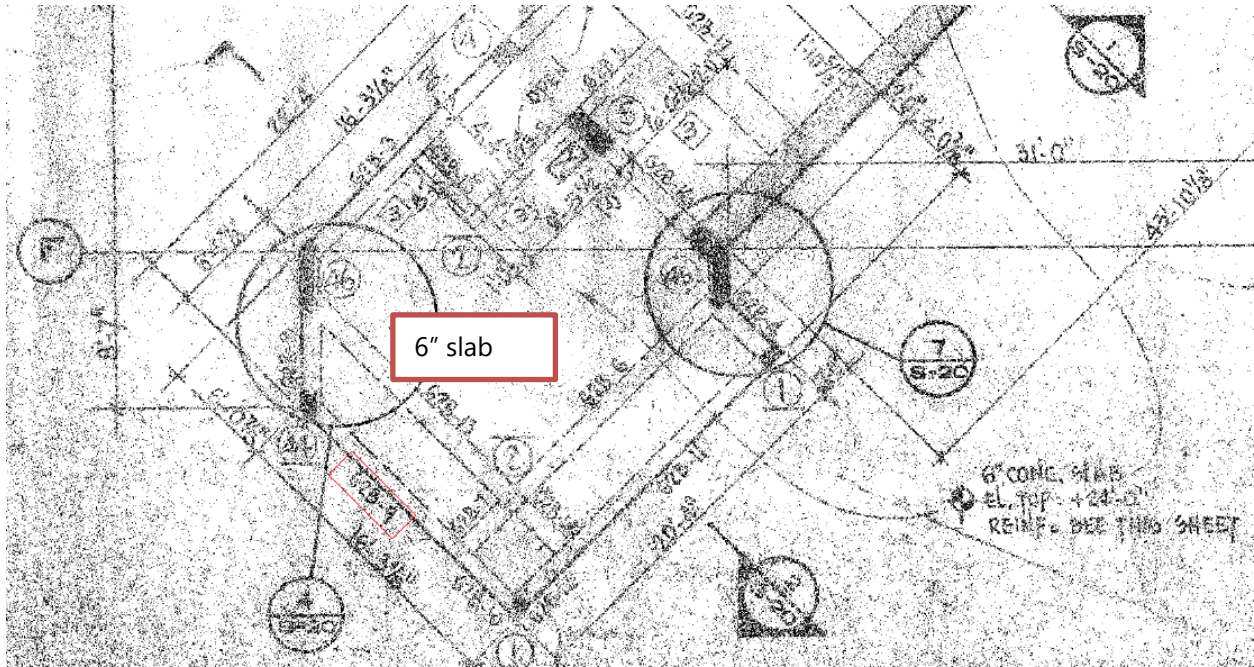


FIGURE 5: PARTIAL FLOOR PLAN

BEAM SCHEDULE (2ND FLOOR)									
MARK	ELEV. TOP OF BEAM	SIZE	REINFORCING				# 3 TIES		REMARKS
			BOTTOM	TOP	'C'	'E'	Nº	SPACING (EACH END)	
G2B-8		12x24	* 2-11	* 3-11				@12"¢	* SEE DETAILS $\frac{4}{G20}$ & $\frac{5}{G20}$
G2B-9			*	*				@12"¢	* SEE DETAILS $\frac{4}{G20}$ & $\frac{5}{G20}$
G2B-10			* 2-6	* 2-9				@10"¢	* CONT. THRU G2B-9

FIGURE 6: EXISTING BEAM

MIA: A-VGDS - GATE E-24

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad \text{k} \equiv 1000 \cdot \text{lb} \quad \text{klf} \equiv \frac{\text{k}}{\text{ft}}$$

Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live}_{\text{Floor}} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \cdot \text{psf} & d_{9_bar} &:= 1.127 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{cmu_wall_height}_{E24} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{E24} &= 11.667 \cdot \text{ft} \\ \text{cmu_wall_weight}_{E24} &:= \text{CMU} \cdot \text{cmu_wall_height}_{E24} & \text{cmu_wall_weight}_{E24} &= 0.642 \cdot \text{klf} \\ \text{Slab_Span_to_adj_beam} &:= \frac{3 \cdot \text{ft} + 6 \cdot \text{in}}{2} \\ \text{slab_weight}_{E24} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Slab}_6_{\text{in}} & \text{slab_weight}_{E24} &= 0.131 \cdot \text{klf} \\ \text{Live}_{E24} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Live}_{\text{Floor}} & \text{Live}_{E24} &= 0.175 \cdot \text{klf} \\ \text{dist}_{\text{top}} &:= \text{cover} + \frac{d_{9_bar}}{2} & \text{dist}_{\text{top}} &= 2.063 \cdot \text{in} \\ \text{dist}_{\text{bot}} &:= \text{cover} + \frac{d_{6_bar}}{2} & \text{dist}_{\text{bot}} &= 1.875 \cdot \text{in} \end{aligned}$$

$P_{\text{steel_support}} := 644 \cdot \text{lb}$
(From Stadd Model MIA
A-VGDS - Bracket Type 4 -
Max Vertical from Node #1)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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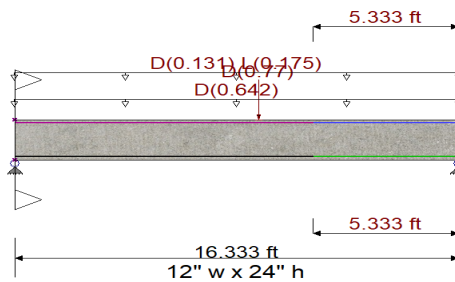
DESCRIPTION: Gate E24 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : ASCE 7-16

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	1.0



Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in

Span #1 Reinforcing....

2-#9 at 2.063 in from Top, from 0.0 to 16.333 ft in this span
 2-#9 at 2.063 in from Top, from 0.0 to 11.0 ft in this span

2-#6 at 1.875 in from Bottom, from 0.0 to 16.333 ft in this span
 2-#6 at 1.875 in from Bottom, from 0.0 to 11.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)

Uniform Load : D = 0.1310, L = 0.1750 k/ft, Tributary Width = 1.0 ft, (6" Floor)

Point Load : D = 0.770 k @ 9.0 ft, (A-VGDS bottom bracket)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.578 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.006 in Ratio = 30197 >=360.
Mu : Applied	48.657 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
Mn * Phi : Allowable	84.215 k-ft	Max Downward Total Deflection	0.054 in Ratio = 3638 >=180.
Location of maximum on span	11.008 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	10.537	10.616
Overall MINimum	1.429	1.429
+D+H	9.108	9.187
+D+L+H	10.537	10.616
+D+Lr+H	9.108	9.187
+D+S+H	9.108	9.187
+D+0.750Lr+0.750L+H	10.180	10.259
+D+0.750L+0.750S+H	10.180	10.259
+D+0.60W+H	9.108	9.187

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E24 - Level 2

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750Lr+0.750L+0.450W+H	10.180	10.259
+D+0.750L+0.750S+0.450W+H	10.180	10.259
+0.60D+0.60W+0.60H	5.465	5.512
+D+0.70E+0.60H	9.108	9.187
+D+0.750L+0.750S+0.5250E+H	10.180	10.259
+0.60D+0.70E+H	5.465	5.512
D Only	9.108	9.187
L Only	1.429	1.429
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	22.13	13.22	13.22	0.00	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.18	22.13	12.94	12.94	2.33	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.36	22.13	12.66	12.66	4.62	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.54	22.13	12.38	12.38	6.85	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.71	22.13	12.10	12.10	9.04	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.89	22.13	11.82	11.82	11.17	1.00	24.02	Vu < PhiVc/2	lot Reqd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.07	22.13	11.54	11.54	13.26	1.00	24.02	Vu < PhiVc/2	lot Reqd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.25	22.13	11.26	11.26	15.29	1.00	24.02	Vu < PhiVc/2	lot Reqd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.43	22.13	10.98	10.98	17.28	1.00	24.02	Vu < PhiVc/2	lot Reqd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.61	22.13	10.70	10.70	19.21	1.00	24.02	Vu < PhiVc/2	lot Reqd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.79	22.13	10.42	10.42	21.09	0.91	23.73	Vu < PhiVc/2	lot Reqd 9.6.:	23.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.96	22.13	10.14	10.14	22.93	0.82	23.41	Vu < PhiVc/2	lot Reqd 9.6.:	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.14	22.13	9.86	9.86	24.71	0.74	23.15	Vu < PhiVc/2	lot Reqd 9.6.:	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.32	22.13	9.58	9.58	26.45	0.67	22.93	Vu < PhiVc/2	lot Reqd 9.6.:	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.50	22.13	9.30	9.30	28.13	0.61	22.73	Vu < PhiVc/2	lot Reqd 9.6.:	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.68	22.13	9.02	9.02	29.77	0.56	22.57	Vu < PhiVc/2	lot Reqd 9.6.:	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.86	22.13	8.74	8.74	31.35	0.51	22.42	Vu < PhiVc/2	lot Reqd 9.6.:	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.03	22.13	8.46	8.46	32.89	0.47	22.29	Vu < PhiVc/2	lot Reqd 9.6.:	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.21	22.13	8.18	8.18	34.37	0.44	22.17	Vu < PhiVc/2	lot Reqd 9.6.:	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.39	22.13	7.90	7.90	35.81	0.41	22.06	Vu < PhiVc/2	lot Reqd 9.6.:	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.57	22.13	7.62	7.62	37.19	0.38	21.97	Vu < PhiVc/2	lot Reqd 9.6.:	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.75	22.13	7.34	7.34	38.53	0.35	21.88	Vu < PhiVc/2	lot Reqd 9.6.:	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.93	22.13	7.06	7.06	39.81	0.33	21.80	Vu < PhiVc/2	lot Reqd 9.6.:	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.11	22.13	6.78	6.78	41.05	0.30	21.73	Vu < PhiVc/2	lot Reqd 9.6.:	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.28	22.13	6.50	6.50	42.24	0.28	21.66	Vu < PhiVc/2	lot Reqd 9.6.:	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.46	22.13	6.22	6.22	43.37	0.26	21.60	Vu < PhiVc/2	lot Reqd 9.6.:	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.64	22.13	5.94	5.94	44.46	0.25	21.54	Vu < PhiVc/2	lot Reqd 9.6.:	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.82	22.13	5.66	5.66	45.49	0.23	21.48	Vu < PhiVc/2	lot Reqd 9.6.:	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.00	22.13	5.38	5.38	46.48	0.21	21.43	Vu < PhiVc/2	lot Reqd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.18	22.13	5.10	5.10	47.41	0.20	21.38	Vu < PhiVc/2	lot Reqd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.36	22.13	4.82	4.82	48.30	0.18	21.33	Vu < PhiVc/2	lot Reqd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.53	22.13	4.54	4.54	49.14	0.17	21.28	Vu < PhiVc/2	lot Reqd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.71	22.13	4.26	4.26	49.92	0.16	21.24	Vu < PhiVc/2	lot Reqd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.89	22.13	3.98	3.98	50.66	0.14	21.20	Vu < PhiVc/2	lot Reqd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.07	22.13	3.70	3.70	51.34	0.13	21.16	Vu < PhiVc/2	lot Reqd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.25	22.13	3.42	3.42	51.98	0.12	21.12	Vu < PhiVc/2	lot Reqd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.43	22.13	3.14	3.14	52.56	0.11	21.09	Vu < PhiVc/2	lot Reqd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.60	22.13	2.86	2.86	53.10	0.10	21.05	Vu < PhiVc/2	lot Reqd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.78	22.13	2.58	2.58	53.59	0.09	21.02	Vu < PhiVc/2	lot Reqd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.96	22.13	2.30	2.30	54.02	0.08	20.98	Vu < PhiVc/2	lot Reqd 9.6.:	21.0	0.0	0.0
+1.40D+1.60H	1	7.14	22.13	2.03	2.03	52.76	0.07	20.96	Vu < PhiVc/2	lot Reqd 9.6.:	21.0	0.0	0.0
+1.40D+1.60H	1	7.32	22.13	1.76	1.76	53.09	0.06	20.92	Vu < PhiVc/2	lot Reqd 9.6.:	20.9	0.0	0.0
+1.40D+1.60H	1	7.50	22.13	1.49	1.49	53.38	0.05	20.89	Vu < PhiVc/2	lot Reqd 9.6.:	20.9	0.0	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E24 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.40D+1.60H	1	7.68	22.13	1.22	1.22	53.63	0.04	20.86	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0
+1.40D+1.60H	1	7.85	22.13	0.95	0.95	53.82	0.03	20.83	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.40D+1.60H	1	8.03	22.13	0.69	0.69	53.97	0.02	20.80	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.40D+1.60H	1	8.21	22.13	0.42	0.42	54.06	0.01	20.77	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.40D+1.60H	1	8.39	22.13	0.15	0.15	54.12	0.01	20.74	Vu < PhiVc/2	lot Req'd 9.6.:	20.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.57	22.13	-0.21	0.21	55.70	0.01	20.75	Vu < PhiVc/2	lot Req'd 9.6.:	20.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.75	22.13	-0.49	0.49	55.64	0.02	20.78	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.93	22.13	-0.77	0.77	55.52	0.03	20.81	Vu < PhiVc/2	lot Req'd 9.6.:	20.8	0.0	0.0
+1.40D+1.60H	1	9.10	22.13	-2.00	2.00	53.73	0.07	20.95	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0
+1.40D+1.60H	1	9.28	22.13	-2.27	2.27	53.35	0.08	20.98	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.40D+1.60H	1	9.46	22.13	-2.54	2.54	52.92	0.09	21.01	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	9.64	22.13	-2.82	2.82	53.98	0.10	21.04	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	9.82	22.13	-3.10	3.10	53.45	0.11	21.07	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.00	22.13	-3.38	3.38	52.88	0.12	21.11	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.17	22.13	-3.66	3.66	52.25	0.13	21.15	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.35	22.13	-3.94	3.94	51.57	0.14	21.19	Vu < PhiVc/2	lot Req'd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.53	22.13	-4.22	4.22	50.84	0.15	21.23	Vu < PhiVc/2	lot Req'd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.71	22.13	-4.50	4.50	50.06	0.17	21.27	Vu < PhiVc/2	lot Req'd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.89	22.13	-4.78	4.78	49.24	0.18	21.31	Vu < PhiVc/2	lot Req'd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.07	22.13	-5.06	5.06	48.36	0.19	21.36	Vu < PhiVc/2	lot Req'd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.25	22.13	-5.34	5.34	47.43	0.21	21.41	Vu < PhiVc/2	lot Req'd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.42	22.13	-5.62	5.62	46.45	0.22	21.46	Vu < PhiVc/2	lot Req'd 9.6.:	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.60	22.13	-5.90	5.90	45.43	0.24	21.51	Vu < PhiVc/2	lot Req'd 9.6.:	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.78	22.13	-6.18	6.18	44.35	0.26	21.57	Vu < PhiVc/2	lot Req'd 9.6.:	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.96	22.13	-6.46	6.46	43.22	0.28	21.63	Vu < PhiVc/2	lot Req'd 9.6.:	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.14	22.13	-6.74	6.74	42.04	0.30	21.70	Vu < PhiVc/2	lot Req'd 9.6.:	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.32	22.13	-7.01	7.01	40.82	0.32	21.77	Vu < PhiVc/2	lot Req'd 9.6.:	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.50	22.13	-7.29	7.29	39.54	0.34	21.84	Vu < PhiVc/2	lot Req'd 9.6.:	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.67	22.13	-7.57	7.57	38.21	0.37	21.93	Vu < PhiVc/2	lot Req'd 9.6.:	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.85	22.13	-7.85	7.85	36.84	0.39	22.02	Vu < PhiVc/2	lot Req'd 9.6.:	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.03	22.13	-8.13	8.13	35.41	0.42	22.12	Vu < PhiVc/2	lot Req'd 9.6.:	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.21	22.13	-8.41	8.41	33.93	0.46	22.23	Vu < PhiVc/2	lot Req'd 9.6.:	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.39	22.13	-8.69	8.69	32.41	0.49	22.35	Vu < PhiVc/2	lot Req'd 9.6.:	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.57	22.13	-8.97	8.97	30.83	0.54	22.49	Vu < PhiVc/2	lot Req'd 9.6.:	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.74	22.13	-9.25	9.25	29.20	0.58	22.65	Vu < PhiVc/2	lot Req'd 9.6.:	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.92	22.13	-9.53	9.53	27.52	0.64	22.83	Vu < PhiVc/2	lot Req'd 9.6.:	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.10	22.13	-9.81	9.81	25.80	0.70	23.04	Vu < PhiVc/2	lot Req'd 9.6.:	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.28	22.13	-10.09	10.09	24.02	0.77	23.28	Vu < PhiVc/2	lot Req'd 9.6.:	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.46	22.13	-10.37	10.37	22.20	0.86	23.57	Vu < PhiVc/2	lot Req'd 9.6.:	23.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.64	22.13	-10.65	10.65	20.32	0.97	23.91	Vu < PhiVc/2	lot Req'd 9.6.:	23.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.82	22.13	-10.93	10.93	18.39	1.00	24.02	Vu < PhiVc/2	lot Req'd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.99	22.13	-11.21	11.21	16.42	1.00	24.02	Vu < PhiVc/2	lot Req'd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.17	22.13	-11.49	11.49	14.39	1.00	24.02	Vu < PhiVc/2	lot Req'd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.35	22.13	-11.77	11.77	12.31	1.00	24.02	Vu < PhiVc/2	lot Req'd 9.6.:	24.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.53	22.13	-12.05	12.05	10.19	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	15.71	22.13	-12.33	12.33	8.01	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	15.89	22.13	-12.61	12.61	5.78	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.07	22.13	-12.89	12.89	3.51	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.24	22.13	-13.17	13.17	1.18	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope	Span # 1	1	16.333	48.66	84.21	0.58

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E24 - Level 2

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
+1.40D+1.60H Span # 1	1	16.333	47.19	84.21	0.56
+1.20D+0.50Lr+1.60L+1.60H Span # 1	1	16.333	48.66	84.21	0.58
+1.20D+1.60L+0.50S+1.60H Span # 1	1	16.333	48.66	84.21	0.58
+1.20D+1.60Lr+L+1.60H Span # 1	1	16.333	45.58	84.21	0.54
+1.20D+1.60Lr+0.50W+1.60H Span # 1	1	16.333	40.45	84.21	0.48
+1.20D+L+1.60S+1.60H Span # 1	1	16.333	45.58	84.21	0.54
+1.20D+1.60S+0.50W+1.60H Span # 1	1	16.333	40.45	84.21	0.48
+1.20D+0.50Lr+L+W+1.60H Span # 1	1	16.333	45.58	84.21	0.54
+1.20D+L+0.50S+W+1.60H Span # 1	1	16.333	45.58	84.21	0.54
+0.90D+W+1.60H Span # 1	1	16.333	30.34	84.21	0.36
+1.20D+L+0.20S+E+1.60H Span # 1	1	16.333	45.58	84.21	0.54
+0.90D+E+0.90H Span # 1	1	16.333	30.34	84.21	0.36

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.0539	8.167		0.0000	0.000

6.4. GATE E-23

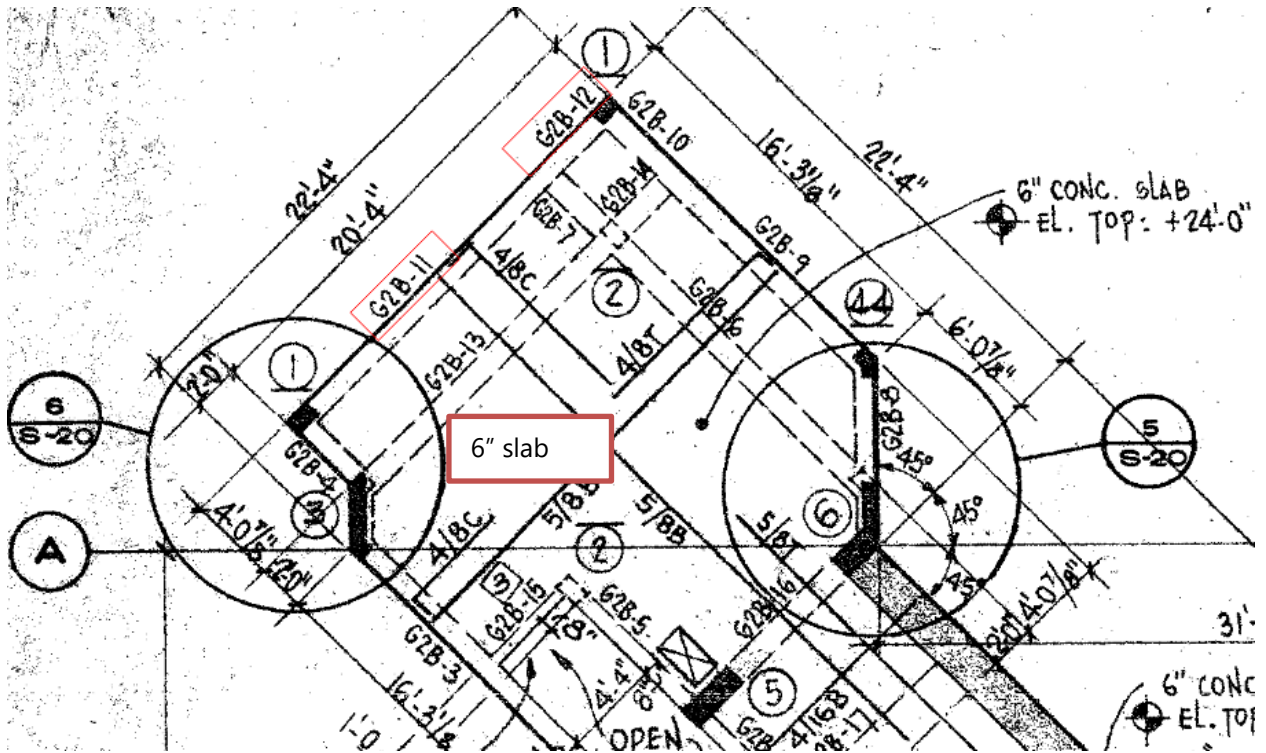


FIGURE 7: PARTIAL PLAN

BEAM SCHEDULE (2ND FLOOR)									
MARK	ELEV. TOP OF BEAM	SIZE	REINFORCING				#3 TIES		REMARKS
			BOTTOM	TOP	'C'	'E'	Nº	SPACING (EACH END)	
G2B-8		12 x 24	* 2-11	* 3-11				@ 12" c/c	* SEE DETAILS (4) & (2)
G2B-9			*	*				@ 12" c/c	* SEE DETAILS (4) & (5)
G2B-10			* 2-6	* 2-9				@ 10" c/c	* CONT. THRU G2B-9
G2B-11			*	*				@ 12" c/c	* SEE DETAILS (4) & (2)
G2B-12			* 2-6	* 2-9				@ 10" c/c	* CONT. THRU G2B-11

FIGURE 8: BEAM INFO

MIA: A-VGDS - GATE E-23

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad k \equiv 1000 \cdot \text{lb} \quad \text{klf} \equiv \frac{k}{\text{ft}}$$

Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live}_{\text{Floor}} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \cdot \text{psf} & d_{9_bar} &:= 1.127 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{cmu_wall_height}_{E23} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{E23} &= 11.667 \cdot \text{ft} \\ \text{cmu_wall_weight}_{E23} &:= \text{CMU} \cdot \text{cmu_wall_height}_{E23} & \text{cmu_wall_weight}_{E23} &= 0.642 \cdot \text{klf} \\ \text{Slab_Span_to_adj_beam} &:= \frac{3 \cdot \text{ft} + 6 \cdot \text{in}}{2} \\ \text{slab_weight}_{E23} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Slab}_6_{\text{in}} & \text{slab_weight}_{E23} &= 0.131 \cdot \text{klf} \\ \text{Live}_{E23} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Live}_{\text{Floor}} & \text{Live}_{E23} &= 0.175 \cdot \text{klf} \\ \text{dist}_{\text{top}} &:= \text{cover} + \frac{d_{9_bar}}{2} & \text{dist}_{\text{top}} &= 2.063 \cdot \text{in} \\ \text{dist}_{\text{bot}} &:= \text{cover} + \frac{d_{6_bar}}{2} & \text{dist}_{\text{bot}} &= 1.875 \cdot \text{in} \end{aligned}$$

$P_{\text{steel_support}} := 644 \cdot \text{lb}$
(From Stadd Model MIA
A-VGDS - Bracket Type 1 -
Max Vertical from Node #1)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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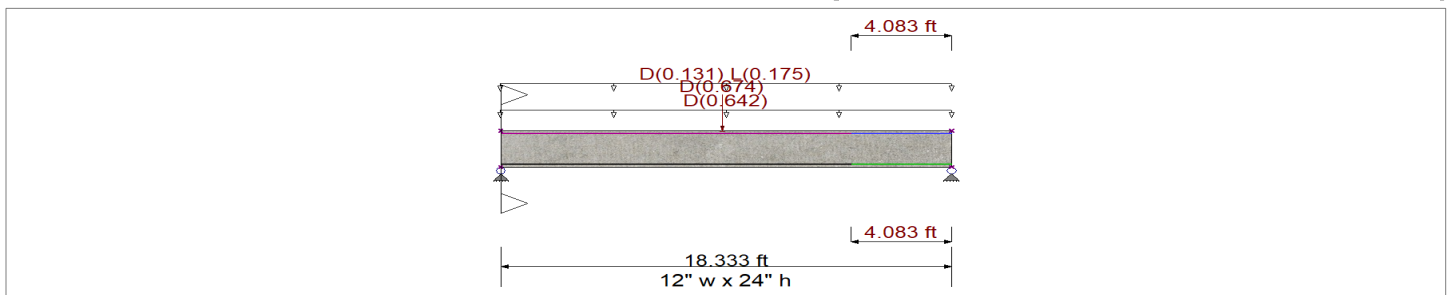
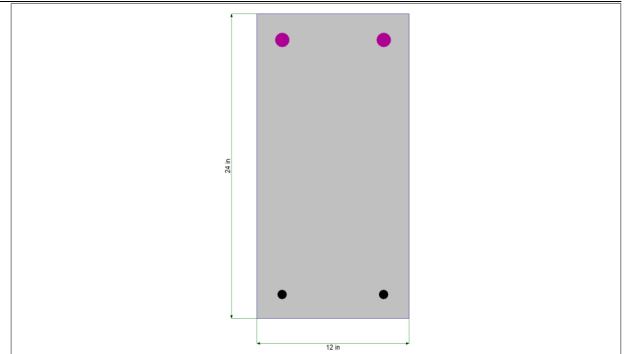
DESCRIPTION: Gate E23 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : ASCE 7-16

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	1.0



Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 24.0 in

Span #1 Reinforcing....

2-#9 at 2.063 in from Top, from 0.0 to 18.333 ft in this span
 2-#9 at 2.063 in from Top, from 0.0 to 14.250 ft in this span

2-#6 at 1.875 in from Bottom, from 0.0 to 18.333 ft in this span
 2-#6 at 1.875 in from Bottom, from 0.0 to 14.250 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)

Uniform Load : D = 0.1310, L = 0.1750 k/ft, Tributary Width = 1.0 ft, (6" Floor)

Point Load : D = 0.6740 k @ 9.0 ft, (A-VGDS bottom bracket)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.563 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.010 in Ratio = 21353 >=360
Mu : Applied	47.428 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
Mn * Phi : Allowable	84.215 k-ft	Max Downward Total Deflection	0.108 in Ratio = 2035 >=180
Location of maximum on span	14.226 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	11.783	11.771
Overall MINimum	1.604	1.604
+D+H	10.179	10.167
+D+L+H	11.783	11.771
+D+Lr+H	10.179	10.167
+D+S+H	10.179	10.167
+D+0.750Lr+0.750L+H	11.382	11.370
+D+0.750L+0.750S+H	11.382	11.370
+D+0.60W+H	10.179	10.167

Project Title:
 Engineer:
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Concrete Beam

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DESCRIPTION: Gate E23 - Level 2

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750Lr+0.750L+0.450W+H	11.382	11.370
+D+0.750L+0.750S+0.450W+H	11.382	11.370
+0.60D+0.60W+0.60H	6.107	6.100
+D+0.70E+0.60H	10.179	10.167
+D+0.750L+0.750S+0.5250E+H	11.382	11.370
+0.60D+0.70E+H	6.107	6.100
D Only	10.179	10.167
L Only	1.604	1.604
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	22.13	14.78	14.78	0.00	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.20	22.13	14.47	14.47	2.93	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.40	22.13	14.15	14.15	5.80	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.60	22.13	13.84	13.84	8.60	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	0.80	22.13	13.52	13.52	11.34	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.00	22.13	13.21	13.21	14.02	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.20	22.13	12.90	12.90	16.64	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.40	22.13	12.58	12.58	19.19	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.60	22.13	12.27	12.27	21.68	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	1.80	22.13	11.95	11.95	24.11	0.91	23.74	PhiVc/2 < Vu <=	Min 11.5.6.3	33.7	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	2.00	22.13	11.64	11.64	26.47	0.81	23.40	Vu < PhiVc/2	lot Req'd 9.6.:	23.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.20	22.13	11.33	11.33	28.77	0.73	23.12	Vu < PhiVc/2	lot Req'd 9.6.:	23.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.40	22.13	11.01	11.01	31.01	0.65	22.88	Vu < PhiVc/2	lot Req'd 9.6.:	22.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.60	22.13	10.70	10.70	33.18	0.59	22.68	Vu < PhiVc/2	lot Req'd 9.6.:	22.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.81	22.13	10.38	10.38	35.29	0.54	22.51	Vu < PhiVc/2	lot Req'd 9.6.:	22.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.01	22.13	10.07	10.07	37.34	0.50	22.36	Vu < PhiVc/2	lot Req'd 9.6.:	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.21	22.13	9.76	9.76	39.33	0.46	22.23	Vu < PhiVc/2	lot Req'd 9.6.:	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.41	22.13	9.44	9.44	41.25	0.42	22.11	Vu < PhiVc/2	lot Req'd 9.6.:	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.61	22.13	9.13	9.13	43.11	0.39	22.01	Vu < PhiVc/2	lot Req'd 9.6.:	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.81	22.13	8.81	8.81	44.91	0.36	21.92	Vu < PhiVc/2	lot Req'd 9.6.:	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.01	22.13	8.50	8.50	46.65	0.34	21.83	Vu < PhiVc/2	lot Req'd 9.6.:	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.21	22.13	8.19	8.19	48.32	0.31	21.75	Vu < PhiVc/2	lot Req'd 9.6.:	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.41	22.13	7.87	7.87	49.93	0.29	21.68	Vu < PhiVc/2	lot Req'd 9.6.:	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.61	22.13	7.56	7.56	51.47	0.27	21.62	Vu < PhiVc/2	lot Req'd 9.6.:	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.81	22.13	7.24	7.24	52.95	0.25	21.55	Vu < PhiVc/2	lot Req'd 9.6.:	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.01	22.13	6.93	6.93	54.37	0.23	21.50	Vu < PhiVc/2	lot Req'd 9.6.:	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.21	22.13	6.61	6.61	55.73	0.22	21.44	Vu < PhiVc/2	lot Req'd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.41	22.13	6.30	6.30	57.02	0.20	21.39	Vu < PhiVc/2	lot Req'd 9.6.:	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.61	22.13	5.99	5.99	58.26	0.19	21.35	Vu < PhiVc/2	lot Req'd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.81	22.13	5.67	5.67	59.42	0.18	21.30	Vu < PhiVc/2	lot Req'd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.01	22.13	5.36	5.36	60.53	0.16	21.26	Vu < PhiVc/2	lot Req'd 9.6.:	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.21	22.13	5.04	5.04	61.57	0.15	21.22	Vu < PhiVc/2	lot Req'd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.41	22.13	4.73	4.73	62.55	0.14	21.18	Vu < PhiVc/2	lot Req'd 9.6.:	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.61	22.13	4.42	4.42	63.47	0.13	21.15	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.81	22.13	4.10	4.10	64.32	0.12	21.11	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.01	22.13	3.79	3.79	65.11	0.11	21.08	Vu < PhiVc/2	lot Req'd 9.6.:	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.21	22.13	3.47	3.47	65.84	0.10	21.04	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.41	22.13	3.16	3.16	66.50	0.09	21.01	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.61	22.13	2.85	2.85	67.10	0.08	20.98	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.81	22.13	2.53	2.53	67.64	0.07	20.95	Vu < PhiVc/2	lot Req'd 9.6.:	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.01	22.13	2.22	2.22	68.12	0.06	20.92	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0
+1.40D+1.60H	1	8.21	22.13	1.91	1.91	66.38	0.05	20.90	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0
+1.40D+1.60H	1	8.42	22.13	1.61	1.61	66.73	0.04	20.87	Vu < PhiVc/2	lot Req'd 9.6.:	20.9	0.0	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E23 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.40D+1.60H	1	8.62	22.13	1.31	1.31	67.02	0.04	20.84	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.40D+1.60H	1	8.82	22.13	1.01	1.01	67.25	0.03	20.81	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.40D+1.60H	1	9.02	22.13	-0.24	0.24	67.41	0.01	20.74	Vu < PhiVc/2	lot Reqd 9.6.	20.7	0.0	0.0
+1.40D+1.60H	1	9.22	22.13	-0.54	0.54	67.33	0.01	20.77	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.40D+1.60H	1	9.42	22.13	-0.84	0.84	67.19	0.02	20.80	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.40D+1.60H	1	9.62	22.13	-1.14	1.14	67.00	0.03	20.83	Vu < PhiVc/2	lot Reqd 9.6.	20.8	0.0	0.0
+1.40D+1.60H	1	9.82	22.13	-1.44	1.44	66.74	0.04	20.85	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0	0.0
+1.40D+1.60H	1	10.02	22.13	-1.74	1.74	66.42	0.05	20.88	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.22	22.13	-2.05	2.05	68.21	0.06	20.90	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.42	22.13	-2.36	2.36	67.77	0.06	20.93	Vu < PhiVc/2	lot Reqd 9.6.	20.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.62	22.13	-2.67	2.67	67.27	0.07	20.96	Vu < PhiVc/2	lot Reqd 9.6.	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	10.82	22.13	-2.99	2.99	66.70	0.08	20.99	Vu < PhiVc/2	lot Reqd 9.6.	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.02	22.13	-3.30	3.30	66.07	0.09	21.03	Vu < PhiVc/2	lot Reqd 9.6.	21.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.22	22.13	-3.62	3.62	65.38	0.10	21.06	Vu < PhiVc/2	lot Reqd 9.6.	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.42	22.13	-3.93	3.93	64.62	0.11	21.09	Vu < PhiVc/2	lot Reqd 9.6.	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.62	22.13	-4.24	4.24	63.80	0.12	21.13	Vu < PhiVc/2	lot Reqd 9.6.	21.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	11.82	22.13	-4.56	4.56	62.92	0.13	21.16	Vu < PhiVc/2	lot Reqd 9.6.	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.02	22.13	-4.87	4.87	61.98	0.14	21.20	Vu < PhiVc/2	lot Reqd 9.6.	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.22	22.13	-5.19	5.19	60.97	0.16	21.24	Vu < PhiVc/2	lot Reqd 9.6.	21.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.42	22.13	-5.50	5.50	59.90	0.17	21.28	Vu < PhiVc/2	lot Reqd 9.6.	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.62	22.13	-5.82	5.82	58.76	0.18	21.32	Vu < PhiVc/2	lot Reqd 9.6.	21.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	12.82	22.13	-6.13	6.13	57.57	0.20	21.37	Vu < PhiVc/2	lot Reqd 9.6.	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.02	22.13	-6.44	6.44	56.31	0.21	21.42	Vu < PhiVc/2	lot Reqd 9.6.	21.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.22	22.13	-6.76	6.76	54.98	0.23	21.47	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.42	22.13	-7.07	7.07	53.60	0.24	21.53	Vu < PhiVc/2	lot Reqd 9.6.	21.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.62	22.13	-7.39	7.39	52.15	0.26	21.58	Vu < PhiVc/2	lot Reqd 9.6.	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	13.82	22.13	-7.70	7.70	50.64	0.28	21.65	Vu < PhiVc/2	lot Reqd 9.6.	21.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.03	22.13	-8.01	8.01	49.07	0.30	21.72	Vu < PhiVc/2	lot Reqd 9.6.	21.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.23	22.13	-8.33	8.33	47.43	0.32	21.79	Vu < PhiVc/2	lot Reqd 9.6.	21.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.43	22.13	-8.64	8.64	45.73	0.35	21.87	Vu < PhiVc/2	lot Reqd 9.6.	21.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.63	22.13	-8.96	8.96	43.97	0.38	21.96	Vu < PhiVc/2	lot Reqd 9.6.	22.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	14.83	22.13	-9.27	9.27	42.14	0.41	22.06	Vu < PhiVc/2	lot Reqd 9.6.	22.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.03	22.13	-9.58	9.58	40.25	0.44	22.17	Vu < PhiVc/2	lot Reqd 9.6.	22.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.23	22.13	-9.90	9.90	38.30	0.48	22.29	Vu < PhiVc/2	lot Reqd 9.6.	22.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.43	22.13	-10.21	10.21	36.28	0.52	22.43	Vu < PhiVc/2	lot Reqd 9.6.	22.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.63	22.13	-10.53	10.53	34.21	0.57	22.59	Vu < PhiVc/2	lot Reqd 9.6.	22.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	15.83	22.13	-10.84	10.84	32.07	0.62	22.78	Vu < PhiVc/2	lot Reqd 9.6.	22.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	16.03	22.13	-11.15	11.15	29.86	0.69	23.00	Vu < PhiVc/2	lot Reqd 9.6.	23.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	16.23	22.13	-11.47	11.47	27.60	0.77	23.25	Vu < PhiVc/2	lot Reqd 9.6.	23.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	16.43	22.13	-11.78	11.78	25.27	0.86	23.56	PhiVc/2 < Vu <=	Min 11.5.6.3	33.5	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.63	22.13	-12.10	12.10	22.87	0.98	23.94	PhiVc/2 < Vu <=	Min 11.5.6.3	33.9	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	16.83	22.13	-12.41	12.41	20.42	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.03	22.13	-12.72	12.72	17.90	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.23	22.13	-13.04	13.04	15.32	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.43	22.13	-13.35	13.35	12.68	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.63	22.13	-13.67	13.67	9.97	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	17.83	22.13	-13.98	13.98	7.20	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	18.03	22.13	-14.30	14.30	4.37	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0
+1.20D+1.60L+0.50S+1.60H	1	18.23	22.13	-14.61	14.61	1.47	1.00	24.02	PhiVc/2 < Vu <=	Min 11.5.6.3	34.0	11.0	11.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope	Span # 1	1	18.333	47.43	84.21	0.56

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E23 - Level 2

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
+1.40D+1.60H Span # 1	1	18.333	45.79	84.21	0.54
+1.20D+0.50Lr+1.60L+1.60H Span # 1	1	18.333	47.43	84.21	0.56
+1.20D+1.60L+0.50S+1.60H Span # 1	1	18.333	47.43	84.21	0.56
+1.20D+1.60Lr+L+1.60H Span # 1	1	18.333	44.36	84.21	0.53
+1.20D+1.60Lr+0.50W+1.60H Span # 1	1	18.333	39.25	84.21	0.47
+1.20D+L+1.60S+1.60H Span # 1	1	18.333	44.36	84.21	0.53
+1.20D+1.60S+0.50W+1.60H Span # 1	1	18.333	39.25	84.21	0.47
+1.20D+0.50Lr+L+W+1.60H Span # 1	1	18.333	44.36	84.21	0.53
+1.20D+L+0.50S+W+1.60H Span # 1	1	18.333	44.36	84.21	0.53
+0.90D+W+1.60H Span # 1	1	18.333	29.44	84.21	0.35
+1.20D+L+0.20S+E+1.60H Span # 1	1	18.333	44.36	84.21	0.53
+0.90D+E+0.90H Span # 1	1	18.333	29.44	84.21	0.35

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.1081	9.167		0.0000	0.000

6.5. GATE E-21

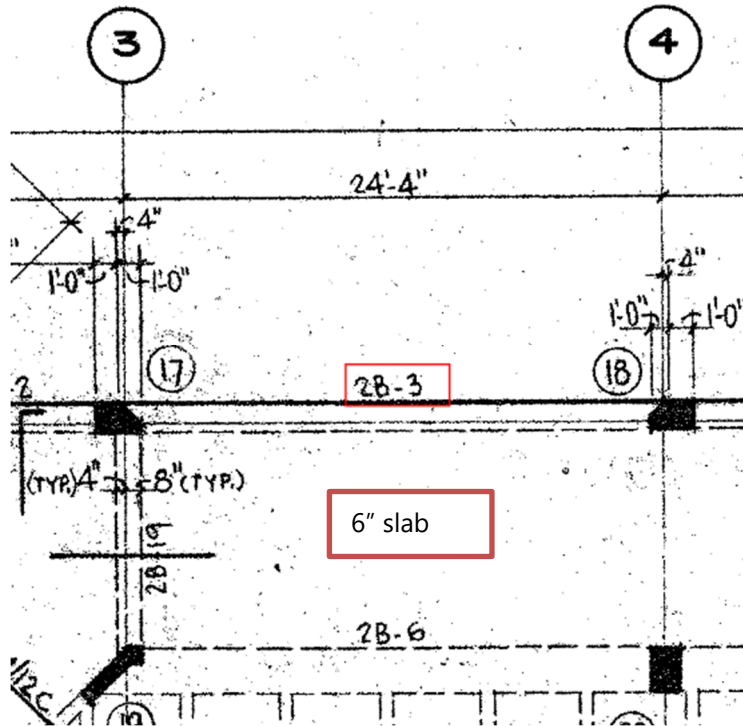


FIGURE 9: PARTIAL PLAN

BEAM SCHEDULE (2ND FLOOR)									
MARK	ELEV. TOP OF BEAM	SIZE	REINFORCING				#3 TIES		REMARKS
			BOTTOM	TOP	'C'	'E'	Nº	SPACING (EACH END)	
2B-3		16 x 24	2-9	1-9				2Ø5", 10"± TO ±	

FIGURE 10: BEAM INFO

MIA: A-VGDS - GATE E-21

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad \text{k} \equiv 1000 \cdot \text{lb} \quad \text{klf} \equiv \frac{\text{k}}{\text{ft}}$$

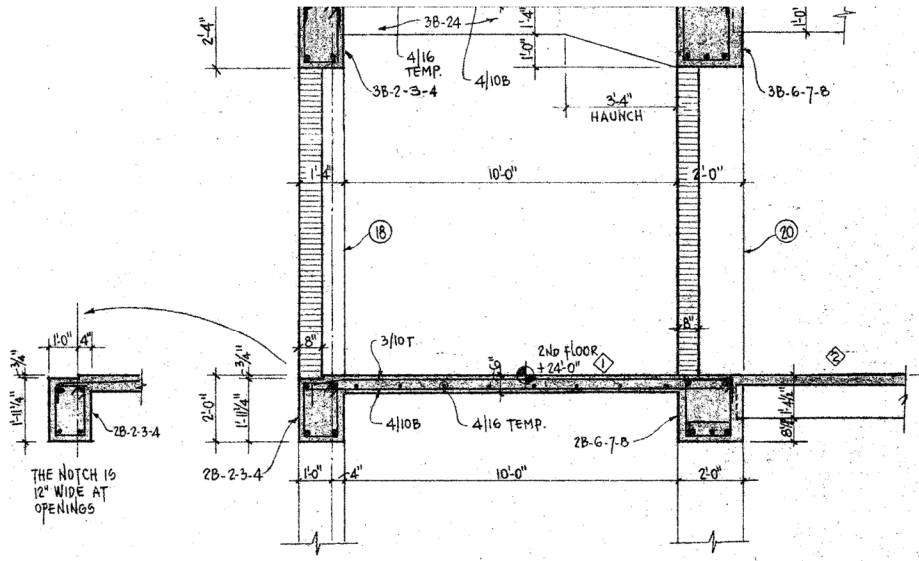
Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live}_{\text{Floor}} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \cdot \text{psf} & d_{9_bar} &:= 1.127 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{cmu_wall_height}_{E21} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{E21} &= 11.667 \cdot \text{ft} \\ \text{cmu_wall_weight}_{E21} &:= \text{CMU} \cdot \text{cmu_wall_height}_{E21} & \text{cmu_wall_weight}_{E21} &= 0.642 \cdot \text{klf} \\ \text{Slab_Span_to_adj_beam} &:= \frac{10 \cdot \text{ft} + 0 \cdot \text{in}}{2} \\ \text{slab_weight}_{E21} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Slab}_6_{\text{in}} & \text{slab_weight}_{E21} &= 0.375 \cdot \text{klf} \\ \text{Live}_{E21} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Live}_{\text{Floor}} & \text{Live}_{E21} &= 0.5 \cdot \text{klf} \\ \text{dist}_{\text{top}} &:= \text{cover} + \frac{d_{9_bar}}{2} & \text{dist}_{\text{top}} &= 2.063 \cdot \text{in} \\ \text{dist}_{\text{bot}} &:= \text{cover} + \frac{d_{6_bar}}{2} & \text{dist}_{\text{bot}} &= 1.875 \cdot \text{in} \\ & & P_{\text{steel_support}} &:= 644 \cdot \text{lb} \end{aligned}$$

(From Stadd Model MIA
A-VGDS - Bracket Type 1 -
Max Vertical from Node #1)



SECTION $\frac{1}{S-17}$
 SCALE: 3/8" = 1'-0"

(B)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ecb
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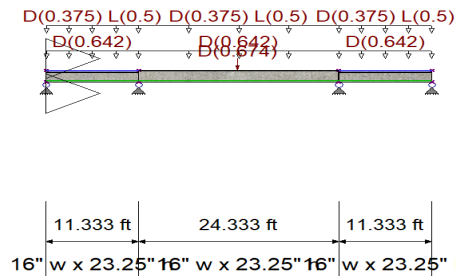
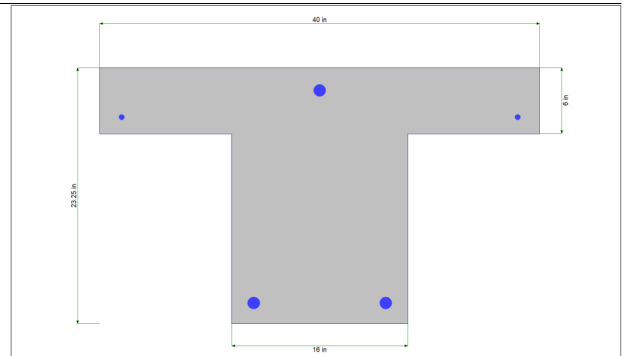
DESCRIPTION: Gate E21 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : IBC 2015

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup =	=	1.0



Cross Section & Reinforcing Details

Tee Section, Stem Width = 16.0 in, Total Height = 23.250 in, Top Flange Width = 40.0 in, Flange Thickness = 6.0 in

Span #1 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 11.333 ft in this span
 2-#4 at 4.50 in from Top, from 0.0 to 11.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 11.333 ft in this span

Span #2 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 24.333 ft in this span
 2-#4 at 1.50 in from Top, from 0.0 to 24.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 24.333 ft in this span

Span #3 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 11.333 ft in this span
 2-#4 at 4.50 in from Top, from 0.0 to 11.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 11.333 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)

Load for Span Number 2

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)
 Point Load : D = 0.6740 k @ 12.0 ft, (A-VGDS)

Load for Span Number 3

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E21 - Level 2

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.916 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.017 in Ratio = 17607 >=360
Mu : Applied	-112.353 k-ft	Max Upward Transient Deflection	-0.002 in Ratio = 86367 >=360
Mn * Phi : Allowable	122.625 k-ft	Max Downward Total Deflection	0.086 in Ratio = 3403 >=180
Location of maximum on span	0.000 ft	Max Upward Total Deflection	-0.007 in Ratio = 20912 >=180
Span # where maximum occurs	Span # 3		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	4.343	44.279	44.268	4.344
Overall MINimum	1.004	10.745	10.745	1.004
+D+H	2.996	33.876	33.863	2.998
+D+L+H	4.343	44.279	44.268	4.344
+D+Lr+H	2.996	33.876	33.863	2.998
+D+S+H	2.996	33.876	33.863	2.998
+D+0.750Lr+0.750L+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+H	4.030	41.654	41.643	4.031
+D+0.60W+H	2.996	33.876	33.863	2.998
+D+0.70E+H	2.996	33.876	33.863	2.998
+D+0.750Lr+0.750L+0.450W+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+0.450W+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+0.5250E+H	4.030	41.654	41.643	4.031
+0.60D+0.60W+0.60H	1.790	20.334	20.325	1.791
+0.60D+0.70E+0.60H	1.790	20.334	20.325	1.791
D Only	2.996	33.876	33.863	2.998
L Only	1.004	10.745	10.745	1.004
H Only				

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	21.38	5.19	5.19	0.00	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.45	21.38	3.98	3.98	2.08	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.91	21.38	2.77	2.77	3.61	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.36	21.38	1.56	1.56	4.59	0.61	28.97	Vu < PhiVc/2	lot Req'd 9.6.:	29.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.81	21.38	0.35	0.35	5.02	0.13	27.16	Vu < PhiVc/2	lot Req'd 9.6.:	27.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.27	21.38	-0.85	0.85	4.91	0.31	27.86	Vu < PhiVc/2	lot Req'd 9.6.:	27.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.72	21.38	-2.06	2.06	4.25	0.87	29.94	Vu < PhiVc/2	lot Req'd 9.6.:	29.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.17	21.38	-3.27	3.27	3.04	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.63	21.38	-4.48	4.48	1.28	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.08	21.19	-5.69	5.69	1.02	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.53	21.19	-6.90	6.90	3.87	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.99	21.19	-8.10	8.10	7.27	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.44	21.19	-9.31	9.31	11.22	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.89	21.19	-10.52	10.52	15.72	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.35	21.19	-11.73	11.73	20.76	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.80	21.19	-12.94	12.94	26.35	0.87	28.73	Vu < PhiVc/2	lot Req'd 9.6.:	28.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.25	21.19	-14.15	14.15	32.49	0.77	28.48	Vu < PhiVc/2	lot Req'd 9.6.:	28.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.71	21.19	-15.35	15.35	39.18	0.69	28.27	PhiVc/2 < Vu <=	Min 11.5.6.3	41.4	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	8.16	21.19	-16.56	16.56	46.41	0.63	28.11	PhiVc/2 < Vu <=	Min 11.5.6.3	41.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	8.61	21.19	-17.77	17.77	54.19	0.58	27.98	PhiVc/2 < Vu <=	Min 11.5.6.3	41.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.07	21.19	-18.98	18.98	62.52	0.54	27.87	PhiVc/2 < Vu <=	Min 11.5.6.3	41.0	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.52	21.19	-20.19	20.19	71.40	0.50	27.77	PhiVc/2 < Vu <=	Min 11.5.6.3	40.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.97	21.19	-21.40	21.40	80.83	0.47	27.69	PhiVc/2 < Vu <=	Min 11.5.6.3	40.8	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	10.43	21.19	-22.60	22.60	90.80	0.44	27.61	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	10.88	21.19	-23.81	23.81	101.32	0.41	27.55	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	11.33	21.75	32.84	32.84	112.39	0.53	28.55	PhiVc < Vu	4.288	39.3	10.0	10.0
+1.20D+1.60L+0.50S+1.60H	2	12.31	21.75	30.25	30.25	81.69	0.67	28.92	PhiVc < Vu	1.322	39.7	10.0	10.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ecb
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DESCRIPTION: Gate E21 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	2	13.28	21.75	27.65	27.65	53.51	0.94	29.62	PhiVc/2 < Vu <=	Min 11.5.6.3	43.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	14.25	21.75	25.06	25.06	27.86	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	15.23	21.75	22.46	22.46	4.73	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	16.20	21.38	19.87	19.87	15.87	1.00	30.44	PhiVc/2 < Vu <=	Min 11.5.6.3	43.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	17.17	21.38	17.27	17.27	33.94	0.91	30.09	PhiVc/2 < Vu <=	Min 11.5.6.3	43.3	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	18.15	21.38	14.68	14.68	49.49	0.53	28.67	PhiVc/2 < Vu <=	Min 11.5.6.3	41.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	19.12	21.38	12.09	12.09	62.52	0.34	27.98	Vu < PhiVc/2	lot Req'd 9.6.3	28.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	20.09	21.38	9.49	9.49	73.02	0.23	27.56	Vu < PhiVc/2	lot Req'd 9.6.3	27.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	21.07	21.38	6.90	6.90	81.00	0.15	27.26	Vu < PhiVc/2	lot Req'd 9.6.3	27.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	22.04	21.38	4.30	4.30	86.45	0.09	27.03	Vu < PhiVc/2	lot Req'd 9.6.3	27.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	23.01	21.38	1.71	1.71	89.37	0.03	26.82	Vu < PhiVc/2	lot Req'd 9.6.3	26.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	23.99	21.38	-1.69	1.69	89.25	0.03	26.82	Vu < PhiVc/2	lot Req'd 9.6.3	26.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	24.96	21.38	-4.29	4.29	86.33	0.09	27.03	Vu < PhiVc/2	lot Req'd 9.6.3	27.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	25.93	21.38	-6.88	6.88	80.90	0.15	27.26	Vu < PhiVc/2	lot Req'd 9.6.3	27.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	26.91	21.38	-9.48	9.48	72.93	0.23	27.56	Vu < PhiVc/2	lot Req'd 9.6.3	27.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	27.88	21.38	-12.07	12.07	62.45	0.34	27.98	Vu < PhiVc/2	lot Req'd 9.6.3	28.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	28.85	21.38	-14.67	14.67	49.43	0.53	28.67	PhiVc/2 < Vu <=	Min 11.5.6.3	41.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	29.83	21.38	-17.26	17.26	33.90	0.91	30.09	PhiVc/2 < Vu <=	Min 11.5.6.3	43.3	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	30.80	21.38	-19.85	19.85	15.84	1.00	30.44	PhiVc/2 < Vu <=	Min 11.5.6.3	43.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	31.77	21.75	-22.45	22.45	4.75	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	32.75	21.75	-25.04	25.04	27.86	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	33.72	21.75	-27.64	27.64	53.50	0.94	29.62	PhiVc/2 < Vu <=	Min 11.5.6.3	43.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	34.69	21.75	-30.23	30.23	81.66	0.67	28.92	PhiVc < Vu	1.309	39.7	10.0	10.0
+1.20D+1.60L+0.50S+1.60H	3	35.67	21.19	25.02	25.02	112.35	0.39	27.49	PhiVc/2 < Vu <=	Min 11.5.6.3	40.6	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	36.12	21.19	23.81	23.81	101.29	0.42	27.55	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	36.57	21.19	22.60	22.60	90.77	0.44	27.61	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.03	21.19	21.39	21.39	80.79	0.47	27.69	PhiVc/2 < Vu <=	Min 11.5.6.3	40.8	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.48	21.19	20.18	20.18	71.37	0.50	27.77	PhiVc/2 < Vu <=	Min 11.5.6.3	40.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.93	21.19	18.98	18.98	62.50	0.54	27.87	PhiVc/2 < Vu <=	Min 11.5.6.3	41.0	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	38.39	21.19	17.77	17.77	54.17	0.58	27.98	PhiVc/2 < Vu <=	Min 11.5.6.3	41.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	38.84	21.19	16.56	16.56	46.39	0.63	28.11	PhiVc/2 < Vu <=	Min 11.5.6.3	41.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	39.29	21.19	15.35	15.35	39.15	0.69	28.28	PhiVc/2 < Vu <=	Min 11.5.6.3	41.4	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	39.75	21.19	14.14	14.14	32.47	0.77	28.48	Vu < PhiVc/2	lot Req'd 9.6.3	28.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	40.20	21.19	12.93	12.93	26.33	0.87	28.74	Vu < PhiVc/2	lot Req'd 9.6.3	28.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	40.65	21.19	11.73	11.73	20.74	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	41.11	21.19	10.52	10.52	15.70	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	41.56	21.19	9.31	9.31	11.21	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.01	21.19	8.10	8.10	7.26	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.47	21.19	6.89	6.89	3.86	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.92	21.19	5.68	5.68	1.01	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	43.37	21.38	4.48	4.48	1.29	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	43.83	21.38	3.27	3.27	3.05	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	44.28	21.38	2.06	2.06	4.26	0.86	29.93	Vu < PhiVc/2	lot Req'd 9.6.3	29.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	44.73	21.38	0.85	0.85	4.92	0.31	27.85	Vu < PhiVc/2	lot Req'd 9.6.3	27.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	45.19	21.38	-0.36	0.36	5.03	0.13	27.17	Vu < PhiVc/2	lot Req'd 9.6.3	27.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	45.64	21.38	-1.56	1.56	4.59	0.61	28.97	Vu < PhiVc/2	lot Req'd 9.6.3	29.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	46.09	21.38	-2.77	2.77	3.61	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	46.55	21.38	-3.98	3.98	2.08	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	47.00	21.38	-5.19	5.19	0.00	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope	Span # 1	1	11.333	-110.50	122.62	0.90

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ec6
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DESCRIPTION: Gate E21 - Level 2

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.40D+1.60H					
Span # 1	1	11.333	-90.89	122.62	0.74
Span # 2	2	24.333	-92.43	128.02	0.72
Span # 3	3	11.333	-92.39	122.62	0.75
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	11.333	-110.50	122.62	0.90
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	11.333	-110.50	122.62	0.90
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	11.333	-77.90	122.62	0.64
Span # 2	2	24.333	-79.22	128.02	0.62
Span # 3	3	11.333	-79.19	122.62	0.65
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	11.333	-77.90	122.62	0.64
Span # 2	2	24.333	-79.22	128.02	0.62
Span # 3	3	11.333	-79.19	122.62	0.65
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+0.50L+0.70S+E+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+0.90D+W+0.90H					
Span # 1	1	11.333	-58.43	122.62	0.48
Span # 2	2	24.333	-59.42	128.02	0.46
Span # 3	3	11.333	-59.39	122.62	0.48
+0.90D+E+0.90H					
Span # 1	1	11.333	-58.43	122.62	0.48
Span # 2	2	24.333	-59.42	128.02	0.46
Span # 3	3	11.333	-59.39	122.62	0.48

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.0033	11.820	+D+L+H	-0.0065	7.933
+D+L+H	2	0.0858	12.167	+D+L+H	-0.0011	24.560
+D+L+H	3	0.0000	11.333	+D+L+H	-0.0065	3.400

6.6. GATE E-31

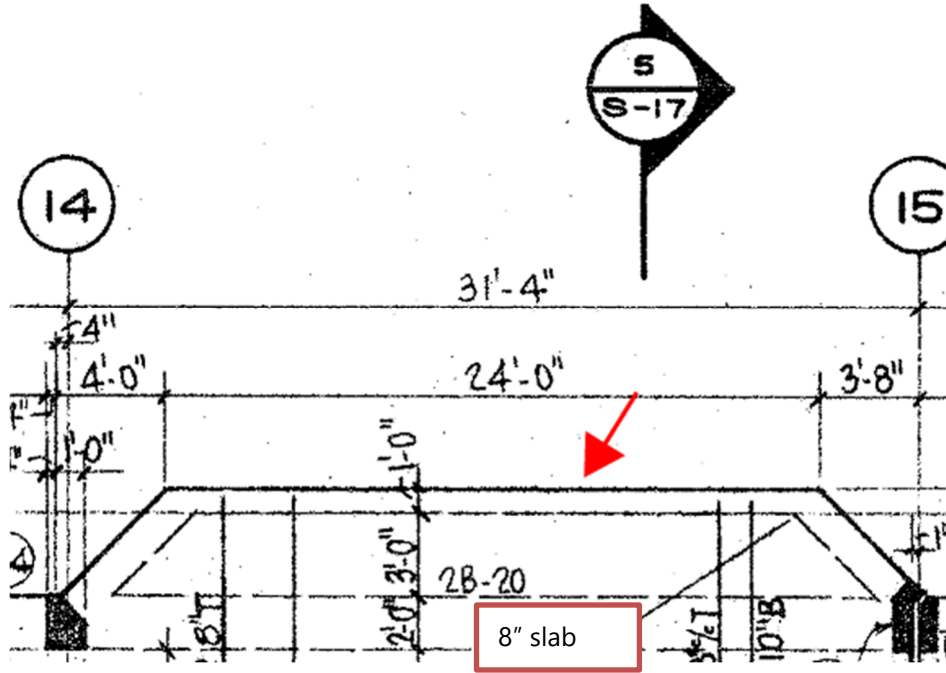
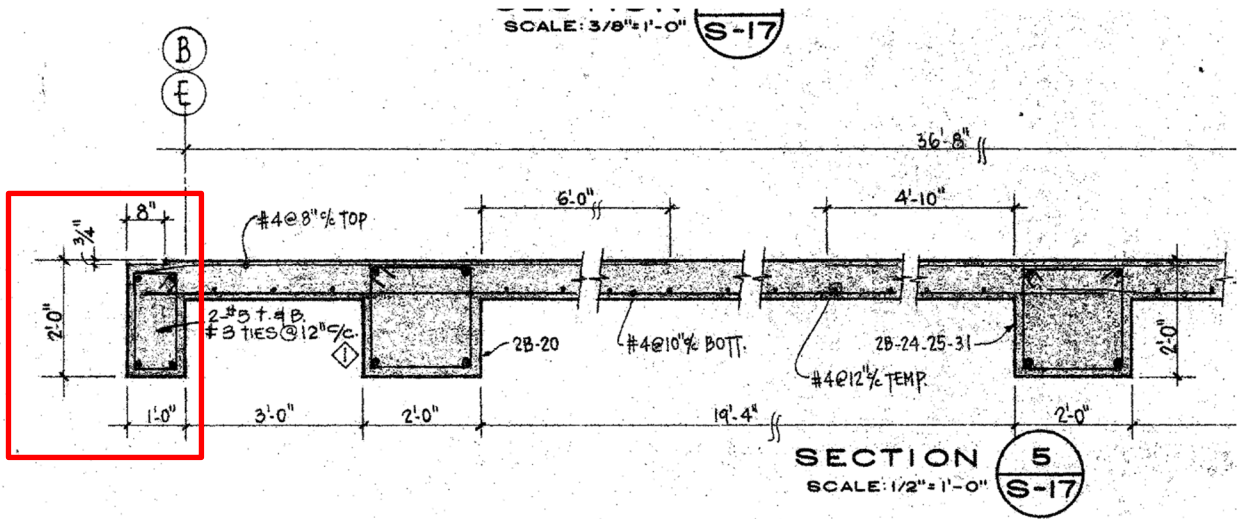


FIGURE 11: PARTIAL PLAN



MIA: A-VGDS - GATE E-31

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad k \equiv 1000 \cdot \text{lb} \quad \text{klf} \equiv \frac{k}{\text{ft}}$$

Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live_Floor} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \text{ psf} & d_{9_bar} &:= 1.127 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{cmu_wall_height}_{E31} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{E31} &= 11.667 \text{ ft} \\ \text{cmu_wall_weight}_{E31} &:= \text{CMU} \cdot \text{cmu_wall_height}_{E31} & \text{cmu_wall_weight}_{E31} &= 0.642 \text{ klf} \end{aligned}$$

$$\text{dist}_{\text{top}} := \text{cover} + \frac{d_{5_bar}}{2} \quad \text{dist}_{\text{top}} = 1.812 \text{ in}$$

$$\text{dist}_{\text{bot}} := \text{cover} + \frac{d_{5_bar}}{2} \quad \text{dist}_{\text{bot}} = 1.812 \text{ in}$$

$$P_{\text{steel_support}} := 644 \cdot \text{lb}$$

(From Stadd Model MIA
A-VGDS - Bracket Type 1 -
Max Vertical from Node #1)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ecb
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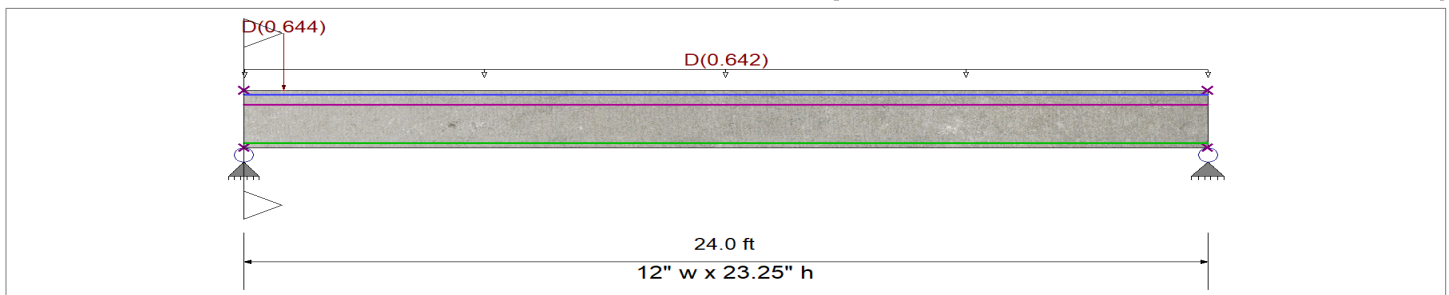
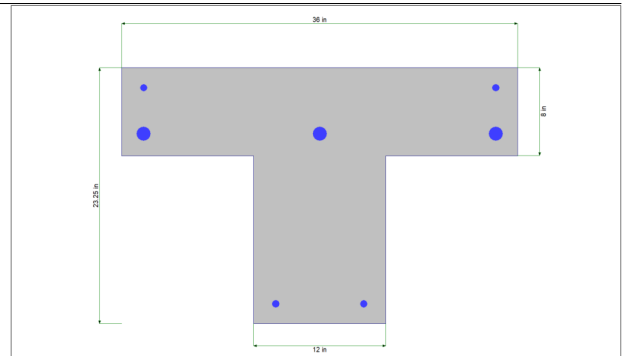
DESCRIPTION: Gate E31 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : ASCE 7-16

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup =	=	1.0



Cross Section & Reinforcing Details

Tee Section, Stem Width = 12.0 in, Total Height = 23.250 in, Top Flange Width = 36.0 in, Flange Thickness = 8.0 in

Span #1 Reinforcing....

2-#5 at 1.812 in from Top, from 0.0 to 24.0 ft in this span
 3-#10 at 6.0 in from Top, from 0.0 to 24.0 ft in this span

2-#5 at 1.812 in from Bottom, from 0.0 to 24.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)

Point Load : D = 0.6440 k @ 1.0 ft, (A-VGDS bottom bracket)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.847 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.000 in Ratio = 0 < 360.0
Mu : Applied	114.620 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 < 360.0
Mn * Phi : Allowable	135.395 k-ft	Max Downward Total Deflection	0.371 in Ratio = 775 >= 180
Location of maximum on span	11.978 ft	Max Upward Total Deflection	0.000 in Ratio = 0 < 180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	14.209	13.618
Overall MINimum	8.525	8.171
+D+H	14.209	13.618
+D+L+H	14.209	13.618
+D+Lr+H	14.209	13.618
+D+S+H	14.209	13.618
+D+0.750Lr+0.750L+H	14.209	13.618
+D+0.750L+0.750S+H	14.209	13.618
+D+0.60W+H	14.209	13.618
+D+0.750Lr+0.750L+0.450W+H	14.209	13.618

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ec6
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DESCRIPTION: Gate E31 - Level 2

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750L+0.750S+0.450W+H	14.209	13.618
+0.60D+0.60W+0.60H	8.525	8.171
+D+0.70E+0.60H	14.209	13.618
+D+0.750L+0.750S+0.5250E+H	14.209	13.618
+0.60D+0.70E+H	8.525	8.171
D Only	14.209	13.618
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.40D+1.60H	1	0.00	21.44	19.89	19.89	0.00	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	0.26	21.44	19.48	19.48	5.16	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	0.52	21.44	19.06	19.06	10.22	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	0.79	21.44	18.64	18.64	15.16	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	1.05	21.44	17.33	17.33	19.95	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	1.31	21.44	16.91	16.91	24.44	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	1.57	21.44	16.50	16.50	28.82	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	1.84	21.44	16.08	16.08	33.10	0.87	21.09	PhiVc/2 < Vu <=	Min 9.6.3.1	31.7	10.7	10.0
+1.40D+1.60H	1	2.10	21.44	15.66	15.66	37.26	0.75	20.95	PhiVc/2 < Vu <=	Min 9.6.3.1	31.6	10.7	10.0
+1.40D+1.60H	1	2.36	21.44	15.25	15.25	41.31	0.66	20.85	PhiVc/2 < Vu <=	Min 9.6.3.1	31.5	10.7	10.0
+1.40D+1.60H	1	2.62	21.44	14.83	14.83	45.26	0.59	20.76	PhiVc/2 < Vu <=	Min 9.6.3.1	31.4	10.7	10.0
+1.40D+1.60H	1	2.89	21.44	14.42	14.42	49.09	0.52	20.69	PhiVc/2 < Vu <=	Min 9.6.3.1	31.3	10.7	10.0
+1.40D+1.60H	1	3.15	21.44	14.00	14.00	52.82	0.47	20.63	PhiVc/2 < Vu <=	Min 9.6.3.1	31.2	10.7	10.0
+1.40D+1.60H	1	3.41	21.44	13.58	13.58	56.44	0.43	20.58	PhiVc/2 < Vu <=	Min 9.6.3.1	31.2	10.7	10.0
+1.40D+1.60H	1	3.67	21.44	13.17	13.17	59.95	0.39	20.54	PhiVc/2 < Vu <=	Min 9.6.3.1	31.1	10.7	10.0
+1.40D+1.60H	1	3.93	21.44	12.75	12.75	63.35	0.36	20.50	PhiVc/2 < Vu <=	Min 9.6.3.1	31.1	10.7	10.0
+1.40D+1.60H	1	4.20	21.44	12.34	12.34	66.64	0.33	20.46	PhiVc/2 < Vu <=	Min 9.6.3.1	31.1	10.7	10.0
+1.40D+1.60H	1	4.46	21.44	11.92	11.92	69.82	0.31	20.43	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	4.72	21.44	11.50	11.50	72.89	0.28	20.41	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	4.98	21.44	11.09	11.09	75.85	0.26	20.38	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	5.25	21.44	10.67	10.67	78.71	0.24	20.36	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	5.51	21.44	10.26	10.26	81.45	0.22	20.34	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	5.77	21.44	9.84	9.84	84.09	0.21	20.32	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.3	0.0	0.0
+1.40D+1.60H	1	6.03	21.44	9.42	9.42	86.61	0.19	20.30	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.3	0.0	0.0
+1.40D+1.60H	1	6.30	21.44	9.01	9.01	89.03	0.18	20.29	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.3	0.0	0.0
+1.40D+1.60H	1	6.56	21.44	8.59	8.59	91.34	0.17	20.27	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.3	0.0	0.0
+1.40D+1.60H	1	6.82	21.44	8.18	8.18	93.54	0.16	20.26	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.3	0.0	0.0
+1.40D+1.60H	1	7.08	21.44	7.76	7.76	95.63	0.14	20.25	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	7.34	21.44	7.34	7.34	97.61	0.13	20.24	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	7.61	21.44	6.93	6.93	99.48	0.12	20.22	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	7.87	21.44	6.51	6.51	101.24	0.11	20.21	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	8.13	21.44	6.10	6.10	102.90	0.11	20.20	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	8.39	21.44	5.68	5.68	104.44	0.10	20.19	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	8.66	21.44	5.27	5.27	105.88	0.09	20.18	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	8.92	21.44	4.85	4.85	107.20	0.08	20.17	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	9.18	21.44	4.43	4.43	108.42	0.07	20.16	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	9.44	21.44	4.02	4.02	109.53	0.07	20.16	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.2	0.0	0.0
+1.40D+1.60H	1	9.70	21.44	3.60	3.60	110.53	0.06	20.15	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0
+1.40D+1.60H	1	9.97	21.44	3.19	3.19	111.42	0.05	20.14	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0
+1.40D+1.60H	1	10.23	21.44	2.77	2.77	112.20	0.04	20.13	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0
+1.40D+1.60H	1	10.49	21.44	2.35	2.35	112.87	0.04	20.12	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0
+1.40D+1.60H	1	10.75	21.44	1.94	1.94	113.44	0.03	20.11	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0
+1.40D+1.60H	1	11.02	21.44	1.52	1.52	113.89	0.02	20.11	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0
+1.40D+1.60H	1	11.28	21.44	1.11	1.11	114.23	0.02	20.10	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0
+1.40D+1.60H	1	11.54	21.44	0.69	0.69	114.47	0.01	20.09	Vu < PhiVc/2	lot Req'd 9.6.3.1	20.1	0.0	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ecb
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DESCRIPTION: Gate E31 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.40D+1.60H	1	11.80	21.44	0.27	0.27	114.60	0.00	20.08	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	12.07	21.44	-0.14	0.14	114.61	0.00	20.08	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	12.33	21.44	-0.56	0.56	114.52	0.01	20.09	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	12.59	21.44	-0.97	0.97	114.32	0.02	20.10	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	12.85	21.44	-1.39	1.39	114.01	0.02	20.10	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	13.11	21.44	-1.81	1.81	113.59	0.03	20.11	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	13.38	21.44	-2.22	2.22	113.06	0.04	20.12	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	13.64	21.44	-2.64	2.64	112.43	0.04	20.13	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	13.90	21.44	-3.05	3.05	111.68	0.05	20.14	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	14.16	21.44	-3.47	3.47	110.83	0.06	20.14	Vu < PhiVc/2	lot Req'd 9.6.:	20.1	0.0	0.0
+1.40D+1.60H	1	14.43	21.44	-3.88	3.88	109.86	0.06	20.15	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	14.69	21.44	-4.30	4.30	108.79	0.07	20.16	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	14.95	21.44	-4.72	4.72	107.61	0.08	20.17	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	15.21	21.44	-5.13	5.13	106.31	0.09	20.18	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	15.48	21.44	-5.55	5.55	104.91	0.09	20.19	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	15.74	21.44	-5.96	5.96	103.40	0.10	20.20	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	16.00	21.44	-6.38	6.38	101.78	0.11	20.21	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	16.26	21.44	-6.80	6.80	100.06	0.12	20.22	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	16.52	21.44	-7.21	7.21	98.22	0.13	20.23	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	16.79	21.44	-7.63	7.63	96.27	0.14	20.24	Vu < PhiVc/2	lot Req'd 9.6.:	20.2	0.0	0.0
+1.40D+1.60H	1	17.05	21.44	-8.04	8.04	94.22	0.15	20.26	Vu < PhiVc/2	lot Req'd 9.6.:	20.3	0.0	0.0
+1.40D+1.60H	1	17.31	21.44	-8.46	8.46	92.05	0.16	20.27	Vu < PhiVc/2	lot Req'd 9.6.:	20.3	0.0	0.0
+1.40D+1.60H	1	17.57	21.44	-8.88	8.88	89.78	0.18	20.28	Vu < PhiVc/2	lot Req'd 9.6.:	20.3	0.0	0.0
+1.40D+1.60H	1	17.84	21.44	-9.29	9.29	87.40	0.19	20.30	Vu < PhiVc/2	lot Req'd 9.6.:	20.3	0.0	0.0
+1.40D+1.60H	1	18.10	21.44	-9.71	9.71	84.90	0.20	20.32	Vu < PhiVc/2	lot Req'd 9.6.:	20.3	0.0	0.0
+1.40D+1.60H	1	18.36	21.44	-10.12	10.12	82.30	0.22	20.33	Vu < PhiVc/2	lot Req'd 9.6.:	20.3	0.0	0.0
+1.40D+1.60H	1	18.62	21.44	-10.54	10.54	79.59	0.24	20.35	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	18.89	21.44	-10.96	10.96	76.78	0.25	20.38	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	19.15	21.44	-11.37	11.37	73.85	0.28	20.40	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	19.41	21.44	-11.79	11.79	70.81	0.30	20.42	PhiVc/2 < Vu <=	Min 9.6.3.1	31.0	10.7	10.0
+1.40D+1.60H	1	19.67	21.44	-12.20	12.20	67.66	0.32	20.45	PhiVc/2 < Vu <=	Min 9.6.3.1	31.1	10.7	10.0
+1.40D+1.60H	1	19.93	21.44	-12.62	12.62	64.41	0.35	20.49	PhiVc/2 < Vu <=	Min 9.6.3.1	31.1	10.7	10.0
+1.40D+1.60H	1	20.20	21.44	-13.03	13.03	61.04	0.38	20.52	PhiVc/2 < Vu <=	Min 9.6.3.1	31.1	10.7	10.0
+1.40D+1.60H	1	20.46	21.44	-13.45	13.45	57.57	0.42	20.56	PhiVc/2 < Vu <=	Min 9.6.3.1	31.2	10.7	10.0
+1.40D+1.60H	1	20.72	21.44	-13.87	13.87	53.99	0.46	20.61	PhiVc/2 < Vu <=	Min 9.6.3.1	31.2	10.7	10.0
+1.40D+1.60H	1	20.98	21.44	-14.28	14.28	50.30	0.51	20.67	PhiVc/2 < Vu <=	Min 9.6.3.1	31.3	10.7	10.0
+1.40D+1.60H	1	21.25	21.44	-14.70	14.70	46.50	0.56	20.74	PhiVc/2 < Vu <=	Min 9.6.3.1	31.3	10.7	10.0
+1.40D+1.60H	1	21.51	21.44	-15.11	15.11	42.59	0.63	20.82	PhiVc/2 < Vu <=	Min 9.6.3.1	31.4	10.7	10.0
+1.40D+1.60H	1	21.77	21.44	-15.53	15.53	38.57	0.72	20.92	PhiVc/2 < Vu <=	Min 9.6.3.1	31.5	10.7	10.0
+1.40D+1.60H	1	22.03	21.44	-15.95	15.95	34.44	0.83	21.04	PhiVc/2 < Vu <=	Min 9.6.3.1	31.7	10.7	10.0
+1.40D+1.60H	1	22.30	21.44	-16.36	16.36	30.20	0.97	21.20	PhiVc/2 < Vu <=	Min 9.6.3.1	31.8	10.7	10.0
+1.40D+1.60H	1	22.56	21.44	-16.78	16.78	25.85	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	22.82	21.44	-17.19	17.19	21.40	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	23.08	21.44	-17.61	17.61	16.83	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	23.34	21.44	-18.03	18.03	12.16	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	23.61	21.44	-18.44	18.44	7.38	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0
+1.40D+1.60H	1	23.87	21.44	-18.86	18.86	2.49	1.00	21.24	PhiVc/2 < Vu <=	Min 9.6.3.1	31.9	10.7	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope						
Span # 1		1	24.000	114.62	135.39	0.85
+1.40D+1.60H						
Span # 1		1	24.000	114.62	135.39	0.85

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ec6
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DESCRIPTION: Gate E31 - Level 2

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+0.50Lr+1.60L+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+1.20D+1.60L+0.50S+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+1.20D+1.60Lr+L+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+1.20D+1.60Lr+0.50W+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+1.20D+L+1.60S+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+1.20D+1.60S+0.50W+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+1.20D+0.50Lr+L+W+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+1.20D+L+0.50S+W+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+0.90D+W+1.60H Span # 1	1	24.000	73.68	135.39	0.54
+1.20D+L+0.20S+E+1.60H Span # 1	1	24.000	98.25	135.39	0.73
+0.90D+E+0.90H Span # 1	1	24.000	73.68	135.39	0.54

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
D Only	1	0.3714	12.000		0.0000	0.000

6.7. GATE E-33

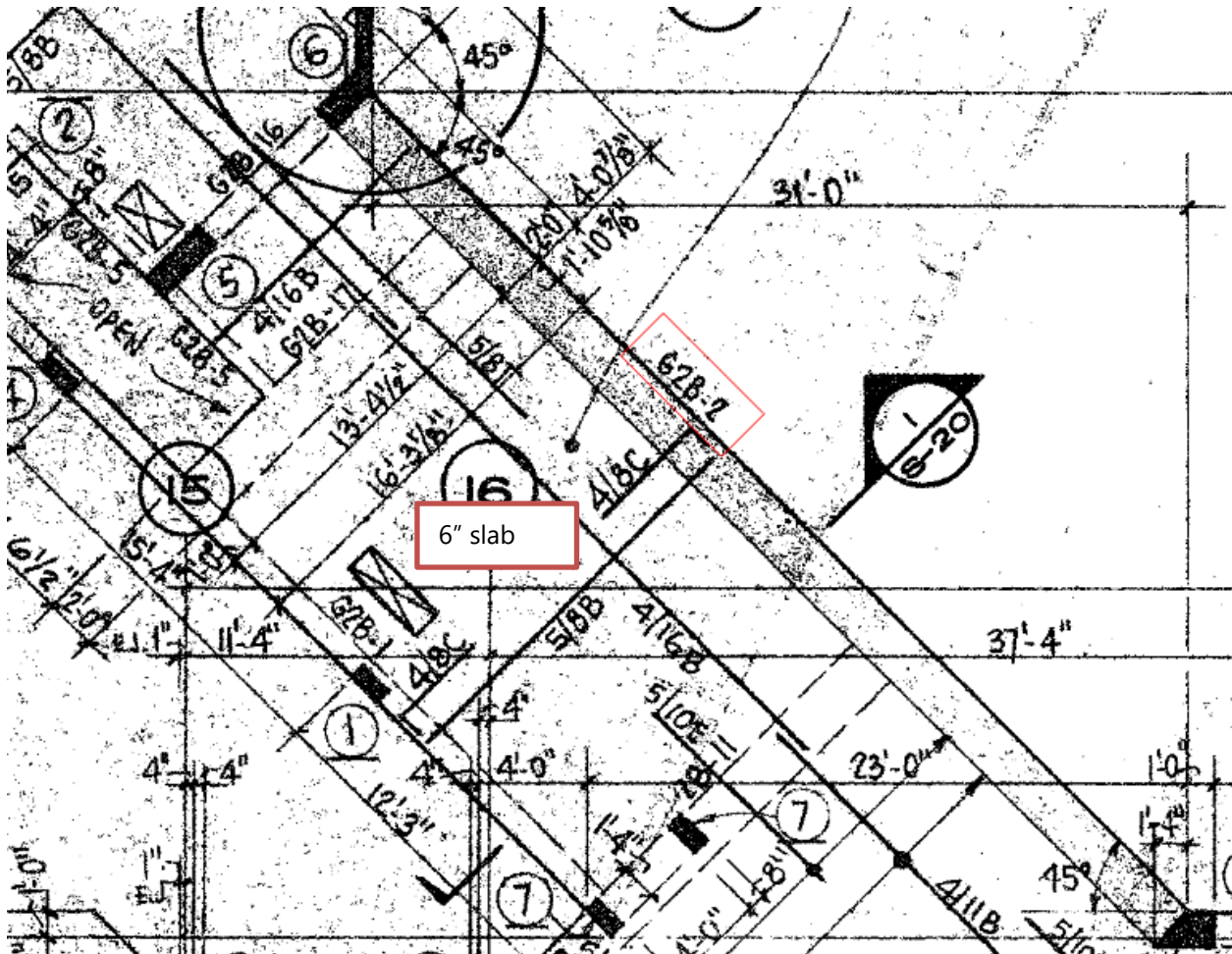
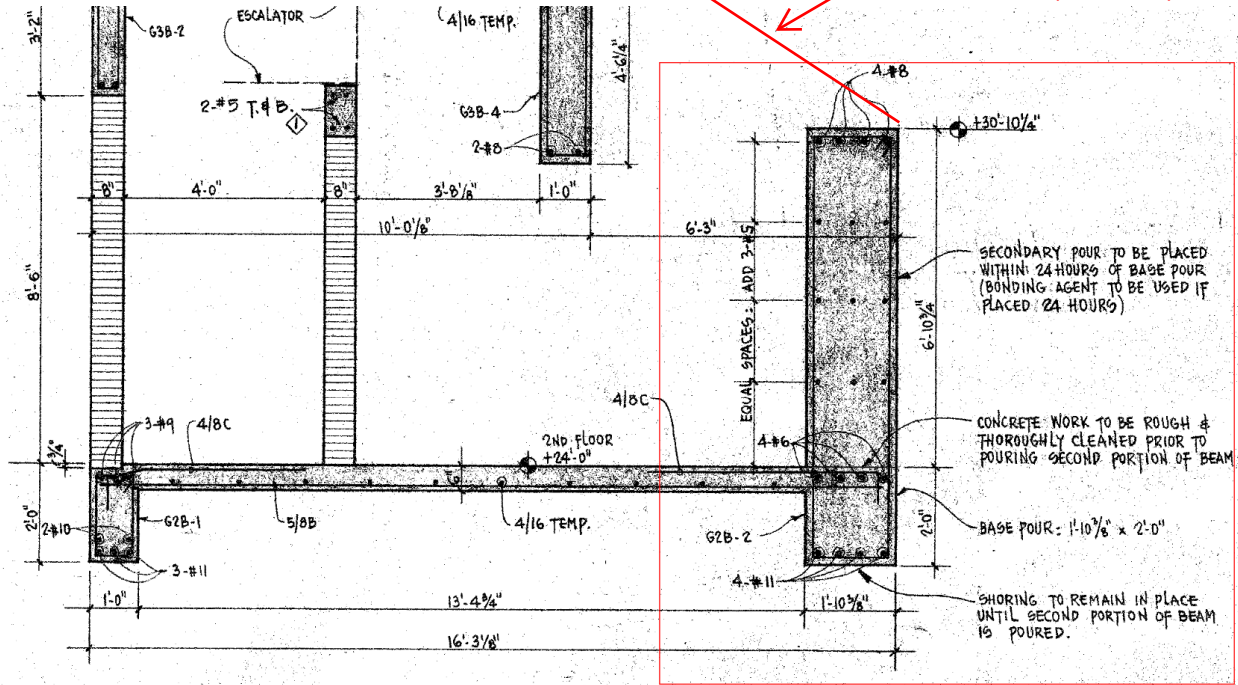


FIGURE 12: PARTIAL PLAN

BEAM SCHEDULE (2ND FLOOR)									
MARK	ELEV. TOP OF BEAM	SIZE	REINFORCING				# 3 TIES		REMARKS
			BOTTOM	TOP	'C'	'E'	Nº	SPACING (EACH END)	
G2B-2		22 ³ / ₈ x 106 ³ / ₄	4-11	4-8			#5 TIES @ 24" c/c	* SEE SECTION (1/220)	

FIGURE 13: BEAM INFO

ROOF (20PSF) - LIVE
ROOF (50 PSF) - DEAD



SECTION 1
SCALE: 1/2"=1'-0" S-20

MIA: A-VGDS - GATE E-33

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad \text{k} \equiv 1000\text{-lb} \quad \text{klf} \equiv \frac{\text{k}}{\text{ft}}$$

Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live_Floor} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \cdot \text{psf} & d_{9_bar} &:= 1.128 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{Roof_Dead} &:= 50 \cdot \text{psf} & \text{Roof_Live} &:= 20 \cdot \text{psf} \\ \text{cmu_wall_height}_{E24} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{E24} &= 11.667 \cdot \text{ft} \\ \text{cmu_wall_weight}_{E24} &:= \text{CMU} \cdot \text{cmu_wall_height}_{E24} & \text{cmu_wall_weight}_{E24} &= 0.642 \cdot \text{klf} \\ \text{Roof_Span_to_adj_beam} &:= \frac{6 \cdot \text{ft} + 3 \cdot \text{in}}{2} \\ \text{ROOF_weight}_{E24} &:= \text{Roof_Span_to_adj_beam} \cdot \text{Roof_Dead} & \text{ROOF_weight}_{E24} &= 0.156 \cdot \text{klf} \\ \text{Roof_Live}_{E24} &:= \text{Roof_Span_to_adj_beam} \cdot \text{Roof_Live} & \text{Roof_Live}_{E24} &= 0.063 \cdot \text{klf} \\ \text{Floor_Span_to_adj_beam} &:= \frac{13 \cdot \text{ft} + 6 \cdot \text{in}}{2} \\ \text{Foor_weight}_{E24} &:= \text{Floor_Span_to_adj_beam} \cdot \text{Slab}_6_{\text{in}} & \text{Foor_weight}_{E24} &= 0.506 \cdot \text{klf} \\ \text{Floor_Live}_{E24} &:= \text{Floor_Span_to_adj_beam} \cdot \text{Live_Floor} & \text{Floor_Live}_{E24} &= 0.675 \cdot \text{klf} \end{aligned}$$

Concrete Beam

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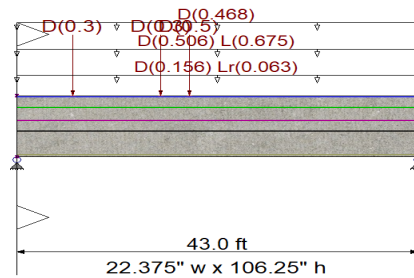
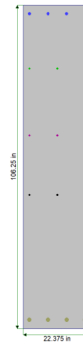
DESCRIPTION: Gate E33 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : ASCE 7-16

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup =	=	1.0



Cross Section & Reinforcing Details

Rectangular Section, Width = 22.375 in, Height = 106.250 in
 Span #1 Reinforcing....

- 4-#8 at 2.750 in from Top, from 0.0 to 43.0 ft in this span
- 3-#5 at 42.750 in from Top, from 0.0 to 43.0 ft in this span
- 4-#6 at 3.0 in from Bottom, from 0.0 to 43.0 ft in this span
- 3-#5 at 20.750 in from Top, from 0.0 to 43.0 ft in this span
- 3-#5 at 44.0 in from Bottom, from 0.0 to 43.0 ft in this span
- 4-#11 at 3.0 in from Bottom, from 0.0 to 43.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

- Uniform Load : D = 0.1560, Lr = 0.0630 k/ft, Tributary Width = 1.0 ft, (roof)
- Point Load : D = 0.30 k @ 6.0 ft, (A-VGDS bottom bracket (LEFT))
- Point Load : D = 0.50 k @ 18.50 ft, (A-VGDS bottom bracket (CENTER))
- Point Load : D = 0.30 k @ 15.50 ft, (A-VGDS bottom bracket (RIGHT))
- Uniform Load : D = 0.5060, L = 0.6750 k/ft, Tributary Width = 1.0 ft, (6" slab)
- Uniform Load : D = 0.4680 k/ft, Tributary Width = 1.0 ft, (CMU (fully applied to beam - conservative))

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.312 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.007 in Ratio = 69411 >=360.
Mu : Applied	1,266.56 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
Mn * Phi : Allowable	4,063.18 k-ft	Max Downward Total Deflection	0.048 in Ratio = 10860 >=180.
Location of maximum on span	21.383 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	92.785	92.415
Overall MINimum	1.355	1.355
+D+H	78.272	77.903

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E33 - Level 2

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+L+H	92.785	92.415
+D+Lr+H	79.627	79.257
+D+S+H	78.272	77.903
+D+0.750Lr+0.750L+H	90.173	89.803
+D+0.750L+0.750S+H	89.157	88.787
+D+0.60W+H	78.272	77.903
+D+0.750Lr+0.750L+0.450W+H	90.173	89.803
+D+0.750L+0.750S+0.450W+H	89.157	88.787
+0.60D+0.60W+0.60H	46.963	46.742
+D+0.70E+0.60H	78.272	77.903
+D+0.750L+0.750S+0.5250E+H	89.157	88.787
+0.60D+0.70E+H	46.963	46.742
D Only	78.272	77.903
Lr Only	1.355	1.355
L Only	14.513	14.513
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	0.00	103.25	117.82	117.82	0.00	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.47	103.25	115.27	115.27	54.77	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.94	103.25	112.71	112.71	108.34	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.41	103.25	110.16	110.16	160.71	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.88	103.25	107.60	107.60	211.87	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.35	103.25	105.04	105.04	261.84	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.82	103.25	102.49	102.49	310.60	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.29	103.25	99.93	99.93	358.17	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.76	103.25	97.38	97.38	404.53	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.23	103.25	94.82	94.82	449.69	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.70	103.25	92.26	92.26	493.65	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.17	103.25	89.71	89.71	536.41	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.64	103.25	87.15	87.15	577.96	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.11	103.25	84.23	84.23	618.28	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.58	103.25	81.68	81.68	657.26	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.05	103.25	79.12	79.12	695.05	0.98	196.71	Vu < PhiVc/2	lot Req'd 9.6.	196.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.52	103.25	76.57	76.57	731.63	0.90	195.39	Vu < PhiVc/2	lot Req'd 9.6.	195.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.99	103.25	74.01	74.01	767.01	0.83	194.21	Vu < PhiVc/2	lot Req'd 9.6.	194.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.46	103.25	71.45	71.45	801.19	0.77	193.16	Vu < PhiVc/2	lot Req'd 9.6.	193.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.93	103.25	68.90	68.90	834.17	0.71	192.21	Vu < PhiVc/2	lot Req'd 9.6.	192.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.40	103.25	66.34	66.34	865.95	0.66	191.35	Vu < PhiVc/2	lot Req'd 9.6.	191.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.87	103.25	63.79	63.79	896.52	0.61	190.56	Vu < PhiVc/2	lot Req'd 9.6.	190.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.34	103.25	61.23	61.23	925.90	0.57	189.84	Vu < PhiVc/2	lot Req'd 9.6.	189.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.81	103.25	58.67	58.67	954.07	0.53	189.17	Vu < PhiVc/2	lot Req'd 9.6.	189.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.28	103.25	56.12	56.12	981.05	0.49	188.55	Vu < PhiVc/2	lot Req'd 9.6.	188.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.75	103.25	53.56	53.56	1,006.82	0.46	187.98	Vu < PhiVc/2	lot Req'd 9.6.	188.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.22	103.25	51.01	51.01	1,031.39	0.43	187.44	Vu < PhiVc/2	lot Req'd 9.6.	187.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.69	103.25	48.45	48.45	1,054.76	0.40	186.93	Vu < PhiVc/2	lot Req'd 9.6.	186.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.16	103.25	45.89	45.89	1,076.93	0.37	186.45	Vu < PhiVc/2	lot Req'd 9.6.	186.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.63	103.25	43.34	43.34	1,097.89	0.34	186.00	Vu < PhiVc/2	lot Req'd 9.6.	186.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	14.10	103.25	40.78	40.78	1,117.66	0.31	185.57	Vu < PhiVc/2	lot Req'd 9.6.	185.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	14.57	103.25	38.22	38.22	1,136.22	0.29	185.16	Vu < PhiVc/2	lot Req'd 9.6.	185.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	15.04	103.25	35.67	35.67	1,153.58	0.27	184.77	Vu < PhiVc/2	lot Req'd 9.6.	184.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	15.51	103.25	32.75	32.75	1,169.74	0.24	184.35	Vu < PhiVc/2	lot Req'd 9.6.	184.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	15.98	103.25	30.20	30.20	1,184.53	0.22	183.99	Vu < PhiVc/2	lot Req'd 9.6.	184.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	16.45	103.25	27.64	27.64	1,198.12	0.20	183.64	Vu < PhiVc/2	lot Req'd 9.6.	183.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	16.92	103.25	25.08	25.08	1,210.51	0.18	183.30	Vu < PhiVc/2	lot Req'd 9.6.	183.3	0.0	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

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DESCRIPTION: Gate E33 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	17.39	103.25	22.53	22.53	1,221.70	0.16	182.97	Vu < PhiVc/2	lot Req'd 9.6.:	183.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	17.86	103.25	19.97	19.97	1,231.69	0.14	182.65	Vu < PhiVc/2	lot Req'd 9.6.:	182.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	18.33	103.25	17.42	17.42	1,240.47	0.12	182.34	Vu < PhiVc/2	lot Req'd 9.6.:	182.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	18.80	103.25	14.26	14.26	1,247.88	0.10	181.96	Vu < PhiVc/2	lot Req'd 9.6.:	182.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	19.27	103.25	11.70	11.70	1,253.98	0.08	181.66	Vu < PhiVc/2	lot Req'd 9.6.:	181.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	19.74	103.25	9.15	9.15	1,258.88	0.06	181.36	Vu < PhiVc/2	lot Req'd 9.6.:	181.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	20.21	103.25	6.59	6.59	1,262.57	0.04	181.07	Vu < PhiVc/2	lot Req'd 9.6.:	181.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	20.68	103.25	4.04	4.04	1,265.07	0.03	180.77	Vu < PhiVc/2	lot Req'd 9.6.:	180.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	21.15	103.25	1.48	1.48	1,266.37	0.01	180.48	Vu < PhiVc/2	lot Req'd 9.6.:	180.5	0.0	0.0
+1.40D+1.60H	1	21.62	103.25	-1.10	1.10	1,177.84	0.01	180.45	Vu < PhiVc/2	lot Req'd 9.6.:	180.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	22.09	103.25	-3.63	3.63	1,265.35	0.02	180.73	Vu < PhiVc/2	lot Req'd 9.6.:	180.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	22.56	103.25	-6.19	6.19	1,263.05	0.04	181.02	Vu < PhiVc/2	lot Req'd 9.6.:	181.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	23.03	103.25	-8.75	8.75	1,259.54	0.06	181.31	Vu < PhiVc/2	lot Req'd 9.6.:	181.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	23.50	103.25	-11.30	11.30	1,254.83	0.08	181.61	Vu < PhiVc/2	lot Req'd 9.6.:	181.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	23.97	103.25	-13.86	13.86	1,248.91	0.10	181.91	Vu < PhiVc/2	lot Req'd 9.6.:	181.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	24.44	103.25	-16.41	16.41	1,241.80	0.11	182.22	Vu < PhiVc/2	lot Req'd 9.6.:	182.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	24.91	103.25	-18.97	18.97	1,233.49	0.13	182.53	Vu < PhiVc/2	lot Req'd 9.6.:	182.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	25.38	103.25	-21.53	21.53	1,223.97	0.15	182.85	Vu < PhiVc/2	lot Req'd 9.6.:	182.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	25.85	103.25	-24.08	24.08	1,213.26	0.17	183.17	Vu < PhiVc/2	lot Req'd 9.6.:	183.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	26.32	103.25	-26.64	26.64	1,201.34	0.19	183.51	Vu < PhiVc/2	lot Req'd 9.6.:	183.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	26.79	103.25	-29.19	29.19	1,188.22	0.21	183.85	Vu < PhiVc/2	lot Req'd 9.6.:	183.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	27.26	103.25	-31.75	31.75	1,173.90	0.23	184.21	Vu < PhiVc/2	lot Req'd 9.6.:	184.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	27.73	103.25	-34.31	34.31	1,158.38	0.25	184.58	Vu < PhiVc/2	lot Req'd 9.6.:	184.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	28.20	103.25	-36.86	36.86	1,141.65	0.28	184.97	Vu < PhiVc/2	lot Req'd 9.6.:	185.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	28.67	103.25	-39.42	39.42	1,123.73	0.30	185.37	Vu < PhiVc/2	lot Req'd 9.6.:	185.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	29.14	103.25	-41.98	41.98	1,104.60	0.33	185.79	Vu < PhiVc/2	lot Req'd 9.6.:	185.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	29.61	103.25	-44.53	44.53	1,084.28	0.35	186.23	Vu < PhiVc/2	lot Req'd 9.6.:	186.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	30.08	103.25	-47.09	47.09	1,062.75	0.38	186.70	Vu < PhiVc/2	lot Req'd 9.6.:	186.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	30.55	103.25	-49.64	49.64	1,040.02	0.41	187.19	Vu < PhiVc/2	lot Req'd 9.6.:	187.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	31.02	103.25	-52.20	52.20	1,016.09	0.44	187.71	Vu < PhiVc/2	lot Req'd 9.6.:	187.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	31.49	103.25	-54.76	54.76	990.96	0.48	188.27	Vu < PhiVc/2	lot Req'd 9.6.:	188.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	31.96	103.25	-57.31	57.31	964.63	0.51	188.87	Vu < PhiVc/2	lot Req'd 9.6.:	188.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	32.43	103.25	-59.87	59.87	937.09	0.55	189.52	Vu < PhiVc/2	lot Req'd 9.6.:	189.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	32.90	103.25	-62.42	62.42	908.36	0.59	190.21	Vu < PhiVc/2	lot Req'd 9.6.:	190.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	33.37	103.25	-64.98	64.98	878.42	0.64	190.97	Vu < PhiVc/2	lot Req'd 9.6.:	191.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	33.84	103.25	-67.54	67.54	847.28	0.69	191.80	Vu < PhiVc/2	lot Req'd 9.6.:	191.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	34.31	103.25	-70.09	70.09	814.94	0.74	192.70	Vu < PhiVc/2	lot Req'd 9.6.:	192.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	34.78	103.25	-72.65	72.65	781.40	0.80	193.71	Vu < PhiVc/2	lot Req'd 9.6.:	193.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	35.25	103.25	-75.20	75.20	746.66	0.87	194.82	Vu < PhiVc/2	lot Req'd 9.6.:	194.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	35.72	103.25	-77.76	77.76	710.72	0.94	196.08	Vu < PhiVc/2	lot Req'd 9.6.:	196.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	36.19	103.25	-80.32	80.32	673.58	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	36.66	103.25	-82.87	82.87	635.23	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	37.13	103.25	-85.43	85.43	595.68	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	37.60	103.25	-87.99	87.99	554.94	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	38.07	103.25	-90.54	90.54	512.99	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	38.54	103.25	-93.10	93.10	469.84	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	39.01	103.25	-95.65	95.65	425.49	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	39.48	103.25	-98.21	98.21	379.93	1.00	197.06	Vu < PhiVc/2	lot Req'd 9.6.:	197.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	39.95	103.25	-100.77	100.77	333.18	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	40.42	103.25	-103.32	103.32	285.22	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	40.89	103.25	-105.88	105.88	236.07	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	41.36	103.25	-108.43	108.43	185.71	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	41.83	103.25	-110.99	110.99	134.15	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0
+1.20D+0.50Lr+1.60L+1.60H	1	42.30	103.25	-113.55	113.55	81.39	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9	5.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ec6
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DESCRIPTION: Gate E33 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	42.77	103.25	-116.10	116.10	27.43	1.00	197.06	PhiVc/2 < Vu <=	Min 11.5.6.3	299.3	5.9 5.0


Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	43.000	1,266.56	4,063.18	0.31
+1.40D+1.60H					
Span # 1	1	43.000	1,177.96	4,063.18	0.29
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	43.000	1,266.56	4,063.18	0.31
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	43.000	1,259.28	4,063.18	0.31
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	43.000	1,188.98	4,063.18	0.29
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	43.000	1,032.97	4,063.18	0.25
+1.20D+L+1.60S+1.60H					
Span # 1	1	43.000	1,165.68	4,063.18	0.29
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	43.000	1,009.68	4,063.18	0.25
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	43.000	1,172.96	4,063.18	0.29
+1.20D+L+0.50S+W+1.60H					
Span # 1	1	43.000	1,165.68	4,063.18	0.29
+0.90D+W+1.60H					
Span # 1	1	43.000	757.26	4,063.18	0.19
+1.20D+L+0.20S+E+1.60H					
Span # 1	1	43.000	1,165.68	4,063.18	0.29
+0.90D+E+0.90H					
Span # 1	1	43.000	757.26	4,063.18	0.19

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.0475	21.500		0.0000	0.000

$$\text{CMU} := \text{CMU} \cdot (8 \cdot \text{ft} + 6 \cdot \text{in}) = 0.468 \text{ klf}$$



fully applied to beam
in enercalc
(conservative)

6.8. GATE E-30

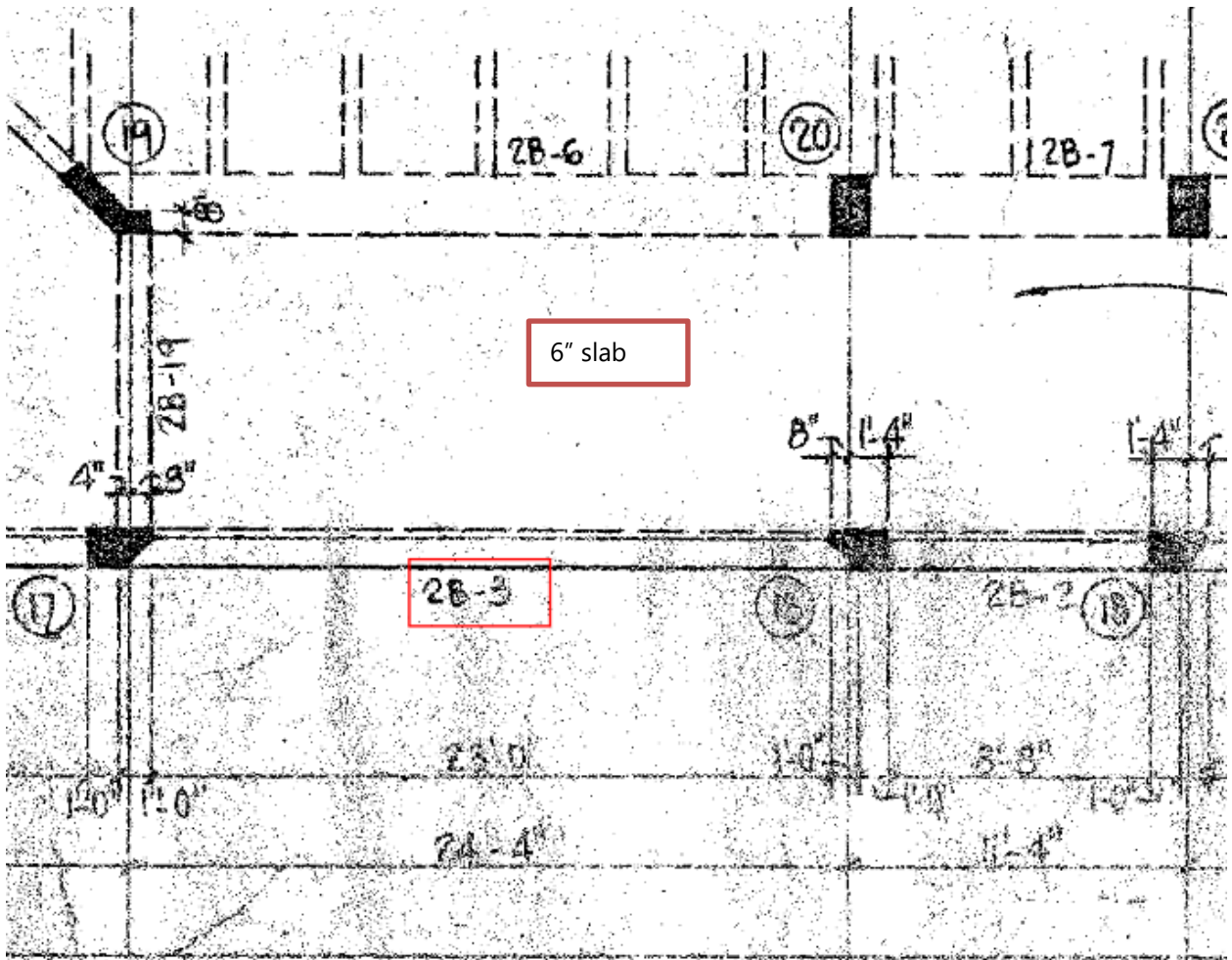
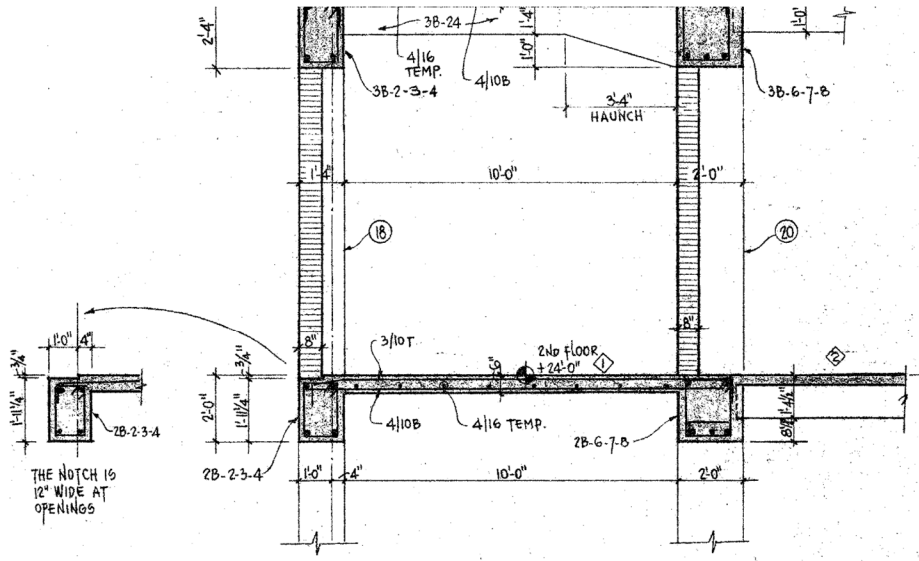


FIGURE 14: PARTIAL PLAN

BEAM SCHEDULE (2ND FLOOR)									
MARK	ELEV. TOP OF BEAM	SIZE	REINFORCING				#3 TIES		REMARKS
			BOTTOM	TOP	'C'	'E'	Nº	SPACING (EACH END)	
2B-3		16x24	2-9	1-9				2@5", 10" @ TO E	

FIGURE 15: BEAM INFO



SECTION $\frac{1}{S-17}$
 SCALE: 3/8" = 1'-0"

(B)

MIA: A-VGDS - GATE E-30

Units

$$\text{psf} \equiv \frac{\text{lb}}{\text{ft}^2} \quad \text{pcf} \equiv \frac{\text{lb}}{\text{ft}^3} \quad \text{plf} \equiv \frac{\text{lb}}{\text{ft}} \quad k \equiv 1000 \cdot \text{lb} \quad \text{klf} \equiv \frac{k}{\text{ft}}$$

Constants

$$\begin{aligned} \rho_{\text{conc}} &:= 150 \cdot \text{pcf} & \text{Level}_3_{\text{Elevation}} &:= 35 \cdot \text{ft} + 8 \cdot \text{in} & d_{6_bar} &:= .75 \cdot \text{in} \\ \text{CMU} &:= 55 \cdot \text{psf} & \text{Level}_2_{\text{Elevation}} &:= 24 \cdot \text{ft} + 0 \cdot \text{in} & d_{5_bar} &:= .625 \cdot \text{in} \\ \text{Live_Floor} &:= 100 \cdot \text{psf} & \text{Slab}_6_{\text{in}} &:= 6 \cdot \text{in} \cdot \rho_{\text{conc}} = 75 \cdot \text{psf} & d_{9_bar} &:= 1.127 \cdot \text{in} \\ & & \text{Slab}_8_{\text{in}} &:= 8 \cdot \text{in} \cdot \rho_{\text{conc}} = 100 \text{ psf} & d_{8_bar} &:= 1.0 \cdot \text{in} \\ & & & & d_{11_bar} &:= 1.410 \cdot \text{in} \\ & & & & \text{cover} &:= 1.5 \cdot \text{in} \end{aligned}$$

Inputs for Enercalc

$$\begin{aligned} \text{cmu_wall_height}_{E30} &:= \text{Level}_3_{\text{Elevation}} - \text{Level}_2_{\text{Elevation}} & \text{cmu_wall_height}_{E30} &= 11.667 \cdot \text{ft} \\ \text{cmu_wall_weight}_{E30} &:= \text{CMU} \cdot \text{cmu_wall_height}_{E30} & \text{cmu_wall_weight}_{E30} &= 0.642 \cdot \text{klf} \\ \text{Slab_Span_to_adj_beam} &:= \frac{10 \cdot \text{ft} + 0 \cdot \text{in}}{2} \\ \text{slab_weight}_{E30} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Slab}_6_{\text{in}} & \text{slab_weight}_{E30} &= 0.375 \cdot \text{klf} \\ \text{Live}_{E30} &:= \text{Slab_Span_to_adj_beam} \cdot \text{Live_Floor} & \text{Live}_{E30} &= 0.5 \cdot \text{klf} \\ & & P_{\text{steel_support}} &:= 644 \cdot \text{lb} \\ \text{dist}_{\text{top}} &:= \text{cover} + \frac{d_{9_bar}}{2} & \text{dist}_{\text{top}} &= 2.063 \cdot \text{in} \\ \text{dist}_{\text{bot}} &:= \text{cover} + \frac{d_{6_bar}}{2} & \text{dist}_{\text{bot}} &= 1.875 \cdot \text{in} \end{aligned}$$

(From Stadd Model MIA
A-VGDS - Bracket Type 1 -
Max Vertical from Node #1)

Concrete Beam

Lic. #: KW-06004725

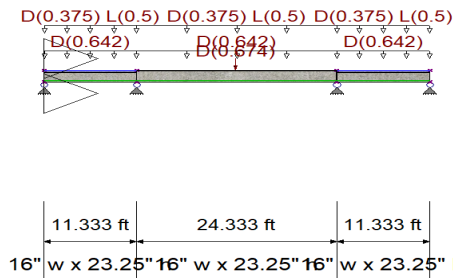
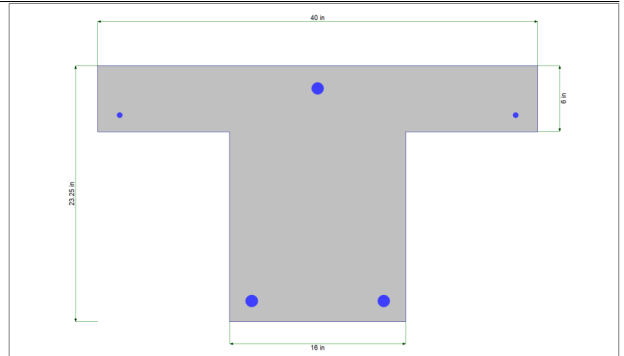
DESCRIPTION: Gate E22 - Level 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : IBC 2015

Material Properties

f_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f_c^{1/2} * 7.50$	=	410.792 psi		Shear :	0.750
Ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup =	=	1.0



Cross Section & Reinforcing Details

Tee Section, Stem Width = 16.0 in, Total Height = 23.250 in, Top Flange Width = 40.0 in, Flange Thickness = 6.0 in

Span #1 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 11.333 ft in this span
 2-#4 at 4.50 in from Top, from 0.0 to 11.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 11.333 ft in this span

Span #2 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 24.333 ft in this span
 2-#4 at 1.50 in from Top, from 0.0 to 24.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 24.333 ft in this span

Span #3 Reinforcing....

1-#9 at 2.063 in from Top, from 0.0 to 11.333 ft in this span
 2-#4 at 4.50 in from Top, from 0.0 to 11.333 ft in this span

2-#9 at 1.875 in from Bottom, from 0.0 to 11.333 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)

Load for Span Number 2

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)
 Point Load : D = 0.6740 k @ 12.0 ft, (A-VGDS)

Load for Span Number 3

Uniform Load : D = 0.6420 k/ft, Tributary Width = 1.0 ft, (CMU)
 Uniform Load : D = 0.3750, L = 0.50 k/ft, Tributary Width = 1.0 ft, (6" slab)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ecb
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DESCRIPTION: Gate E22 - Level 2

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.916 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.017 in Ratio = 17607 >=360
Mu : Applied	-112.353 k-ft	Max Upward Transient Deflection	-0.002 in Ratio = 86367 >=360
Mn * Phi : Allowable	122.625 k-ft	Max Downward Total Deflection	0.086 in Ratio = 3403 >=180
Location of maximum on span	0.000 ft	Max Upward Total Deflection	-0.007 in Ratio = 20912 >=180
Span # where maximum occurs	Span # 3		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	4.343	44.279	44.268	4.344
Overall MINimum	1.004	10.745	10.745	1.004
+D+H	2.996	33.876	33.863	2.998
+D+L+H	4.343	44.279	44.268	4.344
+D+Lr+H	2.996	33.876	33.863	2.998
+D+S+H	2.996	33.876	33.863	2.998
+D+0.750Lr+0.750L+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+H	4.030	41.654	41.643	4.031
+D+0.60W+H	2.996	33.876	33.863	2.998
+D+0.70E+H	2.996	33.876	33.863	2.998
+D+0.750Lr+0.750L+0.450W+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+0.450W+H	4.030	41.654	41.643	4.031
+D+0.750L+0.750S+0.5250E+H	4.030	41.654	41.643	4.031
+0.60D+0.60W+0.60H	1.790	20.334	20.325	1.791
+0.60D+0.70E+0.60H	1.790	20.334	20.325	1.791
D Only	2.996	33.876	33.863	2.998
L Only	1.004	10.745	10.745	1.004
H Only				

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	21.38	5.19	5.19	0.00	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.45	21.38	3.98	3.98	2.08	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.91	21.38	2.77	2.77	3.61	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.36	21.38	1.56	1.56	4.59	0.61	28.97	Vu < PhiVc/2	lot Req'd 9.6.:	29.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.81	21.38	0.35	0.35	5.02	0.13	27.16	Vu < PhiVc/2	lot Req'd 9.6.:	27.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.27	21.38	-0.85	0.85	4.91	0.31	27.86	Vu < PhiVc/2	lot Req'd 9.6.:	27.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.72	21.38	-2.06	2.06	4.25	0.87	29.94	Vu < PhiVc/2	lot Req'd 9.6.:	29.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.17	21.38	-3.27	3.27	3.04	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.63	21.38	-4.48	4.48	1.28	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.:	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.08	21.19	-5.69	5.69	1.02	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.53	21.19	-6.90	6.90	3.87	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.99	21.19	-8.10	8.10	7.27	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.44	21.19	-9.31	9.31	11.22	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.89	21.19	-10.52	10.52	15.72	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.35	21.19	-11.73	11.73	20.76	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.:	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.80	21.19	-12.94	12.94	26.35	0.87	28.73	Vu < PhiVc/2	lot Req'd 9.6.:	28.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.25	21.19	-14.15	14.15	32.49	0.77	28.48	Vu < PhiVc/2	lot Req'd 9.6.:	28.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.71	21.19	-15.35	15.35	39.18	0.69	28.27	PhiVc/2 < Vu <=	Min 11.5.6.3	41.4	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	8.16	21.19	-16.56	16.56	46.41	0.63	28.11	PhiVc/2 < Vu <=	Min 11.5.6.3	41.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	8.61	21.19	-17.77	17.77	54.19	0.58	27.98	PhiVc/2 < Vu <=	Min 11.5.6.3	41.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.07	21.19	-18.98	18.98	62.52	0.54	27.87	PhiVc/2 < Vu <=	Min 11.5.6.3	41.0	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.52	21.19	-20.19	20.19	71.40	0.50	27.77	PhiVc/2 < Vu <=	Min 11.5.6.3	40.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	9.97	21.19	-21.40	21.40	80.83	0.47	27.69	PhiVc/2 < Vu <=	Min 11.5.6.3	40.8	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	10.43	21.19	-22.60	22.60	90.80	0.44	27.61	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	1	10.88	21.19	-23.81	23.81	101.32	0.41	27.55	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	11.33	21.75	32.84	32.84	112.39	0.53	28.55	PhiVc < Vu	4.288	39.3	10.0	10.0
+1.20D+1.60L+0.50S+1.60H	2	12.31	21.75	30.25	30.25	81.69	0.67	28.92	PhiVc < Vu	1.322	39.7	10.0	10.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Lic. #: KW-06004725

File: Existing Concrete Beams.ecb
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DESCRIPTION: Gate E22 - Level 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+1.60L+0.50S+1.60H	2	13.28	21.75	27.65	27.65	53.51	0.94	29.62	PhiVc/2 < Vu <=	Min 11.5.6.3	43.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	14.25	21.75	25.06	25.06	27.86	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	15.23	21.75	22.46	22.46	4.73	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	16.20	21.38	19.87	19.87	15.87	1.00	30.44	PhiVc/2 < Vu <=	Min 11.5.6.3	43.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	17.17	21.38	17.27	17.27	33.94	0.91	30.09	PhiVc/2 < Vu <=	Min 11.5.6.3	43.3	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	18.15	21.38	14.68	14.68	49.49	0.53	28.67	PhiVc/2 < Vu <=	Min 11.5.6.3	41.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	19.12	21.38	12.09	12.09	62.52	0.34	27.98	Vu < PhiVc/2	lot Req'd 9.6.3	28.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	20.09	21.38	9.49	9.49	73.02	0.23	27.56	Vu < PhiVc/2	lot Req'd 9.6.3	27.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	21.07	21.38	6.90	6.90	81.00	0.15	27.26	Vu < PhiVc/2	lot Req'd 9.6.3	27.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	22.04	21.38	4.30	4.30	86.45	0.09	27.03	Vu < PhiVc/2	lot Req'd 9.6.3	27.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	23.01	21.38	1.71	1.71	89.37	0.03	26.82	Vu < PhiVc/2	lot Req'd 9.6.3	26.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	23.99	21.38	-1.69	1.69	89.25	0.03	26.82	Vu < PhiVc/2	lot Req'd 9.6.3	26.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	24.96	21.38	-4.29	4.29	86.33	0.09	27.03	Vu < PhiVc/2	lot Req'd 9.6.3	27.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	25.93	21.38	-6.88	6.88	80.90	0.15	27.26	Vu < PhiVc/2	lot Req'd 9.6.3	27.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	26.91	21.38	-9.48	9.48	72.93	0.23	27.56	Vu < PhiVc/2	lot Req'd 9.6.3	27.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	27.88	21.38	-12.07	12.07	62.45	0.34	27.98	Vu < PhiVc/2	lot Req'd 9.6.3	28.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	28.85	21.38	-14.67	14.67	49.43	0.53	28.67	PhiVc/2 < Vu <=	Min 11.5.6.3	41.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	29.83	21.38	-17.26	17.26	33.90	0.91	30.09	PhiVc/2 < Vu <=	Min 11.5.6.3	43.3	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	30.80	21.38	-19.85	19.85	15.84	1.00	30.44	PhiVc/2 < Vu <=	Min 11.5.6.3	43.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	31.77	21.75	-22.45	22.45	4.75	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	32.75	21.75	-25.04	25.04	27.86	1.00	29.79	PhiVc/2 < Vu <=	Min 11.5.6.3	43.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	33.72	21.75	-27.64	27.64	53.50	0.94	29.62	PhiVc/2 < Vu <=	Min 11.5.6.3	43.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	2	34.69	21.75	-30.23	30.23	81.66	0.67	28.92	PhiVc < Vu	1.309	39.7	10.0	10.0
+1.20D+1.60L+0.50S+1.60H	3	35.67	21.19	25.02	25.02	112.35	0.39	27.49	PhiVc/2 < Vu <=	Min 11.5.6.3	40.6	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	36.12	21.19	23.81	23.81	101.29	0.42	27.55	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	36.57	21.19	22.60	22.60	90.77	0.44	27.61	PhiVc/2 < Vu <=	Min 11.5.6.3	40.7	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.03	21.19	21.39	21.39	80.79	0.47	27.69	PhiVc/2 < Vu <=	Min 11.5.6.3	40.8	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.48	21.19	20.18	20.18	71.37	0.50	27.77	PhiVc/2 < Vu <=	Min 11.5.6.3	40.9	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	37.93	21.19	18.98	18.98	62.50	0.54	27.87	PhiVc/2 < Vu <=	Min 11.5.6.3	41.0	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	38.39	21.19	17.77	17.77	54.17	0.58	27.98	PhiVc/2 < Vu <=	Min 11.5.6.3	41.1	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	38.84	21.19	16.56	16.56	46.39	0.63	28.11	PhiVc/2 < Vu <=	Min 11.5.6.3	41.2	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	39.29	21.19	15.35	15.35	39.15	0.69	28.28	PhiVc/2 < Vu <=	Min 11.5.6.3	41.4	8.3	8.0
+1.20D+1.60L+0.50S+1.60H	3	39.75	21.19	14.14	14.14	32.47	0.77	28.48	Vu < PhiVc/2	lot Req'd 9.6.3	28.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	40.20	21.19	12.93	12.93	26.33	0.87	28.74	Vu < PhiVc/2	lot Req'd 9.6.3	28.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	40.65	21.19	11.73	11.73	20.74	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	41.11	21.19	10.52	10.52	15.70	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	41.56	21.19	9.31	9.31	11.21	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.01	21.19	8.10	8.10	7.26	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.47	21.19	6.89	6.89	3.86	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	42.92	21.19	5.68	5.68	1.01	1.00	29.08	Vu < PhiVc/2	lot Req'd 9.6.3	29.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	43.37	21.38	4.48	4.48	1.29	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	43.83	21.38	3.27	3.27	3.05	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	44.28	21.38	2.06	2.06	4.26	0.86	29.93	Vu < PhiVc/2	lot Req'd 9.6.3	29.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	44.73	21.38	0.85	0.85	4.92	0.31	27.85	Vu < PhiVc/2	lot Req'd 9.6.3	27.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	45.19	21.38	-0.36	0.36	5.03	0.13	27.17	Vu < PhiVc/2	lot Req'd 9.6.3	27.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	45.64	21.38	-1.56	1.56	4.59	0.61	28.97	Vu < PhiVc/2	lot Req'd 9.6.3	29.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	46.09	21.38	-2.77	2.77	3.61	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	46.55	21.38	-3.98	3.98	2.08	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	47.00	21.38	-5.19	5.19	0.00	1.00	30.44	Vu < PhiVc/2	lot Req'd 9.6.3	30.4	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope	Span # 1	1	11.333	-110.50	122.62	0.90

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

File: Existing Concrete Beams.ecb
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DESCRIPTION: Gate E22 - Level 2

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.40D+1.60H					
Span # 1	1	11.333	-90.89	122.62	0.74
Span # 2	2	24.333	-92.43	128.02	0.72
Span # 3	3	11.333	-92.39	122.62	0.75
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	11.333	-110.50	122.62	0.90
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	11.333	-110.50	122.62	0.90
Span # 2	2	24.333	-112.39	128.02	0.88
Span # 3	3	11.333	-112.35	122.62	0.92
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	11.333	-77.90	122.62	0.64
Span # 2	2	24.333	-79.22	128.02	0.62
Span # 3	3	11.333	-79.19	122.62	0.65
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	11.333	-77.90	122.62	0.64
Span # 2	2	24.333	-79.22	128.02	0.62
Span # 3	3	11.333	-79.19	122.62	0.65
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+1.20D+0.50L+0.70S+E+1.60H					
Span # 1	1	11.333	-88.09	122.62	0.72
Span # 2	2	24.333	-89.59	128.02	0.70
Span # 3	3	11.333	-89.55	122.62	0.73
+0.90D+W+0.90H					
Span # 1	1	11.333	-58.43	122.62	0.48
Span # 2	2	24.333	-59.42	128.02	0.46
Span # 3	3	11.333	-59.39	122.62	0.48
+0.90D+E+0.90H					
Span # 1	1	11.333	-58.43	122.62	0.48
Span # 2	2	24.333	-59.42	128.02	0.46
Span # 3	3	11.333	-59.39	122.62	0.48

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.0033	11.820	+D+L+H	-0.0065	7.933
+D+L+H	2	0.0858	12.167	+D+L+H	-0.0011	24.560
+D+L+H	3	0.0000	11.333	+D+L+H	-0.0065	3.400

SECTION 01 02 70

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Procedures for preparation and submittal of Application for Payment.

1.02 RELATED REQUIREMENTS

- A. General Conditions.

1.03 FORMAT

- A. Miami-Dade Aviation Department Form.

1.04 PREPARATION OF APPLICATION

- A. Type required information or use media-driven printout.
- B. Execute certification by signature of authorized officer.
- C. Use data on Bid Form and approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.
- D. List each authorized Change Order and an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work. Provide construction baseline schedule along with time extensions granted through change orders.
- E. Prepare Application for Final Payment as required in General Conditions.

1.05 SUBMITTAL PROCEDURES

- A. Submit three (3) copies of each Application for Payment at time stipulated in Agreement.
- B. Submit under transmittal letter.

1.06 SUBSTANTIATING DATA

- A. When Architect/Engineer requires substantiating information, submit data justifying line item amounts in question.

Provide one copy of data with cover letter for each copy of submittal. Show Application number and date, and line item by number and description.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 03 00

ALTERNATES

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Identification and description of Alternate work.

1.02 RELATED REQUIREMENTS

- A. Proposal Agreement: Quotation of cost of each Alternate.
- B. Proposal Agreement: Alternates accepted by MDAD for incorporation into the Work.
- C. Sections of Specification identified in each Alternate.

1.03 CONTRACTOR RESPONSIBILITY

- A. Alternates will be exercised at the option of MDAD.
- B. Coordinate all related trades as required to complete the Work, including changes resulting from acceptance of each Alternate, when acceptance is designated in Proposal Agreement.

1.04 ALTERNATE NO. 1: [Name]

- A. [Description.]
- B. [Add] [Deduct]

1.05 ALTERNATE NO. 2: [Name]

- A. [Description.]
- B. [Add] [Deduct]

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 04 00

COORDINATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Coordination of Work of Contract.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of Work.
- B. Section 01 04 50 Cutting and Patching.
- C. Section 01 20 00 Project Meetings.
- D. Section 01 60 00 Material and Equipment: Product option and substitutions.
- E. Section 01 70 10 Contract Closeout Procedures: Closeout submittals.

1.03 DESCRIPTION

- A. Coordinate scheduling, submittals, and work of the various sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
- B. Coordinate sequence of Work to accommodate MDAD occupancy as specified in General Conditions and Section 01 01 00.

1.04 MEETINGS

- A. In addition to progress meetings specified in Section 01 20 00 hold coordination meetings and preinstallation conferences with personnel and subcontractors to assure coordination of Work.
- B. Attend all commissioning meetings with appropriate personnel and subcontractors.

1.05 COORDINATION OF SUBMITTALS

- A. Schedule and coordinate submittals.
- B. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other Sections.

1.06 COORDINATION OF SPACE

- A. Coordinate use of Project space and sequence of installation of Lightning Protection, and electrical work that is indicated diagrammatically on drawings. Follow routings shown for pipes, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance and for repairs.
- B. In finished areas except as otherwise shown conceal pipes, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- C. Coordinate various proposed staging areas of construction with MDAD and ramp operations. Provide a month in advance notice. Maintain an up-to-date staging plan for the entire project execution.

1.07 COORDINATION OF CONTRACT CLOSEOUT

- A. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion.

- B. After MDAD occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of MDAD's activities.

- C. Assemble and coordinate closeout submittals specified in Section 01 70 10.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 04 50

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Requirements and limitations for cutting and patching of Work.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of Work.
- B. Section 01 60 00 Material and Equipment: Substitutions
- C. Individual Specifications Sections:
 - 1. Cutting and patching incidental to work of the Section.
 - 2. Advance notification to other Sections of openings required in work of these sections.
 - 3. Do not cut or drill into any prestressed concrete member.
 - 4. Do not cut any structural members.

1.03 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of MDAD or separate contractor.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration
 - 4. Description of proposed work and products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of MDAD or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time work will be executed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Those required for original installation.
- B. For any change in material, submit request for substitution under provisions of General Conditions.

PART 3 EXECUTION

3.01 GENERAL

- A. Execute cutting, fitting, and patching to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install ill-timed work.
 - 3. Remove and replace defective and non-conforming work.
 - 4. Remove samples of installed work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical work.

3.02 INSPECTION

- A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- B. After uncovering, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.03 PREPARATION

- A. Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.

3.04 PERFORMANCE

- A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- B. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- C. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval.
- D. Restore work with new products in accordance with requirements of Contract Documents.
- E. Fit work airtight, watertight to pipes, sleeves, conduit, and other penetrations through surfaces.
- F. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated/fire-resistant material, full thickness of the construction element.
- G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

SECTION 01 05 00

SURVEYING AND FIELD ENGINEERING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Surveying, Field Engineering services
- B. MDAD will arrange for site survey which will identify control points (monuments and benchmarks noted on the Plans). Contractor must confirm and accept.
- C. Contractor to provide all other surveys.

1.02 RELATED REQUIREMENTS

- A. Bidding and Contract Requirements.
- B. General Conditions.
- C. Section 01 01 00 Summary of Work.
- D. Section 01 70 10 Contract Closeout Procedures.

1.03 QUALITY CONTROL

- A. Land Surveyor: Registered in the State of Florida, and acceptable to MDAD.
- B. Professional Engineer: Registered Professional Engineer of the discipline required for specific service on Project, licensed in the State of Florida.

1.04 SUBMITTALS

- A. Submit name, address, and telephone number of Surveyor and Engineer before starting survey work.
- B. On request, submit documentation verifying accuracy of survey work.
- C. Submit certificate signed by Surveyor, Engineer certifying that all elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

1.05 PROJECT RECORD DOCUMENTS

- A. Maintain complete, accurate log of control and survey work as it progresses.
- B. On completion of foundation walls and major site improvements, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
- C. Submit Record Documents under provisions of Section 01 70 10.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 SURVEY REFERENCE POINTS

- A. Establish, maintain, and protect survey control points prior to starting work, using base reference points as shown on Plans. Promptly notify Field Representative and MDAD of any discrepancies discovered.
- B. Promptly report to Field Representative the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated survey control points based on original survey control.

3.02 PREPARATION

- A. Establish a minimum of two permanent benchmarks on site, referenced to established control points. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Verify the accuracy of all lines and grades given on the Plans with existing lines and grades and immediately call all discrepancies to the Field Representative's attention, in writing, requesting determination before proceeding with the work. Perform all work in accordance with the lines and grades thus established and make good any work performed not in accordance therewith at no cost to MDAD.
- C. Establish lines and levels, locate, and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements, including utility locations.
 - 2. Grid or axis for structures.

END OF SECTION

SECTION 01 06 10

POSTING OF NOTICES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Schedule of Wage Rates and Benefits Miami-Dade County or U.S. Department of Labor.
- B. Non-Discrimination Clause and Contractor's Commitments under Section 202 of Executive Order No. 11246.

1.02 SCHEDULE OF WAGE RATES AND BENEFITS

The Contractor, and each subcontractor under him, shall post in a conspicuous place on the site (1) the schedule of the specified overall hourly rate for each applicable classification; (2) the amount of liquidated damages for any failure to pay such rates; and (3) the name and address of the responsible official in Miami-Dade County or the U.S. Department of Labor (whichever is applicable) to whom complaints should be given.

Copy of this Notice will be provided to the Contractor by MDAD.

1.03 NON-DISCRIMINATION CLAUSE

The Contractor shall post the non-discrimination clause as required by Executive Order 11246.

The following is a copy of the required notice:

"Equal Employment Opportunity is the Law--Discrimination is Prohibited by the Civil Rights Act of 1964 and by Executive Order No. 11246

Title VII of the Civil Rights Act of 1964--Administered by:

The Equal Employment Opportunity Commission

Prohibits discrimination because of Race, Color, Religion, Sex, or National Origin by Employers with 25 or more employees, by Labor Organizations with a hiring hall of 25 or more members, by Employment Agencies, and by Joint Labor-Management Committees for Apprenticeship or Training.

ANY PERSON - Who believes he or she has been discriminated against SHOULD CONTACT the:

The Equal Employment Opportunity Commission
131 M Street, NE
Washington, DC 20507

1.04 Executive Order No. 11246--Administered by:

The Office of Federal Contract Compliance Programs

Prohibits discrimination because of Race, Color, Religion, Sex, or National Origin, and requires affirmative action to ensure equality of opportunity in all aspects of employment.

By all Federal Government Contractors and Subcontractors, and by Contractors Performing Work Under a Federal Assisted Construction Contract, regardless of the number of employees in either case.

ANY PERSON - Who believes he or she has been discriminated against **SHOULD CONTACT:**

The Office of Federal Contract Compliance Programs
200 Constitution Ave NW
Washington, DC 20210

END OF SECTION

SECTION 01 09 00

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Applicability of Reference Standards.
- B. Provision of Reference Standards at site.
- C. Acronyms used in Contract Documents for Reference Standards. Source of Reference Standards.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect as of the Advertisement date, except when a specific date is specified.
- C. When required by individual Specifications section, obtain copy of standard. Maintain copy at jobsite during submittals, planning and progress of the specific work, until Substantial Completion.

1.03 SCHEDULE OF REFERENCES

- AA Aluminum Association
- AASHTO American Association of State Highway
- ACI American Concrete Institute
- ADC Air Diffusion Council
- AGC Associated General Contractors of America
- AISC American Institute of Steel Construction
- AISI American Iron and Steel Institute
- AMCA Air Movement and Control Association
- ANSI American National Standards Institute
- APA American Plywood Association
- ASTM American Society for Testing and Materials
- AWWA American Water Works Association
- AWI Architectural Woodwork Institute
- AWPA American Wood-Preservers' Association

AWS	American Welding Society
CDA	Copper Development Association
CLFMI	Chain Link Fence Manufacturers Institute
CRSI	Concrete Reinforcing Steel Institute
EJCDC	Engineers' Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association
FAA	Federal Aviation Administration U.S. DOT
FGMA	Flat Glass Marketing Association
FM	Factory Mutual System
FS	Federal Specification General Services Administration
GA	Gypsum Association
IEEE	Institute of Electrical and Electronics Engineers
MIL	Military Specification
ML/SFA	Metal Lath/Steel Framing Association
NAAMM	National Association of Architectural Metal Manufacturers
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NSWMA	National Solid Wastes Management Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PS	Product Standard
SDI	Steel Door Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air-Conditioning Contractors'
SSPC	Steel Structures Painting Council

TAS	Technical Aid Series
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WRI	Wire Reinforcement Institute

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 10 00

EXISTING UTILITIES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Before performing any utility modifications, utility shutdowns, or any hot work on an existing utility within or outside of a building, or performing any excavation, drilling holes, performing any vibroflotation (vibrocompaction) work, hot work on any underground or above-ground utility or other element, or driving piles, the Contractor shall contact MDAD and all concerned utilities and shall comply with the following requirements.
- B. In order to locate existing utilities, the Contractor shall complete the UNDERGROUND UTILITIES CLEARANCE SIGN-OFF SHEET appended to this Section and submit it to the Architect/Engineer and to MDAD *Facilities Maintenance through the Field Representative* in accordance with the form's instructions.
- C. Before any shut-down of an existing active utility, the Contractor shall complete the SHUT-DOWN REQUEST FORM appended to this Section, as appropriate to the project type, and submit it to MDAD *Facilities Management through the Field Representative* in accordance with the form's instructions.
- D. Before initiating hot work, the Contractor shall submit the HOT WORK PERMIT application, Division 1 Section 01 12 00-1. Hot Work includes, but is not limited to, brazing, cutting, grinding, soldering, or thawing of utility pipes, torch applied roofing, and welding of any element.

1.02 RELATED REQUIREMENTS

- A. Section 01 12 00 HOT WORK OPERATIONS
- B. Section 01 12 00-1 HOT WORK PERMIT

PART 2 PRODUCTS (Not used).

PART 3 EXECUTION

- 3.01 The Contractor shall comply with the Provisions of the Underground Facility Damage Prevention and Safety Act - Chapter 556, Florida Statutes.
- 3.02 Prior to performing any excavation or digging, the Contractor shall give 48 hours notice to each owner of the underground utility facilities. Notifying SUNSHINE STATE ONE CALL OF FLORIDA, INC. does not satisfy this requirement.
- 3.03 There is a rebuttable presumption of negligence under the above referenced Statutes on the part of the Contractor, if the Contractor fails to call the underground utility owner and receive authorization before digging, or if the Contractor calls but fails to wait the required 48 hours.
- 3.04 During the 48-hour period, the underground utility owner shall go to the site and flag its facility.
- 3.05 Violation of the above referenced statute can be cause for civil fines and criminal offenses as delineated in the above referenced statutes.

Appendices: MDAD UNDERGROUND UTILITIES CLEARANCE, Requirements for filling out sign-off sheet and procedures.

MDAD UNDERGROUND UTILITIES CLEARANCE SIGN OFF SHEET.

MDAD SHUT-DOWN REQUESTS

NOTICE TO REQUESTOR/CONTRACTOR

SHUT-DOWN REQUEST FORM.

SHUT-DOWN COORDINATION CONCURRENCE

END OF SECTION

MDAD UNDERGROUND UTILITIES CLEARANCE
Requirements for filling out sign-off sheet and procedures.

REQUESTOR/**CONTRACTOR** SHALL:

Contact MDAD Underground Utilities Coordinator to obtain direction and the MDAD Sign-off Sheet.

CALL/CONTACT:

a) Sunshine State One Call of Florida, Inc. (Former U.N.C.L.E.) for all underground utilities b) All companies/organizations (persons) which are on the MDAD Sign-off Sheet. c) Obtain Names and signatures of contact personnel for all utilities. Copies shall be submitted to MDAD for their records.

Be prepared to submit to these companies drawings/maps of the work area.

Mark in field the location of the proposed work site.

Prepare a set of copies of all papers/maps regarding the project (for MDAD records).

Call the MDAD Utilities Coordinator for final appointment and last signature.

NOTICE TO CONTRACTORS

MDAD's Underground Utilities Clearance Coordination is not an underground utilities locating service for contractors working for Miami-Dade County Airports. MDAD's Underground Utilities Clearance Coordination is a free service provided to contractors working for MDAD, for the purpose of protecting our utilities, including damage prevention.

If underground utilities shown on contractors' drawings cannot be located by the contractor, then the Contractor is responsible for finding the utility by other means, such as hiring a locator with high tech equipment like GPR (ground penetrating radar).

Contractors are responsible for making all the necessary phone calls to obtain the clearance associated with their projects. The accuracy of clearances and signatures from other agencies or groups is the Contractor's responsibility.

MDAD is not responsible for any and all claims, disputes, or other matters arising between Contractors related to the execution or progress of their work, or their interpretation of the available plans and information. MDAD is not responsible for the verification or reliability of existing underground utilities information or for information furnished by other agencies.

MDAD Underground Utilities Clearance Coordination service is limited to sites within Miami-Dade County Airports only. Underground utilities clearance requests inside buildings are NOT PERMITTED due to interference. All clearances and associated coordination are good for a two (2) week period, only, after the date of the signoff by the MDAD Underground Utilities Clearance Coordinator.

**SIGN-OFF SHEET
MIAMI-DADE AVIATION DEPARTMENT
UNDERGROUND UTILITIES CLEARANCE**

MDAD PROJECT NAME AND NUMBER

MDAD P.M.: _____ REQUESTOR NAME: _____
CONTRACTOR/SHOP: _____ TELEPHONE #: _____

LOCATION SITE: MIA TERMINAL / MIAD / N.W. BASE / N.E.BASE / CENTRAL BASE
TAMIAMI / OPA-LOCKA / HOMESTEAD GENERAL

.....
STEP #1.

CONTACT: SUNSHINE STATE ONE CALL OF FLORIDA INC. (1-800-432-4770) OR (1-800-638-4097)

OBTAIN ALL SIGNATURES REQUIRED AND PLEASE ATTACH THE " ONE CALL" PARTICIPATING UTILITY FOR THIS AREA.

.....
STEP#2

NAME OF COMPANY/ORGANIZATION	DATE	SIGNATURE
------------------------------	------	-----------

FPL LOCATOR

BOB GARDNER: 305-876-7896 OR TOM CLARK: 305-876-7936 FAX: 305-869-1435

FAA

JOHN PIVACCO: 305-869-5350 FAX: 305-869-5390

BLACKBOX – COMMUNICATIONS

FLOYD LINDO: 305-869-5511 FAX: 305-876-8405

MDAD IRRIGATION

FRANK CONTRERAS: 305-876-7381 FAX: 305-876-8087

.....
STEP # 3

MDAD UTILITY COORDINATOR

JONATHAN SPICER: 305-876-0626 FAX: 305-876-8007

COMMENTS _____

NOTES:

1. THE LOCATION OF THE PROPOSED WORK SHALL BE MARKED IN THE FIELD.
2. CONTRACTOR SHALL CONTACT THE ABOVE GROUPS TO SIGN-OFF ABOVE.
3. DRAWINGS OF PROPOSED PROJECTS SHALL BE SUBMITTED AT TIME OF CLEARANCE REQUESTS, PLUS ANY OTHER RELEVANT DRAWINGS AVAILABLE.
4. LAST SIGNATURE TO BE OBTAINED IS THAT OF THE MDAD UTILITIES COORDINATOR.
5. MDAD UTILITIES COORDINATOR WILL THEN VERIFY THAT ALL OTHER SIGNATURES HAVE BEEN OBTAINED.
6. MDAD UTILITIES COORDINATOR WILL NOT BE RESPONSIBLE FOR AREAS CLEARED BY OTHER ENTITIES.

MDAD SHUT-DOWN REQUESTS
Instructions for filling out form

Requestor/Contractor Requirements:

1. The Requestor/Contractor of a particular project with the assistance of the MDAD Project Manager shall contact the MDAD shop supervisor and/or lead worker of each discipline for a kick-off meeting regarding shutting down any equipment or system that may impact the airport.
2. Once the affected areas have been identified with the assistance of MDAD, the Requestor/Contractor shall complete the SHUT-DOWN REQUEST FORM correctly with all pertinent information and obtain MDAD Project Manager's concurrence.
3. All Requestors/Contractors shall follow the procedures that are attached to the SHUT-DOWN REQUEST FORM appropriate to the project types, areas and systems that will be affected.

Requirements for filling out the form and procedures:

1. Complete the form properly by making sure that all necessary documents showing the areas, systems and devices expected to be affected, permits, certification of licenses from Contractors, and environmental plans (if required), etc. are attached.

The following are the requirements for each discipline to be attached with the SHUT-DOWN REQUEST FORM:

1. Electrical/Mechanical - site plans or as-builts plans as required to CLEARLY depict showing affected areas, scope of work, etc.
2. Water/Sewer – (water) site plans or as-builts plans as required to CLEARLY depict showing affected areas, scope of work; (sewer) – site plans or as-builts plans as required to CLEARLY depict showing affected area, scope of work, environmental action plan (if required).
3. Fire Sprinkler & Alarm – site plans or as-builts plans as required to CLEARLY depict showing affected areas, scope of work, copies of permits, copies of licenses, copies of Honeywell plans. (Copies of Honeywell Shutdown Notice).
4. Security & Life Safety – site plans or as-builts plans as required to CLEARLY depict showing affected areas, scope of work, copies of permits, licenses and copies of Honeywell Security Plan, Matrix, BlackBox and Honeywell concurrence letters of walk thru involvement.
5. For shut-downs affecting *critical building systems (defined as those systems connected to Emergency Power and listed under DGM section 16403.b)* in the MIA Terminal Complex, all plans shall indicate and label the affected “nested” zones of the fire alarm, paging, fire suppression and/or smoke management systems and components, etc., as required by the MIA Terminal Complex Life Safety Master Plan (LSMP), an approved extension of the Building Code.
6. *Submit a PLAN OF ACTION detailing procedures required to isolate system's portions where the work will be performed and minimize interruptions to remaining critical building systems. Provide alternative power to remaining critical building systems during the shutdown procedure; remaining critical systems shall not be interrupted more than 10 minutes as may be required by a change-over to an alternative power source. Any exceptions shall be listed in SHUT-DOWN REQUEST FORM.*

This is to ensure that all shut-downs are approved in a timely manner.

1. *Submit* completed SHUT-DOWN REQUEST FORM *and other supporting documents including plans, sketches etc. in electronic PDF format via e-mail* to the MDAD Shut-down Coordinator *at shutdowncoordinator@miami-airport.com*, Incomplete paperwork will not be processed and the requestor shall be contacted.
2. *The shutdown coordinator will transmit via e-mail a shutdown notice with PDF drawings depicting areas expected to be affected by the shutdown to required MDAD Divisions and Tenants.*
3. *Following acceptance of the proposed shutdown by all pertinent MDAD Divisions and Tenants, the shutdown coordinator will contact the Requestor/Contractor and inform of either approval or disapproval.*
4. Via an e-mail *notification*, the MDAD Shut-down Coordinator will confirm *with* everyone affected by the shut-down of the date *and time*. Unless an emergency arises, all shut-downs shall be scheduled no sooner than 14 calendar days after completed paperwork is submitted by the *Requestor/Contractor* to the MDAD Shut-down Coordinator, so that there is sufficient time to

coordinate with all of the requisite MDAD parties affected before scheduling any requested shutdown.

5. When the Requestor/Contractor has received approval of a scheduled shut-down of any life-safety-related systems or components, he/she shall arrange for and pay for any fire watches that may be required by the Authority Having Jurisdiction (AHJ).
6. *MDAD personnel will be scheduled to attend the shutdown and assist the Requestor/Contractor if an emergency occurs; as an alternate emergency contact MAINTENANCE -1 can be contacted 24 hours a day at 305-606-0099*

NOTICE TO REQUESTOR/CONTRACTOR

MDAD Shut-down Coordination Group is not a service company for Contractors working for Miami Dade County airports. The Coordination Group provides a free service to Contractors working for MDAD, for the purpose of protecting all utilities, including damage prevention, as well as protecting our business partners from operation interruptions.

The Coordinator is not responsible for delays due to the forms not being properly completed. Contractors are responsible for providing all necessary information before requesting a shutdown. The Coordination Group is available to assist the Contractors, provided they advise in a timely manner. MDAD is not responsible for any and all claims, disputes or other matters arising between Contractors related to the execution or progress of their work or their interpretation of the available plans and information.

SHUT-DOWN COORDINATION CONCURRENCE

SCHEDULED SHUT-DOWN DATE:			
SYSTEM TO BE SHUT-DOWN:			
REASON FOR SHUT-DOWN:			
LOCATION:			
COMPANIES COORDINATING SHUT-DOWN	REPRESENTATIVE	DATE	COMMENTS
HONEYWELL 305-876-8134			
	Dean Roberts		
DASH DOOR 305-477-1164			
	Jeff Steiner		
MATRIX 305-869-3692			
	Lee Levenson		
BLACKBOX 305-869-5511			
	Floyd Lindo		
MIA FIRE TECH SHOP 305-876-0349			
	Carlos Tellez		
CONTRACTOR			
<i>MDAD Emergency Contact During Shutdown</i> <i>305-606-0099</i>	<i>Maintenance 1</i>		

SHUT-DOWN REQUEST FORM

PROJECT NAME: _____ PROJECT NO.: _____
REQUESTOR/CONTRACTOR: _____ TODAY'S DATE: _____
For in-house work: Shop Supervisor (single trade) SHUTDOWN DATE: _____
Chief (multiple trades)
TELEPHONE NUMBER: _____ REQUESTED: _____

NOTE:

Submit completed SHUT-DOWN REQUEST FORM and other supporting documents including plans, sketches etc. preferably in electronic PDF format via e-mail to the MDAD Shut-down Coordinator at shutdowncoordinator@miami-airport.com. Hand delivered hardcopies will be accepted as an alternate.
Submit not less than 14 calendar days before requested shut-down date.

LOCATION OF WORK / FLOOR: _____

A/E NAME/TELEPHONE/FAX NO. & E-Mail: _____

A/E PROJECT MANAGER: _____

ENGINEERING CONSULT. NAME/TEL./FAX NO. & E-Mail: _____

REQUESTOR/CONTRACTOR _____

NAME/TELEPHONE/FAX NO. & E-Mail: _____

REQUESTOR/CONTRACTOR PROJECT MANAGER: _____

SUB-CONTRACTOR NAME/TEL./FAX NO & E-Mail: _____

SUB-CONTRACTOR PROJECT MANAGER: _____

SYSTEM TO BE SHUT DOWN: _____

REASON FOR SHUT-DOWN: _____

AREAS AFFECTED BY SHUT-DOWN: _____

OTHER SYSTEMS AFFECTED (E, A/C, P, ETC.): _____

REQUESTED DURATION OF SHUT-DOWN REQUEST: _____

REQUESTED SHUT-DOWN DATE (APPROXIMATE): _____

EXPECTED COMPLETION DATE (APPROXIMATE): _____

DAILY START TIME (FIRE TECHS OPEN F.A. PANELS): _____

DAILY STOP TIME (FIRE TECHS CLOSE F.A. PANELS): _____

MDAD PROJECT MANAGER
CONCURRENCE SIGNATURE: _____
Date

REQUESTOR/CONTRACTOR SIGNATURE: _____

Date

By signing this form, the Requestor/Contractor acknowledges that he/she has read all the SHUT-DOWN procedures and if any exceptions exist they have been noted on this form. Attach additional sheets if required to document any exceptions.

SECTION 01 12 00

HOT WORK OPERATIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Before initiating hot work, the Contractor shall submit the Hot Work permit application. Hot Work includes, but is not limited to, work above and below ground, involving open flames or work producing heat and/or sparks (including, but not limited to, brazing, cutting, grinding, soldering or thawing materials, torch applied products, installation and welding).

PART 2 PRODUCTS (Not used).

PART 3 EXECUTION

- 3.01 All tradesmen operating on airport property whose work entails open flame cutting, welding or similar hot work shall not proceed with such operations until the safety of the work area has been approved by the Airport Fire Division and a "Hot Work Permit" obtained. The provisions of this directive shall apply to any operation involving open flames or producing heat and/or sparks.
- 3.02 Follow the MDAD Facilities Procedure contained in Procedure FD5-047-P using the Hot Work Permit form FD5-047 current issues. Both are located in the MDAD Local Area Network (LAN), H drive/Facilities/Procedures and Forms. Form FD5-047 is also available in the next Section 01 12 00-01 following this one.

END OF SECTION

HOT WORK PERMIT

A Hot Work Permit is required for any operation that involves open flames or produces heat and/or sparks. This includes, but is not limited to, Brazing, Cutting, Grinding, Flame-Soldering, Pipe Thawing, Torch-Applied Roofing, and Welding.

PROJECT NAME: _____ PROJECT No: _____

MDAD WORK ORDER No: _____ CONTRACTOR JOB No: _____ DATE WORK TO BE DONE: _____

PERFORMING CONTRACTOR: _____ GC SUB PHONE No: _____

WORK TO BE DONE BY: EMPLOYEE: _____ SUPERVISOR: _____ FIRE WATCH: _____

HOT WORK is to be performed at one location per permit.

FACILITY, BUILDING, and FLOOR _____

NATURE OF JOB: _____

SPECIAL PRECAUTIONS: _____

REQUIRED PRECAUTIONS CHECKLIST

General Contractor or designee to verify that each precaution has been taken or to indicate that it is Not Applicable (NA).

- Available sprinklers, hose streams, and extinguishers are in service/operable.
- Hot Work equipment is in good repair.
- Entrances to work area have been posted with NO SMOKING signs.
- No welding or open flames within 100 feet of aircraft or a flammable spill.
- Work area enclosed to contain sparks and prevent vision flash burn.
- Ventilation is adequate to remove smoke/vapor from work area.

Requirements within fifty feet (fifteen meters) of work:

- Flammable liquids, dust, lint, and oily deposits have been removed.
- Explosive atmosphere in area has been eliminated.
- Floors have been cleaned of debris.
- Combustible floors have been wet down, covered with damp sand, or covered with fire-resistive sheets.
- Other combustibles have been removed, where possible, or protected with fire-resistive tarpaulins or metal shields.
- All wall and floor openings have been covered.
- Fire-resistive tarpaulins have been spread beneath work to collect sparks.

For work on walls or ceilings:

- Construction is noncombustible and without combustible covering or insulation.
- Combustible materials or items on other side of walls have been moved away.
- When welding, cutting, or heating is performed on walls, floors, or ceiling, since direct penetration of sparks or heat transfer may introduce a fire hazard to an adjacent area, the same precautions shall be taken on the opposite side as are taken on the side on which the work is being performed.

For work on enclosed equipment (tanks, ducts, etc.):

- Enclosed equipment has been cleaned of all combustibles.
- Containers have been purged of flammable liquids/vapors.

Fire Watch / Hot Work area monitoring:

- Fire Watch will be provided during and for thirty minutes after work, including any coffee or meal breaks.
- Fire Watch is supplied with suitable extinguishers/a charged small hose.
- Fire Watch is trained in use of this equipment and in sounding alarm.

I VERIFY that the above named location has been examined, that the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and I request authorization to perform this work.

SIGNED _____

Printed Name Date

General Contractor Firm Phone Number

AUTHORIZATION:

SIGNED _____

Printed Name Date

A/E Consultant/CIS Firm Name Phone Number

WORK PERFORMED:

START: _____ END: _____

PERMIT EXPIRES (Good for one day only):

DATE: _____ TIME: _____

FINAL CHECK:

The work area and all adjacent areas to which sparks and heat might be spread were inspected during the fire watch period and for at least thirty minutes after the work was completed and no fire conditions were found.

SIGNED _____

Fire Watch Date

Printed Name: _____

NOTIFICATION:

- Post a copy of approved Permit at the Hot Work site.
- Fax a copy of approved permit to:
 1. Airside Ops (General Aviation Center) at (305) 869-5858.
 2. Risk Management at (305) 876-7162.
 3. Life Safety Bureau at (305) 869-1589.
 4. Maintenance at (305) 869-1633.
On weekends and after hours use (305) 876-0193.
- A/E Field Rep to log and file copy signed by Fire Watch.

IN CASE OF FIRE --- CALL (305) 876-7070

SECTION 01 20 00

PROJECT MEETINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor participation in pre-construction conferences.
- B. Contractor administration of progress meetings and pre-installation conferences.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of Work.
- B. Section 01 30 00 Submittals
- C. Section 01 31 00 Progress Schedules
- D. Section 01 34 00 Shop Drawings, Product Data and Samples.
- E. Section 01 70 10 Contract Closeout Procedures
- F. Section 01 72 00 Project Record Documents.

1.03 PRE-CONSTRUCTION CONFERENCES

- A. MDAD and Field Representative will hold a pre-construction conference. (See General Conditions.)

1.04 PROGRESS MEETINGS (See General Conditions)

- A. Schedule and administer Project meetings throughout progress of the work at weekly intervals as well as any called meeting and [pre-installation conferences.]
- B. Attendance: Job superintendents, major subcontractors, and suppliers; MDAD, Architect/Engineer and Field Representative as appropriate to agenda topics for each meeting.
- C. Agenda will include review of Work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions and other items affecting progress or work.
- D. All discussions in the construction meetings should be documented by the Contractor thoroughly. MDAD, Architect/Engineer, and Field Representative should be copied on all meeting notes throughout the execution of the project.

1.05 PRE-INSTALLATION CONFERENCES

- A. When required in individual specification Section, Contractor will convene a pre-installation conference prior to commencing work of the Section.
- B. Require attendance of entities directly affecting, or affected by, work of the Section.
- C. Review conditions of installation, preparation and installation procedures and coordination with related work.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 30 00

SUBMITTALS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures.
- B. Construction Progress Schedules.
- C. Schedule of Values.
- D. Shop Drawings.
- E. Product Data.
- F. Samples.
- G. Manufacturers' Instructions.
- H. Manufacturers' Certificates.
- I. Progress Photographs

1.02 RELATED REQUIREMENTS

- A. General Conditions - Definitions, basic responsibilities of entities, and Article 4.8 Substitution
- B. Section 01 01 00 Summary of work.
- C. Section 01 02 70 Applications for Payment.
- D. Section 01 31 00 Progress Schedules
- E. Section 01 31 10 Progress Schedules (Computerized Project Planner Format)
- F. Section 01 31 20 Progress Schedules (Conventional CPM Format)
- G. Section 01 34 00 Shop Drawings, Product Data and Samples.
- H. Section 01 37 00 Schedule of Values.
- I. Section 01 40 50 Contract Quality Control.
- J. Section 01 60 00 Material and Equipment.
- K. Section 01 70 10 Contract Closeout Procedures.

1.03 PROCEDURES

- A. Deliver submittals to the Field Representative.
- B. Identify Project, Project Number, dates of previous submittals, Contractor, subcontractors, suppliers; identify pertinent drawings by sheet and detail number, and Specification Section number, as appropriate, Identify deviations from Contract Documents. Provide space for Contractor and Architect/Engineer review stamps.
- C. Before commencing any work, prepare and submit to the Field Representative the initial Progress Schedule and Schedule of Values in triplicate. After review by Architect/Engineer revise and resubmit as required for approval by the Architect/Engineer and MDAD. Submit revised Progress Schedule with each application for partial payment, reflecting changes since previous submittal.

- D. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.
 - E. After Architect/Engineer review of submittal, revise and resubmit as required, identifying changes made since previous submittal.
 - F. Distribute copies of reviewed submittals to concerned parties. Instruct recipients to promptly report any inability to comply with provisions.
 - G. No partial payment will be processed without a current approved Near Term and Overall Progress Schedule and an approved Schedule of Values.
- 1.04 CONSTRUCTION PROGRESS SCHEDULE
- A. Submit progress schedule in the form and procedure specified in Sections 01310 and 01311.
 - B. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. This is to include the commissioning activities, such as, but not limited to, prefunctional testing, functional testing, and training. Show projected percentage of completion for each item of work as of time of each Application for Progress Payment.
 - C. Show submittal dates required for shop drawings, product data and samples and product delivery dates, including those furnished by MDAD.
 - D. Provide MDAD and Architect a two-week look ahead schedule of activities throughout the execution of the project.
- 1.05 SCHEDULE OF VALUES
- A. Submit typed preliminary Schedule of Values on MDAD provided forms or MDAD approved forms.
 - B. Submit typed Schedule of Values on MDAD provided forms or MDAD approved forms.
 - C. Format: Identify each line item with number and title of the major Specification Sections or major components of this item.
 - D. Include specified Allowances, if any, in each line item amount.
 - E. Include in each line item a directly proportional amount of Contractor's overhead and profit.
 - F. Provide a sub-schedule for each separate stage of work specified in Section 01 01 00.
 - G. Revise Schedule of Values to list Change Orders and Work Orders, for each Application of Partial Payment.
- 1.06 SHOP DRAWINGS
- A. Prior to the submission of any shop drawing, but not later than 30 days from the effective date of the Notice to Proceed, the Contractor shall prepare and submit to the Field Representative, a Schedule of Shop Drawing submittals stating when each shop drawing or sample will be provided to the Field Representative for review.
 - B. The Contractor shall be responsible for the preparation of detailed shop drawings necessary for the fabrication, erection, and construction of all parts of the work in conformity with the requirements of the Contract Documents.

- C. Submit shop drawings per the schedule of shop drawing submittals, inserted in one loose leaf binder, with tabs and index to the Field Representative. All individual submittal sheets inserted in said binder must be clearly marked and referenced to proper paragraph and subparagraph of specifications. Cross out any items on sheets which constitute information not pertaining to equipment specified. Clearly mark all components that are provided as "optional" by manufacturer. Shop drawings shall be approved by Contractor prior to submittal to the Field Representative. Shop drawings will be reviewed by the Architect/Engineer. After Architect-Engineer approval, reproduce and distribute in accordance with requirements in Section 01 34 00.
 - D. All submissions of shop drawings, brochures and catalog cuts shall be accompanied by a transmittal letter listing the drawings submitted by number and title.
 - E. When professional calculations and/or certification of performance criteria of materials, systems, and/or equipment is required, the Architect/Engineer is entitled to rely upon the accuracy and completeness of such calculations and certifications submitted by Contractor. Calculations, when required, shall be submitted in a neat, clear and in an easy to follow format. Such calculations and/or certifications shall be signed and sealed by a Professional Engineer registered in the State of Florida.
 - F. Failure to comply with any of the above may result in the rejection of shop drawings.
- 1.07 PRODUCT DATA
- A. Submit not less than six copies, as approved by the Field Representative and required in Section 01 34 00. Mark each copy to identify applicable products, models, options and other data; supplement manufacturers' standard data to provide information unique to the work.
- 1.08 MANUFACTURER'S INSTRUCTIONS
- A. When required in individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data.
- 1.09 SAMPLES
- A. Submit full range of manufacturers' standard colors, textures, and patterns for Architect/Engineer's selection. Submit samples for selection of finishes within 30 days after Award of Contract. All color and finish selections must be submitted by the Contractor in a single submission, properly labeled and identified.
 - B. Submit sample to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.
 - C. Include identification on each sample, giving full information.
 - D. Submit the number specified in respective Specification section; one will be retained by Architect/Engineer. Reviewed samples which may be used in the work are indicated in the Specification Section.
- 1.10 FIELD SAMPLES
- A. Provide field samples of finishes at project as required by individual Specifications section. Install sample complete and finished. Acceptable samples in place may be retained in completed work.
- 1.11 PROGRESS PHOTOGRAPHS

A. STILL PHOTOGRAPHS (Digital)

1. Before construction operations have started at the site, the Contractor shall take and provide color photographs showing the existing conditions and thereafter an average of views shall be taken each month until completion of the work. The actual number and location of views to be taken each time will be determined by the Field Representative.

Two color prints copies and the negatives of each view shall be submitted to the Field Representative promptly after taking the views.

2. Photographs shall be of standard commercial quality, 8" x 10" in size of heavy-weight glossy paper; each photograph shall be enclosed in a double-face plastic sleeve. Each photograph shall show an information box in the lower right hand corner approximately 1-1/2" high box shall be incorporated into the print by a photographic process and shall not be pasted to the finished print.

The following information shall be typed, not handwritten, in the box:

Miami-Dade Aviation Department - CONTRACT No.

(Architect/Engineer's Name)

(Field Representative's Name)

(Contractor's Name)

View No. _____ Date _____

(Information regarding view such as location, direction of sight and significant points of interest.)

Each negative shall be of standard commercial quality 35mm, enclosed separately in clear plastic with identification overlay containing the same information shown on the prints.

All negatives shall be submitted in brown negative envelopes with the identification information typed on the envelope.

The Contractor shall notify the Field Representative 24 hours in advance of taking any photographs.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

Procedures for preparation and submittal of Construction Progress Schedules and periodic updating.

1.02 RELATED REQUIREMENTS

- A. Section 01010 Summary of work.
- B. Section 01027 Applications for Payment.
- C. Section 01300 Submittals.
- D. Section 01311 Construction Schedules
- E. Section 01340 Shop Drawings, Product Data and Samples
- F. Section 01370 Schedule of Values

1.03 FORMAT

Prepare the progress schedule in the form of a network analysis system using a computerized critical path method (CPM) format Section 01311.

1.04 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by major Specification section number.
- C. Provide activity code identity for each stage of Work identified in Section 01 01 00.
- D. Show accumulated percentage of completion of each item, and total percentage of work completed, as of the first day of each month or as requested by MDAD.
- E. Provide schedule of Shop Drawings submittals within 30 days from the Notice to Proceed.
- F. Provide submittal dates for shop drawings, product data and samples, including MDAD furnished products and products specified under Allowances, and dates reviewed submittals will be required from Consultant. Show decision dates for selection of finishes.
- G. Show total monetary value for each work activity by trade. Amounts to be consistent with the unit bid price items and the approved Schedule of Values.
- H. Coordinate content with Section 01 37 00 - Schedule of Values.
- I. Changes in scope requiring a Change Order or Work Order must be identified in the schedule by an activity code approved by MDAD.

1.05 REVISIONS TO SCHEDULES

- A. Indicate schedule and quantity progress of each activity to date of submittal and projected completion date of each activity.

- B. Identify activities modified since previous submittal, major changes in scope and other identifiable.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed, and its effect including the effect of changes on schedules of separate contracts, if any.
- D. Free floats in the approved construction progress schedules are owned by MDAD.

1.06 PROCEDURES

- A. Follow procedures outlined in Section 01 30 00.
- B. Prepare and submit progress schedules in accordance with the provisions of Section 01 31 10.
- C. Contractor is solely responsible for the preparation, revision and updating of the overall project schedule and the near-term schedule in the form and content prescribed in Section 01 31 10.
- D. The timely execution or performance of all construction related activities and the duration and sequencing of those activities in accordance with the approved project schedule(s) is the Contractor's responsibility.
- E. Submit revised progress schedules with each partial payment certificate.
- F. Transmit on County approved forms.
- G. Submit the number of copies that Contractor requires, plus four (4) copies that will be retained by Architect/Engineer, Field Representative, and MDAD.

1.07 DISTRIBUTION

- A. Distribute copies of reviewed schedules to job site file, subcontractors, suppliers, and other concerned entities.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in Schedules.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 10

CONSTRUCTION SCHEDULES (COMPUTERIZED CMP FORMAT) LUMP SUM CONTRACTS

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Procedures for preparation and submittal of construction progress schedules and periodic updating.

1.02 RELATED REQUIREMENT

- A. Section 01 01 00 Summary of Work.
- B. Section 01 02 70 Applications for Payment
- C. Section 01 30 00 Submittals.
- D. Section 01 31 00 Construction Schedules.
- E. Section 01 31 40 Construction Scheduling Management System
- F. Section 01 34 00 Shop Drawings
- G. Section 01 37 00 Schedule of Values

1.03 GENERAL

- A. The Contractor's and/or Subcontractor's timely execution or performance of all construction related activities shall be in strict compliance with the approved Overall Project Schedule. Means and methods of construction in accordance with the Contract Documents shall remain the sole responsibility of the Contractor.
- B. The construction of the project will be planned and recorded utilizing Primavera Project Planner computer software (Version 5.0 or greater). It shall be used for coordination, monitoring, and payment of all work under the Contract including all activities of the Contractor, subcontractors, vendors, and suppliers.

1.04 OVERALL PROJECT SCHEDULE

The overall project schedule shall be in the form of a time scaled precedence diagram and associated computer analysis and shall consist of detailed activities and their restraining relationships as required to complete the project from Notice To Proceed through completion of the Work and shall indicate the following:

- A. Beginning and end date duration in workdays for each activity. (Activities in occupied areas and activities requiring premium time labor rates shall be differentiated from each other and from the balance of project activities).
- B. Beginning and end date and total duration in workdays for each Area or portion thereof.
- C. Significant milestones, including, but not limited to those indicated in Section 01 01 00 "Summary of Work".
- D. Identity of each trade, contractor, and subcontractor for each work activity.

- E. Specific location of each work activity per the Architect/Engineer's phasing drawings or alternative location drawings approved by MDAD.
- F. Total monetary value, including overhead and profit for each activity.
- G. Monetary value for permanent materials for each activity.
- H. Site Labor man-hours by trade for each Subcontractor and the General Contractor for each activity.
- I. Total Site Labor dollars and all Site Labor rates for each trade used in each activity.
- J. Equipment or Machinery to be used to perform the activity. Data required includes type of equipment, hours required and hourly rate for each piece of equipment and dollar value per piece of equipment for each activity.
- K. Specific phase of the work as defined by the Architect/Engineer using activity codes approved by MDAD.
- L. Detailed schedule of all "utility shut-downs" which would impact MDAD, F.I.S, airlines, tenants and other building operations or functions including, but not limited to: power, telephone, airline computers, communication systems, air conditioning systems, fire sprinklers, alarm systems, domestic water systems, and sanitary sewer systems
- M. Sequence and interdependence of all activities required for complete performance of all items of work under this contract.
- N. All network restraints (restraining ties between activities which restrict the start or finish of another activity). The use of Aneegative lags@ in the restrictions between activities of the Overall Project Schedule is expressly forbidden.
- O. Shop drawing submittals by the Contractor, reviews by the Architect/Engineer.
- P. Fabrication and delivery activities for all equipment, including that furnished by MDAD, and materials to be installed during the project.
- Q. Dates for ordering long lead items (materials, equipment, or specialty shop fabricated work).
- R. Notice to tenant(s) prior to start of work in occupied or used tenant spaces.

The Contractor shall also provide the following information: work days per week, holidays, number of shifts per day, number of hours per shift, number of prime time work hours, proposed schedule of "utility shut-downs", Special Equipment or Machinery to be used, and list of work activities which must be performed during restricted or special working hours.

The precedence diagram shall show the sequence and interdependence of all activities required for complete performance of all items of work under this contract, including shop drawing submittals and approvals and fabrication and delivery activities.

Long-term construction activities shall be broken down into recognizable smaller activities so that no

activity will be longer than 15 workdays.

MDAD reserves the right to selectively limit the number of activities in the schedule.

The schedule shall be sufficiently detailed to track the progress of each activity and the project, as a whole, on a daily basis. The activities shall be clearly described so that the work is readily identifiable. The progress of each activity is to be reasonable and based on the amount of labor, materials, and equipment involved. When added together, the dollar value of all activities shall equal the Contract amount less the Allowance Account(s).

The overall project schedule shall be prepared and submitted to the Field Representative within forty-five (45) calendar days from the effective date of the Notice to Proceed.

The precedence diagram submitted by the Contractor shall be drawn in the format approved by MDAD and shall be accompanied by a computer generated and plotted schedule utilizing Primavera Project Planner scheduling software. The Contractor shall exercise sufficient care to produce clear, legible, and accurate diagrams. The Contractor shall group activities related to specific physical areas on the diagram for ease of understanding and simplification.

MDAD will review the overall project schedule for compliance with the Contract requirements as to staging, phasing, and the time of completion. Such review and acceptance of these schedules does not imply either the Architect/Engineer's, the Field Representative's or MDAD's endorsement and/or responsibility of each and every activity duration or sequence of activities.

The overall project schedule shall be updated monthly. This monthly update shall generate a report that will indicate the remaining duration along with schedule and resources percent complete for each activity. This report together with the monthly sorts will act as the basis for the Contractor's requests for partial payment and shall be submitted with it.

The duration of the overall project schedule shall be in agreement with the duration of the Contract as stipulated in the Bid Form, or as modified by the Contract provisions described in these Contract Documents.

1.05 NEAR TERM SCHEDULE

The near term project schedule shall delineate, in the same detail as required for the overall project schedule, the work anticipated for the first ninety (90) calendar days after Notice to Proceed (NTP), with the balance of project duration, including all milestones, shown in summary form. The near-term project schedule shall be prepared and submitted to the Field Representative prior to the Notice to Proceed.

1.06 CONSTRUCTION PROGRESS REPORT

As part of the monthly updating process, the Contractor shall prepare a construction progress report describing the physical progress during the report period, plans for the forthcoming report period, actions to correct any negative float predictions, and potential delays and problems and their estimated impact on performance and the overall project completion date.

- A. Clearly describe all approved revisions to the accepted overall project schedule for that period.
- B. Report actual progress by updating the mathematical analysis for the accepted overall project schedule.
- C. Show tasks/activities, or portions of activities completed during the reporting period, and their actual value.

- D. State the percentage of work actually completed as of the report date, and the progress along the critical path in terms of days ahead of or days behind the allowable dates.
- E. Report progress along other paths with negative float if the work is behind schedule.
- F. Include a narrative report that shows, but is not necessarily limited to:
 - a. Description of the problem areas, current and anticipated;
 - b. List of delaying factors and their impact;
 - c. Explanation of corrective actions taken or proposed.
- G. Describe plans/actions for the next report period.

1.07 SCHEDULE REVISIONS

The overall project schedule may be revised from time to time as conditions may require, and as approved by MDAD provided, however, that nothing in this Article shall be construed to authorize or approve any extension of time or increase in Contract price, it being expressly understood and agreed that time extensions or increase in contract price, if any, may only be granted in accordance with the applicable requirements of the Contract Documents. Any further revisions to the overall project schedule durations, restrictions, lags, or any other logic or cost related components of the schedule must be accepted, in writing, by MDAD.

The Contractor may make only those revisions to the construction schedule as are accepted in advance by MDAD. In the event of a revision, the Contractor shall make certain that not more than one activity shall have the same activity identification number. The activity numbers of deleted activities shall not be used again.

Changes to the Contract by Work Order or Change Order are to be included in the overall project schedule. The new activities and logic are to be reviewed and accepted by MDAD prior to being incorporated into the accepted overall project schedule.

Once the changes are accepted, the Contractor's schedule revisions shall be incorporated into the previously accepted overall project schedule with the same force as the original schedule. It is understood that should the Contractor fall behind in the schedule and not be entitled to any time extension other than the extension already reflected, the Contractor shall submit his plan for bringing his work back up to schedule and shall implement the plan. If other measures are not sufficient to make up the lag, the

Contractor's plan and implementation thereof shall include increasing the number of workers, shifts, days of work, and/or instituting or increasing overtime, all at no additional cost to MDAD.

Failure or refusal by the Contractor to submit a plan or implement the approved plan for bringing the work back into conformity with the accepted schedule may result in withholding payment to the Contractor or termination of this Contract by MDAD.

1.08 DUTIES

The Field Representative or MDAD's scheduling representative will perform those duties assigned by MDAD. They will be available to offer suggestions in regard to the interrelation of project activities, and schedule content and format, help identify predecessor activities which relate to other construction projects, MDAD, airlines, tenant, building, and inter-project activities.

The Contractor shall perform those respective duties set forth in this Provision and Section 01 31 10

'Construction Schedules (CPM Format) Lump Sum Contract.' The Contractor shall make decisions with regard to the interrelation of project activities, and schedule content and format, and shall identify predecessor activities that relate to each activity.

1.09 SCHEDULE SUBMITTALS

To facilitate and enhance the use of Contractor provided scheduling and cost related information required by the Contract Documents, the Contractor shall utilize Primavera Project Planner Software and provide the following:

- A. Initial Baseline Schedule Submittals. The near-term schedule submittal (activities for first 90 days) shall be submitted prior to the NTP. The overall project schedule submittal (all activities required for the entire contract) shall be submitted within 45 calendar days after NTP. Submit a hard copy of the near term and overall project schedules with detailed predecessor and successor analysis, and cost and resource tabular reports.
- B. Monthly Update Submittals. Contractor may use the near-term schedule to fulfill the scheduling requirements of the Contract for the initial monthly update. Starting at the second monthly update and continuing for the remainder of the Project, the Contractor shall use the overall project schedule to fulfill the scheduling requirements of the Contract.
- C. Submit electronically with each of the above submittals, containing the files used to generate the above reports, the near-term schedule, and the current overall project schedule. Contractor shall conform to the standard schedule, cost and resource report formats supplied by MDAD.

1.10 REPORTS, SORTS AND COMPUTER DISKETTES

Unless indicated otherwise, all reports and computer sorts shall depict all activities and their durations required to complete the entire project.

Each budget report shall be accompanied by a separate detailed cost report, which shall break down each activity into total material and labor costs. Labor costs for each activity shall be further broken down into total regular time and total premium time amounts.

The initial, and monthly schedules, reports, and sorts shall be consistent with the accepted overall project schedule.

Each request for payment must be accompanied by the updated report of both time and costs, together with all required sorts and computer diskette copies, based on the monthly update of the approved Overall Project Schedule. Requests for payment will not be processed unless properly submitted as specified.

All costs and time associated with the preparation and distribution of schedules, reports, sorts, and other supportive information required by this Article for the entire Project shall be deemed incidental to and included in the Contract Bid Price Item(s).

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

**TIME IMPACT ANALYSIS SUMMARY SHEET
(TIA)**

Contract No: _____ Page ___ of ___

Contract Project Title: _____

Contractor Company Name: _____

Title of Event Delayed: _____

Event Reference Number: _____

Event References (drawings, transmittals, work orders, change orders, correspondence, etc.):

(continue on separate attachment if required)

Date of Approved Updated Schedule Used for Analysis:

Schedule File Name:

Detailed Description of Cause of Delay:

(continue on separate attachment if required)

Detailed Description of Work Delayed:

(continue on separate attachment if required)

**TIME IMPACT ANALYSIS DETAIL SHEET
(TIA)**

Contract No: _____ Page ___ of _

Title of Event Delayed:
Event Reference Number:

<u>Activity No:</u>	<u>Description</u>	<u>Start</u>	<u>Finish</u>	<u>Duration</u>

SECTION 01 31 40

CONSTRUCTION SCHEDULING MANAGEMENT SYSTEM

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Procedures for the construction scheduling Management System.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of Work.
- B. Section 01 31 00 Progress Schedules.
- C. Section 01 31 10 Progress Schedules (Computerized Project Planner Format) Lump Sum Contracts.

1.03 The Contractor and all subcontractors shall participate in the Construction Scheduling Management System as provided for in these Specifications.

1.04 There shall be regular Scheduling Coordination meetings, which will generally be a part of the weekly construction coordination meetings. The first such Scheduling Coordination meeting shall be two weeks after the date of Notice to Proceed and each subsequent Scheduling Coordination meeting shall be every two weeks thereafter. The Field Representative may schedule additional Scheduling Coordination meetings. Unless otherwise directed by the Field Representative, the Scheduling Coordination meetings shall be held at the job site and shall be attended by the Contractor and all subcontractors. The Contractor and subcontractors shall be represented at each Scheduling Coordination meeting by a person or persons authorized to make decisions and commitments regarding schedules, crew sizes, sequence(s) of events and similar scheduling matters on behalf of said Contractor or subcontractor. The contractors may authorize specified subcontractors not to attend one or more of the Scheduling Coordination meetings. Contractor should advise MDAD of these decisions prior to the meeting.

1.05 The Scheduling Coordination meeting shall be a forum to establish the true state of completion of the project, to update the status of the delivery of material and equipment items and to prepare or revise the detailed Near-Term Progress Schedule.

1.06 After each Scheduling Coordination meeting, the Field Representative or MDAD's scheduling representative will prepare and distribute a report including the following: (A) a copy of the latest approved Near Term Progress Schedule; (B) a status review of the project; (C) a written analysis of problem areas and proposed solutions thereto; (D) the trend chart showing the trends of the completion dates of significant segments of the project; and (E) a listing of the more critical activities on which work should be accomplished before the next Scheduling Coordination meeting.

1.07 The Contractor shall provide all schedules required under this Article. The Field Representative or MDAD's scheduling representative may, from time to time, propose revisions to the Overall Project Schedule and Near-Term Schedules to reflect the current status of the project. Draft revisions shall be circulated to all parties for review and comment. When approved by MDAD, the revised overall project schedule and the Near-Term Schedules shall become effective.

1.08

In the event any activity is behind schedule and, unless a time extension is claimed and granted in accordance with the applicable requirements of the General Conditions, the Contractor shall reschedule each such activity so as not to delay the Contract completion. If such rescheduling is not accomplished within a reasonable time, the Contractor, the Field Representative, and MDAD's scheduling representative (if other than the Field Representative) shall meet to develop a program to bring each such activity back on schedule. Said program may include any or all the following:

- A. Carrying out the activity with the crew size shown on the Overall Project Schedule, using overtime/prime time work to complete or bring current the activity;
- B. Increasing the crew size(s) and/or number of shifts to a level sufficient to complete or bring current the activity;
- C. Any combination of activities which will complete or bring current the activity.

Unless a claim for time extension, additional compensation or for any other relief under the Contract is processed in accordance with the provisions of applicable requirements of the General Conditions, the Contractor shall perform the work under the aforesaid program at no additional cost to MDAD.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 34 00

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures for submittal.
- B. Schedule of submittals.

1.02 RELATED REQUIREMENTS

- A. General Conditions Definitions, basic responsibilities of entities, and Article 4.8 Substitution
- B. Section 01 04 00 Coordination.
- C. Section 01 30 00 Submittals.
- D. Section 01 40 50 Contract Quality Control: Mockups and samples for testing.
- E. Section 01 60 00 Material and Equipment: Product options.
- F. Section 01 72 00 Project Record Documents.

1.03 SHOP DRAWINGS

- A. 'Shop Drawings' are defined as drawings, diagrams, illustrations, schedules, catalog cuts, performance charts, brochures, and other data prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor, which illustrates how specific portions of the work shall be fabricated and/or installed.
- B. Shop drawing transparencies provided by the Contractor with each submittal shall be original drawings, sharp, clear, and distinct, suitable for reproductions.
- B. Each shop drawing shall be clear, thoroughly detailed, and shall have listed on it all Contract references, drawing number(s), specification section number(s), plus shop drawing numbers of related work by subcontractors, if applicable.
- D. Identify field dimensions; show relation to adjacent or critical features or work or products.
- E. Minimum Sheet Size: 11 x 17 inches.
- F. Where it is difficult to provide shop drawing transparencies, such as "catalog cuts", "brochures" or "photographs", the Contractor shall submit a minimum of six (6) copies of such "cuts", "brochures" or "photographs". Additional copies shall be supplied when required by the Field Representative.
- G. Shop drawings shall be complete in every detail, including a location plan relating the work to space identification such as station, offset, and column numbers, floor level, etc. Materials, gauges, method of fastening, size and spacing of fastenings, connections with other work, cutting, fitting, drilling, and any and all other necessary information per usual trade practice or as required for any specific purpose must be clearly shown.

H. Each shop drawing shall contain a title block with the following information provided:

- (1) Number and title of drawing, including Contract title and Number;
- (2) Date of drawing and revisions;
- (3) Name of Contractor and Subcontractor (if any) submitting drawings;
- (4) Name of Project, Building or Facility;
- (5) Specification Section title and number;
- (6) Contractor's Stamp of approval, signed by the Contractor or his checker;
- (7) Space above the title block for Architect/Engineer's action stamp;
- (8) Submittal or resubmittal number (whether first, second, third, etc.);
- (9) Date of submittal.

The Contractor, when requested by the Field Representative in writing, shall submit such additional shop drawings as may be required by the Architect/Engineer.

1.04 PRODUCT DATA

- A. Submit only pages that are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
- B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.
- C. Identify work of separate stages or separate floors, and other logically grouped activities.

1.05 SAMPLES

- A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures, and patterns, for selection. All color and finish schedules must be submitted by the Contractor in a single submission properly identified and labeled.
- B. Submit samples to illustrate functional characteristics of products, including parts and attachments.
- C. Approved samples which may be used in the work are indicated in the Specification section.
- D. Label each sample with identification required for transmittal letter.
- E. Provide field samples of finishes at Project, at location acceptable to the Field Representative, as required by individual Specifications section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work.

1.06 CONTRACTOR REVIEW

- A. The Contractor shall check and approve all shop drawings to make sure that they conform to the Plans, Technical Specifications, and other Contract requirements, and shall correct all shop drawings found to be inaccurate or otherwise in error, prior to submittal to the Field Representative. The Contractor shall verify all field dimensions and criteria and shall be responsible for the coordination of work by all Subcontractors. The Contractor, by approving and submitting shop drawings, represents that they have determined and verified the accuracy of all field measurements and quantities, field construction criteria, materials, catalog numbers, and similar data, and that they have reviewed and coordinated the information in the shop drawings with the requirements of the work and the Contract Documents.

- B. Review manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
- C. Coordinate submittals with requirements of work and Contract Documents.
- D. The Contractor or the Contractor's checker shall sign, in the proper block, each sheet of shop drawings and data, and each sample label to certify compliance with requirements of Contract Documents. Shop drawings submitted without such stamp and signature of approval will be returned to the Contractor unchecked and will require a re-submission. In such event, it will be deemed that the Contractor has not complied with the requirements of this Section and shall bear the risks of delays as if no drawings or details had been submitted.
- E. Notify Architect/Engineer through the Field Representative in writing at time of submittal, of any deviation(s) from requirements of Contract Documents.
- F. Do not order material, fabricate products, or begin work that requires submittals until return of submittal with Architect/Engineer acceptance.

1.07 SUBMITTAL REQUIREMENTS

- A. Transmit submittals in accordance with approved Progress Schedule and in such sequence so as to avoid delay in the work or work of other contracts. Submit copy of shop drawings transmittal letter and requests for substitutions, if any, to the Field Representative.
- B. Provide space on each submittal for Contractor and Architect/Engineer action stamps.
- C. Apply Contractor's approval stamp, signed or initialed, certifying to review, verification of products, field dimensions and field construction criteria and coordination of information with requirements of work and Contract Documents.
- D. Coordinate submittals into logical groupings to facilitate interrelation of the several items:
 - (1) Finishes that involve Architect/Engineer's selection of color, textures, or patterns.
 - (2) Associated items that require correlation for efficient function or for installation.
- E. Submit shop drawings electronically for review and approval of the Architect/ Engineer.
- F. Submit number of copies of product data and manufacturer's instructions Contractor requires, plus six (6) copies that will be retained by Architect/Engineer, Field Representative, and MDAD.
- G. Submit number of samples specified in individual Specification sections.
- H. Submit Contractor's approved transmittal letter. Identify project by contract title and number. Identify work and product by Specifications section and Article number.

1.08 RESUBMITTALS

- A. Make resubmittals under procedures specified for initial submittals; clearly identify changes made since previous submittal.

1.09 ARCHITECT/ENGINEER AND FIELD REPRESENTATIVE

- A. The Architect/Engineer will review shop drawings and samples and indicate whatever action he/she is taking, within 14 calendar days from the date of its receipt at the Architect/Engineer's

office, so as to minimize delay. The Architect/Engineer's review will be only for conformance with the design concept of the Contract and with the information given in the Contract Documents. The Architect/Engineer's approval of a separate item shall not constitute approval of an assembly in which the item functions. The Field Representative will return the transparency shop drawings to the Contractor for his use and distribution.

- B. The Architect/Engineer's approval of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Architect/Engineer through the Field Representative in writing of such deviation at the time of submission and the Architect/Engineer has given written approval to the specific deviation, nor shall the Architect/Engineer's approval relieve the Contractor from responsibility for errors or omissions in the shop drawings, product data sheets or samples.

1.10 DISTRIBUTION

- A. Duplicate and distribute reproductions of shop drawings, copies of product data and samples, which bear Architect/Engineer stamp of approval, to job site file, Record Documents file, sub-contractors, suppliers, other affected contractors, and other entities requiring information.
- B. Project submittals should be handled electronically with the exception of product data and physical samples, which should be presented to MDAD, Field Representative, and Architect/Engineer for review and approval.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 37 00

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Procedures for preparation and submittal of Schedule of Values.

1.02 RELATED REQUIREMENTS

- A. General Conditions Article 10 Partial Payments to Contractor
- B. Section 01 01 00 Summary of Work.
- C. Section 01 02 70 Applications for Payment.
- D. Section 01 30 00 Submittals.

1.03 FORMAT

- A. Type Schedule on MDAD provided forms or MDAD approved format. Contractor shall provide draft of schedule of values format for the review and approval of MDAD and Architect.
- B. Follow Table of Contents of Project Manual for listing component parts. Identify each line item by number and title of major Specifications section. Field Representative will provide minimum requirements.
- C. Follow procedures specified in Sections 01 30 00, 01 31 00 and 01 31 10.

1.04 CONTENT

- A. List installed value of each major item of work and each subcontracted item of work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.
- B. Coordinate listings with Progress Schedule.
- C. For items on which payments will be requested for stored products, list sub-values for cost of stored products with taxes paid.
- D. Submit a sub-schedule for each separate stage of work specified in Section 01 01 00.
- E. The sum of values listed shall equal total Contract or lump sum price items.

1.05 SUBMITTALS

- A. Submit Preliminary Schedule of Values within fifteen (15) days after the tentative award of the Contract.
- B. Submit finalized Schedule of Values within ten (10) days from the approval date of the Overall Construction Progress Schedule.
- C. Submit three copies of Schedule as required by the General Conditions.

- D. Transmit under the Field Representative accepted transmittal letter. Identify project by title, and project number.

1.06 SUBSTANTIATING DATA

- A. When the Field Representative requires substantiating information, submit data justifying line item amounts in question.

1.07 ACTION

- A. No payment will be made for work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by MDAD.
- B. The equitable value of work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 40 50

CONTRACT QUALITY CONTROL

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Quality control of products and workmanship.
- B. Mix design.
- C. Manufacturer's instructions.
- D. Manufacturer's certificates.
- E. Equipment operations.

1.02 RELATED REQUIREMENTS

- A. Section 01 09 00 Reference Standards.
- B. Section 01 30 00 Submittals
- C. Section 01 34 00 Shop Drawings, Product Data and Samples
- D. Section 01 44 00 Contractor Quality Control Program
- E. Individual Technical Specifications Sections: Field samples and mockups.

1.03 DESCRIPTION

- A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship, and site conditions, to produce work in accordance with Contract Documents.

1.04 WORKMANSHIP

- A. Comply with industry standards of the region except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Provide suitably qualified personnel to produce work of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.
- D. Provide finishes to match approved samples.

1.05 MANUFACTURER'S INSTRUCTIONS

- A. Require compliance with instructions in full detail, including each step-in sequence.
- B. Should instructions conflict with Contract Documents, request written clarification from Architect/Engineer through the Field Representative before proceeding.

1.06 MANUFACTURER'S CERTIFICATES

- A. When required in individual Specifications section, submit manufacturer's certificate, in duplicate, certifying that products meet or exceed specified requirements, executed by responsible officer.

1.07 MANUFACTURER'S FIELD SERVICES

- A. When required in individual Specification section, have supplier provide qualified representative to observe field conditions, conditions of surfaces and installation, quality of workmanship, test, adjust, and balance of equipment and applications, and to make written report of observations and recommendations to Field Representative.

1.08 AUTOMATICALLY CONTROLLED EQUIPMENT

- A. Whenever batching or mixing plant equipment is required to be operated automatically under the contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period of 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 41 00

PROJECT TESTING LAB SERVICES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. MDAD provided Project Testing Laboratory Services.
- B. Contractor provided testing facilities for the Project Testing Laboratory's use.

1.02 RELATED REQUIREMENTS

- A. General Conditions: Inspections, testing, and approvals.
- B. Section 01 72 00 Project Record Documents.
- C. Section 03 30 00 Concrete

1.03 REFERENCES

- A. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates and Criteria for Laboratory Evaluation.
- B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in testing and/or Inspection on Soil and Rock as used in Engineering Design and Construction.
- C. ASTM E329 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as used in Construction.

1.04 SELECTION AND PAYMENT

- A. MDAD will employ and pay for services of an independent testing laboratory (Project Testing Laboratory) to perform specified Quality Assurance testing.

1.05 LABORATORY REPORTS

- A. After each inspection and test the Project Testing Laboratory will forward copies of all reports directly to MDAD.

1.06 LIMITS ON PROJECT TESTING LABORATORY AUTHORITY

- A. Project Testing Laboratory may not release, revoke, alter or enlarge on requirements of Contract Documents.
- B. Project Testing Laboratory may not approve or accept any portion of the work.
- C. Project Testing Laboratory may not assume any duties of the Architect/Engineer, the Field Representative or the Contractor.
- D. Project Testing Laboratory has no authority to stop work.

1.07 CONTRACTOR RESPONSIBILITIES

- A. Make available to Project Testing Laboratory at designated location adequate samples of materials proposed to be used that require testing, together with proposed mix designs.
- B. Cooperate with laboratory personnel and provide access to work, and to manufacturer's facilities.

- C. If required by the Field Representative or the Project Testing Laboratory, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.
- D. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- E. Notify the Field Representative, MDAD and laboratory 48 hours prior to expected time for operations requiring inspection and testing services.
- F. Costs of all testing except for retesting due to failure, will be paid by MDAD. Failed tests will be retested at Contractor's expense.
- G. Arrange with Project Testing Laboratory and pay for additional samples and tests required by Contractor beyond specified requirements.

1.08 RETESTING

MDAD retains the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. Either the Architect/Engineer or the Field Representative shall have the right to reject material which, when retested, does not meet the requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 44 00

CONTRACTOR QUALITY CONTROL PROGRAM

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall establish, provide, and maintain an effective Quality Control Program, *conforming to MDAD's Quality Assurance Manual*, that details the methods and procedures that will be taken to assure that all materials and completed construction required by this Contract conform to the Plans, Technical Specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the Technical Specifications, the Contractor shall assume full responsibility for the quality of all work.
- B. The intent of this section is to provide a minimum framework for the Contractor to establish a necessary level of control that will:
1. Adequately provide for the production of acceptable quality materials and workmanship.
 2. Provide sufficient information to assure the Architect/Engineer, the Field Representative, and the MDAD that the specification requirements will be met.
 3. Allow the Contractor as much latitude as possible to develop its own standard of control.
- C. The Contractor shall be prepared to discuss and present, at the preconstruction conference, its written Quality Control Program. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and accepted by both the Architect/Engineer and the Field Representative. The Contractor shall make all adjustments to the Quality Control Program deemed necessary by either the Architect/Engineer or the Field Representative. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed and accepted.

The quality control requirements contained in this section and elsewhere in the Contract Technical Specifications are in addition to and separate from the testing requirements that are the responsibility of the Project Testing laboratory as specified elsewhere in the Contract Documents.

1.02 DESCRIPTION OF PROGRAM

- A. The Contractor shall describe the Quality Control Program in a written document that shall be reviewed prior to the start of any production, construction, or fabrication. The written Quality Control Program shall be submitted to the Field Representative at least ten (10) calendar days before the pre-construction conference.

The Quality Control Program shall describe how the Contractor will perform inspection and testing of all items of work required by the Technical Specifications, including those performed by subcontractors and vendors. This Quality Control Program shall ensure conformance to applicable Specifications and Plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall include surveillance and tests required by the Technical Specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

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

1. Quality control organization;
 2. Project progress schedule;
 3. Submittals schedule;
 4. Inspection requirements;
 5. Quality control testing plan;
 6. Quality control testing laboratory;
 7. Documentation of quality control activities; and
 8. Requirements for corrective action when quality control and/or acceptance criteria are not met.
- C. The Contractor is encouraged to add any additional elements to the Quality Control Program that it deems necessary to adequately control all production and/or construction processes required by this contract.

1.03 QUALITY CONTROL ORGANIZATION.

- A. The Contractor's Quality Control Program shall be implemented by the establishment of separate quality control organization. Such organization may be internal to the Contractor's company, an outside organization contracted by the Contractor, or a combination of both. An organizational chart shall be developed to show all quality control personnel, including personnel provided by any outside organization, and how these personnel integrate with other management/production and construction functions and personnel.
- B. The organizational chart shall identify all quality control staff by name and function, experience qualifications, certifications and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different technicians can be utilized for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the Quality Control Program, the personnel assigned shall be subject to the qualification requirements of paragraph C.1 and C.2 below. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.
- C. The quality control organization shall consist of the following minimum personnel:
1. Quality Control (QC) Program Administrator. A QC Program Administrator shall be assigned to this project to the extent and in a manner necessary to effectively implement and manage the Contractor's QC Program. The QC Program Administrator shall be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The QC Program Administrator shall have a minimum of 5 years of experience in industrial or airport construction and shall have had prior quality control experience on a project of comparable size and scope as the Contract.

In addition, the QC Program Administrator shall have at least 2 years of demonstrable experience in the construction supervision of system type, or in the government inspection of type systems as well as certification at Level III by the National Institute for Certification in Engineering Technologies for systems. The QC Program Administrator shall have full authority to institute any and all actions necessary for the successful implementation of the Quality Control Program to ensure compliance with the Plans and

Specifications. The QC Program Administrator shall report directly to an officer of the Contractor having full decision-making authority for the Project.

2. Quality Control Technicians. A sufficient number of quality control technicians necessary to monitor each of the following aspects of construction shall be provided:
 - a. Sheet metal
 - b. Alarm and communications systems, and electrical work
 - c. Electrical
 - d. Other aspects as selected by Contractor
 - e. Equipment
 - f. Finishes

These personnel shall be engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II or higher construction materials technician or highway construction technician and shall have a minimum of 2 years of experience in their area of expertise. Certification at an equivalent level, by a State of Florida or nationally recognized organization will be acceptable in lieu of NICET certification.

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

- (a) Inspection of all materials, construction, plant, and equipment for conformance to the specifications, and as required by Section 1.06 below.
- (b) Performance of all quality control tests as required by the technical specifications and Section 1.07 below.

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

1.04 PROJECT PROGRESS SCHEDULE

- A. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as specified in the Contract Documents.
- B. The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a weekly basis, or as otherwise specified in the Contract Documents. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the Contract.

1.05 SUBMITTALS SCHEDULE

- A. The Contractor shall submit a detailed listing of all submittals (e.g., job mix formula, mix designs, material certifications) and shop drawings required by the Technical Specifications. The listing can be developed in a spreadsheet format and shall include:
 1. Specification Section number;
 2. Section description;

3. Description of submittal;
4. Specification paragraph requiring submittal; and
5. Scheduled date of submittal.

1.06 INSPECTION REQUIREMENTS.

- A. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by Section 1.08 below.
- B. Each item of work and its substrate or surroundings shall be inspected preparatory to, during the progress of the work, and afterward to ensure that the Contract Documents are being followed, that the work is good quality, and so that defects are discovered and corrected as the work proceeds. Inspections shall be performed weekly, daily, or continuously, depending on the speed, quantity, and complexity of each aspect of the work, until each aspect of the work is complete.

1.07 QUALITY CONTROL TESTING PLAN.

- A. As a part of the overall Quality Control Program, the Contractor shall implement a Quality Control Testing Plan, as required by the Technical Specifications. The testing plan shall include the minimum tests and test frequencies required by each Technical Specification Item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.
- B. The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:
 1. Specification section number (e.g., P-401);
 2. Section description (e.g., Plant Mix Bituminous Pavements);
 3. Test type (e.g., gradation, grade, asphalt content);
 4. Test standard (e.g., ASTM, AASHTO or USCE, etc., test number, as applicable);
 5. Test frequency (e.g., as required by Technical Specifications or minimum frequency when requirements are not stated);
 6. Responsibility (e.g., plant technician); and
 7. Control requirements (e.g., target, permissible deviations).
- C. The testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D 3665. The Field Representative and/or the Project Testing Laboratory shall be provided the opportunity to witness quality control sampling and testing.
- D. All quality control test results shall be documented by the Contractor as required by Section 1.08 below.

1.08 DOCUMENTATION

- A. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.
- B. These records must cover both conforming and defective or deficient features and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's QC Program Administrator.

Except as otherwise provided herein, such records shall be made available to the Field Representative upon request.

- C. Specific Contractor quality control records required for the Contract shall include, but are not necessarily limited to, the following records:
1. Daily Inspection Reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations on a form acceptable to the Field Representative. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:
 - (a) Technical Specification item number and description;
 - (b) Compliance with approved submittals;
 - (c) Proper storage of materials and equipment;
 - (d) Proper operation of all equipment;
 - (e) Adherence to Plans and Technical Specifications;
 - (f) Review of quality control tests; and
 - (g) Safety inspection.

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

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

2. Daily Test Reports. The Contractor shall be responsible for establishing a system which will record all quality control test results. Daily test reports shall document the following information:
 - (a) Technical Specification item number and description;
 - (b) Test designation;
 - (c) Location;
 - (d) Date of test;
 - (e) Control requirements;
 - (f) Test results;
 - (g) Causes for rejection;
 - (h) Recommended remedial actions; and
 - (i) Retests.
 - (j) Occurrences of interest.

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

1.09 CORRECTIVE ACTION REQUIREMENTS

- A. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general

requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the Technical Specifications.

- B. The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.
- C. When applicable or required by the Technical Specifications, the Contractor shall establish and utilize statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

1.10 OBSERVATION BY THE FIELD REPRESENTATIVE

- A. All items of material and equipment shall be subject to observation by the Field Representative at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed herein and the applicable Specifications and Plans. In addition, all items of materials, equipment and work in place shall be subject to observation by the Field Representative and/or the Project Testing Laboratory at the site for the same purpose.
- B. Observation by the Field Representative does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

1.11 NONCOMPLIANCE

- A. The Field Representative will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Field Representative or its authorized representative to the Contractor or its authorized representative at the site of the work, shall be considered sufficient notice.
- B. In cases where quality control activities do not comply with either the Contractor's Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the Field Representative, the Field Representative may:
 - (a) Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.
 - (b) Order the Contractor to stop operations until appropriate corrective actions are taken.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 50

MOBILIZATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work specified in this Section shall consist of the preparatory work and operations in mobilizing for beginning work on the Project, including, but not limited to, the following:
- (1) The costs of bonds and any required insurance, and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials.
 - (2) The costs of operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site; and
 - (3) The costs for the establishment of temporary offices, shops, buildings, construction identification signs, safety equipment and first aid supplies, sanitary and other facilities, as required by the Contract Documents, and any Federal, State and/or local laws and regulations.
- B. The Contractor shall prepare and submit to the Field Representative detailed itemized cost breakdown of this item, at the preconstruction conference.

1.02 The Contractor shall include in the Schedule of Values a line item for "Mobilization".

1.03 Not used.

1.04 PARTIAL PAYMENTS

Partial payments for Mobilization will be made in accordance with the following schedule during the progress of construction on this project.

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum Price for Mobilization*
5	25
10	50
25	75
50	100

Partial payments for the item "Mobilization" shall be made in accordance with the above schedule and the sum of all the partial payments for the item Mobilization will be limited to 3% of the original Contract Amount for the Project. Any remaining amount will be paid upon completion of all work under the Project.

The standard retainage, as specified in General Conditions, will be applied to these allowances. Partial payments made on this item shall in no way act to preclude or limit any of the provisions for partial payments otherwise provided for by the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 60

CONTRACTOR OVERHEAD

PART 1 - GENERAL

1.01 DESCRIPTION

The work specified in this Section shall consist of all of the Overhead as defined in the General Conditions.

1.02 METHOD OF MEASUREMENT

Measurement of Overhead for payment shall be on a calendar day basis.

1.03 BASIS OF PAYMENT

Payment for Overhead shall be made at the contract unit price.

Payment will be made under:

Item No.1 Contractor Overhead – Per Calendar Day.

1.04 PARTIAL PAYMENTS

Partial payments for Overhead will be made in accordance with the Contract Documents. The standard retainage, as specified in the General Conditions, will be applied.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 51 10

TEMPORARY ELECTRICITY

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Temporary electrical services.
- B. Operation and Maintenance.
- C. Removal.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work.
- B. Section 01 51 20 Temporary Lighting.
- C. Section 01 59 00 Field Representative's Office and Testing Laboratories.

1.03 SERVICE REQUIREMENTS

- A. Power Source: MDAD's existing service; connect at indicated location, or as directed by the Field Representative. Provide sub-metering to record energy consumed.
- B. Service: Provide temporary service compatible with servicing utility company and adequate to accommodate maximum construction and temporary lighting at any time. Plus, continuous operation of MDAD's facilities. Contractor is responsible to make determination prior to submitting bids.

1.04 DISTRIBUTION

- A. Weatherproof distribution boxes with [] volt, [] phase power outlet and [] volt outlets consisting of 100 ampere fused switches with equipment ground, spaced so that a 100 foot extension cord will reach all areas of the building.
- B. Wiring, connections and protection for temporary lighting, warning, and marker lights.
- C. Wiring, connections, and protection for temporary and permanent equipment for environmental control, for temporary use of electrically operated equipment and for testing.

1.05 USE OF EXISTING SYSTEM

- A. Monitor usage, prevent interference with MDAD's normal requirements.
[OR]
- A. Do not use existing system for temporary electricity.

1.07 CONTRACTOR RESPONSIBILITIES

- A. Obtain permit and pay for inspections.
- B. [Obtain and pay for temporary easement across property other than that of County.]
- C. Pay for installation, operation, maintenance and removal of system[.] [,and] restoration of existing and permanent equipment.]
- D. Contractor shall pay costs of energy consumed for operation of on or off-site batch and mixing plants.

- E. Contractor shall pay costs of energy consumed for construction operations.
- F. Temporary utilities shall be installed, operated, and maintained (including their initial and maintenance costs) per MDAD requirements as negotiated in the Construction Contract between MDAD and the Contractor.

1.08 OWNER RESPONSIBILITIES

- A. MDAD will pay costs of energy consumed for normal construction operations, except as specified in 1.07 above. Take measures to conserve energy usage.
- B. Wastes or failure to conserve energy will be cause for revocation of permit of electrical use from the airport system.

PART 2 PRODUCTS

2.01 MATERIALS

- A. May be new or used, adequate to the purpose and meeting the Florida Building Code requirements.
- B. Devices and Equipment: Standard devices, meeting UL requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install initial service at time of site mobilization.
- B. Comply with requirements of the Contract Documents.
- C. Modify and extend system as work progresses.
- D. Comply with Florida Building Code.

3.02 OPERATION AND MAINTENANCE

- A. Maintain system to provide continuous service, including prompt restoration of interruptions to MDAD's system when temporary service is connected.

3.03 REMOVAL

- A. Remove temporary material and equipment prior to final Completion.
- B. Restore existing and permanent facilities used for temporary purposes to original condition.

END OF SECTION

SECTION 01 51 20

TEMPORARY LIGHTING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Temporary lighting.
- B. Operation and Maintenance.
- C. Removal.
- D. Cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work.
- B. Section 01 51 10 Temporary Electricity.
- C. Section 01 59 00 Field Representative's Office and Testing Laboratories.
- D. Section 01 71 00 Final Cleaning.
- E. Individual Sections: Lighting required for work.

1.03 SERVICE REQUIREMENTS

- A. Temporary lighting for field offices, storage, shop, work, and other construction areas, and circulation areas for personnel, and for the public.
- B. Security lighting during hours of low visibility.
- C. Lighting required for maintenance and protection of airside and landside traffic.

1.04 USE OF EXISTING SYSTEM

- A. Existing lighting system may be used for temporary purposes. Maintain to prevent interference with MDAD'S normal operations.

1.05 COSTS

- A. Obtain permits and pay for inspections.
- B. Pay for installation, operation, maintenance, and removal lighting.
- C. Costs of Electricity used for lighting: As specified in Section 01 51 10.
- D. Temporary utilities shall be installed, operated, and maintained (including their initial and maintenance costs) per MDAD requirements as negotiated in the Construction Contract between MDAD and the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. May be new or used, adequate to the purpose.
- B. Receptacles, Fixtures, Controls: Standard products, meeting UL standards.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Locate fixtures in areas of work adequate to carry out all tasks in a safe and workmanlike manner and to adequately inspect work effort.

- B. Modify, supplement, and extend lighting as work progresses. Installation of lighting shall neither affect the normal operations of the ramp and inside terminal nor the life safety related systems installed within the premises.

3.02 OPERATION AND MAINTENANCE

- A. Maintain lighting. Promptly replace worn or defective parts.

3.03 REMOVAL

- A. Remove temporary material and equipment at Substantial Completion.
- B. Restore existing and permanent lighting used during construction to original condition. Replace defective fixtures, bulbs, and other component parts.

3.04 CLEANING

- A. Clean existing and permanent fixtures used during construction under provisions of Section 01 71 00.

END OF SECTION

SECTION 01 51 40

TEMPORARY TELEPHONE

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Temporary telephone service.
- B. Maintenance.
- C. Removal.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work.
- B. Section 01 59 00 Field Representative's Office and Testing Laboratories.

1.03 SERVICE REQUIREMENTS

- A. Telephone Service Company: located at Miami International Airport.
- B. Minimum: Direct [_____] line service to field office for construction use, plus [_____] private lines to Field Representative's field office.

1.04 USE OF EXISTING SYSTEM

- A. Do not use existing telephone system.

1.05 COSTS

- A. Pay costs of installation, maintenance, and removal of service.
- B. Pay charges for basic services; entity incurring toll charges will reimburse Contractor.
- C. Temporary utilities shall be installed, operated, and maintained (including their initial and maintenance costs) per MDAD requirements as negotiated in the Construction Contract between MDAD and the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. May be new or used, adequate to the purpose.

2.02 EQUIPMENT

- A. Products of local service company or specialty devices compatible with service company requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install service at time of site mobilization.
- B. Modify and extend service as work progresses.

3.02 MAINTENANCE

- A. Maintain system to provide uninterrupted service.

3.03 REMOVAL

- A. Remove temporary system at Final Completion, or when field office is no longer needed.

END OF SECTION

SECTION 01 51 50

TEMPORARY WATER

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Temporary water service.
- B. Maintenance.
- C. Removal.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work.
- B. Section 01 51 60 Temporary Sanitary Facilities.
- C. Section 01 59 00 Field Representative's Office and Testing Laboratories.

1.03 SERVICE REQUIREMENTS

- A. Water Quality: Potable.
- B. Source: MDAD's existing service connect at indicated location; provide sub-metering to record water consumed.

1.04 DISTRIBUTION

- A. Provide valve outlets located so that water is available under adequate pressure by mean of hoses.
- B. Install backflow preventer valves at point(s) of connection(s).

1.05 USE OF EXISTING SYSTEMS

- A. Existing system may be used for temporary water. Monitor usage to prevent interference with MDAD's normal requirements.

1.06 COSTS

- A. Obtain permits and pay for inspections.
- B. Pay costs of installation, operation, maintenance, and removal of system[.] [and restoration of existing and permanent equipment.
- C. Pay costs of water consumed to County monthly, as determined by sub- metering.
OR
- D. County will pay costs of water consumed for normal construction operations; take measures to conserve usage.
- E. Temporary utilities shall be installed, operated, and maintained (including their initial and maintenance costs) per MDAD requirements as negotiated in the Construction Contract between MDAD and the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. May be new or used, adequate to the purpose.
- B. Drinking Water Dispensers: Standard products.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install initial service at time of job mobilization.
- B. Modify and extend service as work progresses.
- C. Size piping to supply construction needs, and for temporary fire protection.
- D. Disinfect piping used for drinking water.
- E. Install backflow preventer valves at all connections to the system.

3.02 MAINTENANCE

- A. Maintain system to provide continuous service with adequate pressure to outlets, including County's system when temporary service is connected.

- B. Maintain connections, pipes, fittings, and fixtures and conserve use of all utilities. Failure to stop leaks or other waste of water will be cause for revocation of permit for the use of said water from the airport system.

3.03 REMOVAL

- A. Remove temporary system at Substantial Completion.

- B. Restore existing and permanent facilities used for temporary purposes during construction to original condition.

END OF SECTION

SECTION 01 51 60

TEMPORARY SANITARY FACILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Temporary Sanitary Facilities.
- B. Maintenance, Service.
- C. Removal.
- D. Cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work.
- B. Section 01 51 50 Temporary Water
- C. Section 01 59 00 Field Representative's Offices and Testing Laboratories.
- D. Section 01 71 00 Final Cleaning.

1.03 TEMPORARY FACILITIES

- A. Designated existing sanitary facilities may be used for temporary purposes, if maintained in a sanitary condition. Contractor to coordinate with MDAD the use of designated existing sanitary facilities in the Terminals.
- B. Temporary Sanitary Facilities shall comply with the requirements of the State and County health standards.
- C. Permanent sanitary facilities shall not be used for temporary purposes unless specific arrangements are made with MDAD.

1.04 COSTS

- A. Obtain permits and pay for inspections.
- B. Pay service charges for connection and use of temporary sewerage utilities. MDAD will pay charges for permanent utilities upon acceptance of Project.
- C. Pay costs of installation, maintenance, and removal of service.
- D. Cost for Water: Specified in Section 01 51 50.
- E. Temporary utilities shall be installed, operated, and maintained (including their initial and maintenance costs) per MDAD requirements as negotiated in the Construction Contract between MDAD and the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

- A. May be new or used as may be dictated by all governing codes, adequate to the purpose, which will not create unsanitary conditions.

2.02 TOILET FACILITIES

- A. Enclosed portable self-contained units or temporary water closets and urinals, secluded from public view. Provide separate facilities for male and female personnel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide facilities at time of site mobilization.
- B. Modify and extend service as work progresses.
- C. Do not require any worker to work in surroundings or under conditions which are unsanitary, hazardous, or dangerous to his/her health or safety.
- D. When utility services are available, provide water, sewer service and temporary water closets; remove portable facilities.

3.02 MAINTENANCE, SERVICE

- A. Clean areas of facilities daily and maintain in sanitary condition.
- B. Provide toilet paper, paper towels and soap in suitable dispensers.

3.03 REMOVAL

- A. Remove portable units when other facilities are available.
- B. Remove temporary fixtures prior to Final Completion.

3.04 CLEANING

- A. Clean areas of use as specified in Section 01 71 00, disinfect fixtures, repair, or replace damaged fixtures, accessories, and surfaces.
- B. Restore existing and permanent area and facilities used to original condition.

END OF SECTION

SECTION 01 53 00

BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Barriers.
- B. Protected Walkways.
- C. Security Fencing.
- E. Weather Closures.
- F. Partition and Ceiling Enclosures.
- G. Maintenance.
- H. Removal.
- I. Site Restoration.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work.
- B. Section 01 57 00 Maintenance of Air Operations Area Traffic.
- C. Section 01 57 10 Maintenance of Airport Landside Traffic.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. May be new or used as may be dictated by all governing codes, adequate to the purpose, which will not create hazardous conditions.

2.02 FENCING MATERIALS

- A. Commercial quality chain link with three strands of barbed wire.

2.03 ENCLOSURE MATERIALS

- A. For partitions: Framing and rigid sheet materials.

PART 3 EXECUTION

3.01 BARRIERS AND PROTECTED WALKWAYS

- A. Provide to prevent public entry, and to protect public through construction site, to provide for MDAD's use of site, and to protect existing facilities and adjacent properties from damage.
- B. 6'-0" foot high fence enclosing construction area.
- C. Pay costs of installation, maintenance and removal and restoration to existing condition.

3.03 WEATHER CLOSURES

- A. Provide weathertight closures of openings in exterior surfaces to maintain specified working conditions to protect products and finished work from inclement weather.

3.04 PARTITIONS AND CEILING ENCLOSURES

- A. Provide temporary enclosures to separate work areas from areas occupied by MDAD, to prevent penetration of dust, moisture, and noise into occupied areas.

B. Construct with closed joints; seal joints, edges and intersections with other surfaces to prevent penetrations of dust and moisture; STC rating 50 in accordance with ASTM E90. Flame Spread Rating no more than 25 in accordance with ASTM E84.

C. Paint surfaces exposed to view in MDAD occupied areas.

3.05 MAINTENANCE

A. Maintain during progress of work. Repaint painted surfaces annually or more often as directed by the Field Representative.

B. Relocate and extend during successive stages of construction.

3.06 REMOVAL

A. Remove temporary materials, equipment, and construction at Final Acceptance; repair damage caused by installation or use of barricades and enclosures. Remove fence post setting.

3.07 SITE RESTORATION

A. Restore site and existing facilities used during construction to original condition.

END OF SECTION

SECTION 01 53 50

PROTECTION OF WORK AND PROPERTY

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Protection of products, including MDAD-provided products, after installation.
- B. Protection of existing property.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work
- B. Section 01 53 00 Barriers and Enclosures
- C. Section 01 60 00 Material and Equipment: Protection of products in storage.
- D. Section 01 71 00 Final Cleaning: Removal of temporary protection.
- E. Individual Sections: Specific protection for installed products.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PROTECTION AFTER INSTALLATION

- A. Protect installed products and control traffic in immediate area to prevent damage from subsequent operations.
- B. Provide protective coverings at walls, projections, corners and jambs, sills, and soffits of openings in and adjacent to traffic areas.
- C. Cover walls and floors of elevator cabs and jambs of cab doors with 3/4-inch plywood, when elevators are used by construction personnel.
- D. Protect finished floors and stairs from dirt, wear, and damage:
 - (1) Secure heavy sheet goods or similar protective materials in place, in areas subject to foot traffic.
 - (2) Lay planking or similar rigid materials in place, in areas subject to movement of heavy objects.
 - (3) Lay planking or similar rigid materials in place, in areas where storage of products will occur.
- E. Protect waterproofed and roofed surfaces:
 - (1) Restrict use of surfaces from traffic of any kind and from storage of products.
 - (2) When an activity is mandatory, obtain recommendations for protection of surfaces from manufacturer. Install protection and remove on completion of activity. Restrict use of adjacent unprotected areas.
- F. Restrict traffic of any kind across planted lawn and landscape areas.

3.02 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Field Representative has witnessed or otherwise referenced their location and shall not move them until directed.
- B. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in its manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the work is completed and accepted.
- C. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the nonexecution thereof by the Contractor, the Contractor shall restore, at its own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner, at no additional cost to MDAD.

END OF SECTION

SECTION 01 55 00

CONTRACTOR'S ACCESS AND EMPLOYEE'S PARKING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor's Access.
- B. Contractor's Employees Parking.

1.02 CONTRACTOR'S ACCESS

- A. Access to and egress from the Site will be gained only via routes and through gates as directed by MDAD and MDAD operations. Access shall be permitted only during periods of time specified in the Contract Documents. Equipment weight and height limits will be strictly enforced.

1.03 CONTRACTOR'S EMPLOYEES' PARKING

- A. Automobiles of all construction workers on the project shall be parked in an area designated for this purpose by the Miami-Dade Aviation Department in a location coordinated by MDAD and Contractor upon the execution of the construction contract. No construction workers' vehicles will be allowed on the construction site. The Contractor shall furnish transportation for construction workers from the designated parking area to the construction site.
- B. Maintain areas free of debris and rubbish. Maintain site in a clean and orderly condition.
- C. If the Contractor fails to maintain levels of cleanliness satisfactory to the Field Representative, then MDAD shall have the right to cause such areas to be cleaned by others. The costs to MDAD for such cleaning, plus 25% for administration, shall be the obligation of the Contractor and shall be deducted from any money due the Contractor hereunder.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 56 30

HANDLING OF INCIDENTAL FUEL SPILLAGE DURING CONSTRUCTION

PART 1 - GENERAL

1.01 SCOPE

- A. This section consists of procedures to be followed in handling material contaminated with petroleum fuel products (hydrocarbons including petroleum, petroleum derivatives, hydraulics and like products) caused by incidental spillage (including leaks) from the Contractor's equipment.
 - i. Incidental spillage shall mean spillage of a quantity not greater than 25 gallons per incident, of vehicular or mechanical equipment fuel products, onto open ground and absorbed or not absorbed by the soils.
 - ii. Spillage or leakage of petroleum fuel products in quantities in excess of 25 gallons shall be immediately remediated by the Contractor using procedures as directed by the MDAD's Environmental Engineering. Whenever such spillage or leakage occur, the Contractor shall immediately notify the Field Representative and the MDAD's Environmental Engineering Division and shall employ the appropriate corrective actions as directed.
- B. The provisions of this Section are limited to incidental petroleum fuel spillage on ground surfaces and it excludes fuel spillage onto surface waters.
- C. Clean-ups are costly and delays progress. They can be avoided if leaks or spillages are eliminated and in case they occur, are managed efficiently and quickly.

1.02 APPLICABLE CODES

- A. Chapter 24 of the Metropolitan Miami-Dade County Code addresses the Environmental Protection Ordinance:
 - 1. Section 24-11(3), of the Miami-Dade County Code stipulates in essence that "it is unlawful to discharge industrial or other wastes to the waters of Miami-Dade County as such discharge may cause water pollution, and constitute a nuisance and sanitary nuisance as defined in Sections 24-3(42), 24-3(58), 24-3(74) and/or 24-26 hereof."
 - 2. Section 24-14, of the Miami-Dade County Code, also stipulates that: "No person shall cause, or allow to be caused any nuisance or sanitary nuisance as defined in Sections 24-3(42), 24-3(58) and/or 24-26 hereof".
 - 3. The above rules apply to all discharges intentional or accidental.
- B. Leaks and spillages may occur when using mechanical equipment. Equipment generated or lubricated with petroleum products, are prone to leaks or spillages, therefore proper management of "spillage incidents" is essential.

PART 2 PRODUCTS

2.01 ABSORBENT MATERIALS

- A. Equip crews or machinery with the most efficient type of petroleum absorbent materials. These

materials are available at petroleum equipment suppliers and must be readily accessible so that spillages can be contained and prevented from becoming greater incidents.

- B. Fiber material, sand or cat litter may be used as an absorbent material. Sufficient quantity of absorbent material capable of absorbing up to 25 gallons of petroleum fuel products shall be stocked at the job site at all times.

PART 3 EXECUTION

3.01 PROCEDURES

- A. Personnel handling waste materials must have a minimum of 40 hours training as defined in 29 CFR 1910.120 and in accordance with certified OSHA course.
- B. The following steps must be adhered to when handling spillages. They also serve as a guide in preventing a minor incident from turning into a major event.
- C. Perform work as specified herein and in accordance with the applicable provisions of MDAD Standard Technical Specifications Section P-160 except that no payment will be made to the Contractor for the cost of handling and disposing of leaks, spillages and materials contaminated by such leaks or spillages.
- D. The steps outlined below are minimum requirements and are merely guidance. They do not constitute a complete compliance procedure.

1. STEP 1

If a fuel contamination to open ground has been discovered, check for the origin of that leak or spillage. Then stop the spillage or leak or positively contain it and then use absorbents to collect the discharged liquid. Immediately notify the Miami-Dade Aviation Department Environmental Engineering.

2. STEP 2

Sand may be used to absorb ground surface spills while absorbent materials may be used to absorb ground spills as well as surface water spills. Once absorption of spilled fuels is complete, the impacted (contaminated) absorbent materials shall be stored in 55-gallon steel drums (100-150 lbs.).

3. STEP 3

The contaminated materials must be collected, containerized and otherwise properly stored and labeled prior to transport to a pre-approved storage, disposal or treatment facility.

All drums used to store impacted (contaminated) absorbent material and/or contaminated soils shall be properly sealed and labeled with the following information:

Name of company (Contractor):
Contract or Project No.:
Location of origin:
Type of contents:
Type of contaminant:

Quantity: (e.g. 1 of 1)

Date:

Containerized by:

Labeled by:

The procedure for the proper handling and disposal of contaminated soils and absorbent materials is readily available through the Florida Department of Transportation (FDOT) and the Miami-Dade County Department of Environmental Resources Management (DERM).

END OF SECTION

SECTION 01 56 90

CONSTRUCTION CLEANING

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Cleaning and disposal of waste materials, debris and rubbish during construction.

1.02 RELATED REQUIREMENTS

- A. General Conditions: Cleaning Up.
- B. Section 01 71 00 Final Cleaning.
- C. Individual Specifications Sections: Specific cleaning for Product or work.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Provide covered containers for deposit of waste materials, debris and rubbish.

PART 3 EXECUTION

3.01 CLEANING

- A. Maintain areas under Contractor's control (including employee parking and Contractor staging areas) free of waste materials, scraps, surplus material, debris and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums attics, crawl spaces and other closed or remote spaces, prior to closing the space.
- C. Clean areas daily to provide suitable conditions for work and MDAD occupied areas, and to prevent fire or accidents.
- D. Use power brooms to clean paved areas daily and immediately prior to opening any paved area to aircraft or vehicular traffic.
- E. All combustible waste materials shall be removed from buildings at the end of each working day.
- F. Broom clean areas prior to start of surface finishing and continue cleaning daily.
- G. Control cleaning operations so that dust and other particulates will not adhere to wet or newly coated surfaces.
- H. Responsibility for construction cleaning shall not be delegated to subcontractors performing construction work under this Contract.

3.02 DISPOSAL

- A. Remove waste materials, debris, and rubbish from site bi-weekly and legally dispose of off-site in an authorized disposal area.

3.03

CONTRACTOR'S FAILURE TO CLEAN

- A. If the Contractor fails to maintain levels of cleanliness in work areas, satisfactory to the Field Representative, then MDAD shall have the right to cause such areas to be cleaned by others. The costs to MDAD for such cleaning, plus 25% for administration, shall be the obligation of the Contractor and shall be deducted from any money due the Contractor hereunder.

END OF SECTION

SECTION 01 57 00

AIRFIELD OPERATIONAL SAFETY DURING CONSTRUCTION

PART 1 - GENERAL

1.01 DESCRIPTION

The work under this Section consists of furnishing all measures required to maintain the safe and orderly movement of Aircraft operating Area (AOA) traffic in and around the construction areas as shown on the Plans and as described in these Technical Specifications.

1.02 GENERAL

This Section covers the Contractor's responsibilities for maintaining the optimum level of safety and the operating efficiency of the airport during construction. These responsibilities are based on criteria contained in current edition of Federal Aviation Administration Advisory Circular AC 150/5370-2E, Operation Safety on Airport During Construction, and in The Airport Height Zoning Ordinance (County Code Article XXXVII, Sections 33-330 to 33-345). The Contractor shall be responsible for all activities, under his control, as specified in the above referenced Advisory Circulars, the Zoning Ordinance and in other referenced documents. In certain cases where the obstacle clearance criteria utilized for this project may differ from that described herein, these variances will be depicted on the Plans.

1.03 RELATED SPECIFICATIONS AND PROVISIONS

The Contract Documents contain several other provisions relating to safety for which Contractor adherence is required. The requirements of Chapter 25 of the Miami-Dade County Code and the related Miami-Dade Aviation Department Operational Directive MIA 19 dated June 17, 1980 shall apply to the work under this Contract.

1.04 OBSTACLE CLEARANCE DURING CONSTRUCTION – RUNWAYS (Not Used)

1.05 OBSTACLE CLEARANCES DURING CONSTRUCTION - TAXIWAYS, TAXILANES AND APRONS

Construction activity, personnel, equipment, or materials shall not be permitted within 154 feet of the centerline of an active taxiway and within 131 feet of the centerline of an active taxilane, unless otherwise shown on the Plans.

1.06 STOCKPILED MATERIAL

- A. Stockpiled material shall be secured against displacement by aircraft engine and propeller blast and ambient winds. Stockpiled materials, equipment and personnel shall not be allowed within the runway, taxiway and taxilane obstacle clearance areas as described in this Article.

PART 2 PRODUCTS

2.01 MARKING AND LIGHTING OF CONSTRUCTION AREAS

- A. The Contractor shall install lighting, marking, barrel barricades, railroad tie barricades lighted commercial barricades, concrete barriers, plastic barricades, signs, and other measures to delineate closed and hazardous areas during construction. The guidance and procedures provided by the current FAA Advisory Circular AC 150/5340-1, including changes, "Marking of Paved Areas on Airports", shall be utilized as depicted on the Plans. Steady burning red obstruction lights may be required in certain instances to supplement lighted barricades or highlight hazardous or potentially dangerous objects. The location of these lights shall be as shown on Plans or as directed by the Field Representative. Obstruction lights and barrel barricades, railroad tie barricades, lighted commercial barricades, plastic barricades, concrete barriers, water filled plastic

protective barriers, and signs shall not be located within runway, taxiway and taxilane obstacle clearance areas.

- B. TEMPORARY MARKER LIGHTS. The Contractor shall install, operate, and maintain temporary marker lights in the locations shown on the Plans. The Contractor shall furnish portable base mounted light fixtures, red and blue lenses, 30/45-watt 6.6/6.2 ampere transformers, and 30-watt 6.6 ampere lamps. The Contractor shall furnish 5000 volts, #8AWG, Type "C", FAA Specification L824 stranded copper cable; compatible connector kits; FAA Specification L823 tape; compression sleeves and any other materials necessary to install, operate and maintain the temporary marker lights.
- C. The Contractor shall also furnish and install the following:
 - (1) Heat shrinkable sleeves, tape, and incidentals,
 - (2) 15-watt lamps for 120V circuit,
 - (3) Necessary wiring, power, connections, etc. to operate lights on 120V circuit,
 - (4) Required staples to keep cable and wire securely fastened to pavement.
 - (5) Pavement sealant to seal pavements when wiring is installed recessed in saw kerfs.
- D. Yellow flashing lights mounted on top of the various types of barricades are not considered marker lights.

2.02 BARREL BARRICADES

- A. The Contractor shall install and maintain barrel barricades in the locations shown on the Plans, in accordance with the approved layout for each construction area, and as directed by the Field Representative. Barrel barricades shall be in accordance with the details shown on the Plans including barrels, lights, ropes, flags, and incidentals. Barrels shall be weighted immediately upon installation, as necessary to prevent displacement by aircraft engine blast and by ambient wind. Barrel barricade lines shall be inspected each day and repaired or replaced as necessary to meet the requirements of the approved layout plan.

2.03 TEMPORARY CONCRETE BARRIERS

- A. Temporary concrete barriers for traffic control and protection shall be New Jersey type precast concrete barriers conforming to the requirements of ASTM C825.
- B. Temporary concrete barrier sections shall be capable of being interlocked and shall be provided with warning flags, steady burning lights and/or flashing lights as required and shall be provided with grooves to allow flow of surface drainage.
- C. The temporary concrete barriers need not be new, but shall be structurally sound, of a quality and type meeting the requirements of these specifications and shall be subject to the Architect/Engineer's approval.
- D. Temporary concrete barriers shall, at the conclusion of the construction or when no longer needed, be relocated, or removed and disposed of as the case may be.

2.04 RAILROAD TIE BARRICADES (Not Used)

2.05 PLASTIC BARRICADES

Plastic barricades, meeting the following requirements, shall only be used when specifically shown on the Plans or ordered by the Field Representative.

- A. Plastic barricades shall consist of a molded plastic I-beam section suspended, by means of a toggle system, from a molded plastic cone.

The assembly shall be designed to remain usable following vehicular impact.

- (1) The plastic barricade (I-beam section and cones) shall be manufactured from high density Polyethylene compounded with Ultraviolet Stabilizer to protect it against ultraviolet exposure and outdoor weathering.

- (2) The cone shall consist of a stem and a base. The base shall be hollow and so manufactured as to allow for external and internal ballasting (using water, sand, or other suitable material), to provide a ballast weight of approximately 20 lbs.
- (3) The dimensions of the various elements of the plastic barricade system shall be as follows:

Overall Height	45"	
Base Dimension	18" x 18" x 4"	
Weight (unballasted)	7 3/4 lbs.	
Outside diameter stem		
Top		3 1/4"
Bottom		6"
Wall Thickness	1/8" +/- 1/32"	
<u>I-Beam Section</u>		
Depth (reflective areas)		8"
Lengths (as ordered by the Field Representative)		36" or 48"
Wall Thickness		1/8"
Weight		1.2 lbs. per foot

- B. The plastic barricade assembly shall be equal to MAXICADE System as manufactured by Glasdon - Traffic Services Incorporated (distributed locally by Saft T Store, West Palm Beach, Telephone: 1-407-793-5817) or approved equal.
- C. The I-beam section shall be capable of being mounted (using a flexible toggle system) on the plastic cones. The cones shall be designed to support the I-beam sections and also to support traffic lights.
- D. The plastic barricade assembly shall be impregnated with traffic orange color. White reflective sheeting shall be applied to the I-beam section to form a series of alternating 6-inch-wide stripes, traffic orange and reflective white, at 45° angle.

2.06 PLASTIC PROTECTIVE BARRIERS (WATER FILLED)
 The water filled plastic protective barriers shall be the Yodock Barrier, the Guardian Safety Barrier, or approved equal.

The plastic protective barrier shall meet the following and shall be:

- A. Color impregnated with the colors shown on the plans or as approved by the Architect/Engineer.
- B. Resistant to damage caused by ultraviolet rays.
- C. Manufactured with internally molded baffles (to maintain its shape), be properly sealed, is leakproof, provided with drain plugs and underside grooves to allow flow of surface drainage.
- D. Barrier sections shall, when installed in a row, be interlocked in an approved manner; end-to-end length of each installed section shall be not less than 72 inches; each water filled section shall weigh not less than 1650 pounds.
- E. Provided with securely mounted warning flags, steady burning lights and/or flashing lights as required.

The plastic protective barrier shall, at the conclusion of the construction or when no longer needed, be relocated, or removed and disposed of as the case may be.

PART 3 EXECUTION

3.01 LOOSE MATERIALS AND DEBRIS

- A. Loose materials shall be removed from the active portion of the AOA, placed in protected areas, or otherwise secured to prevent dispersal into active portions of the AOA. The AOA is defined as all areas used or intended to be used for aircraft operations including active runways, aprons, taxiways, taxilanes, etc. Debris shall be promptly removed from the AOA. The Contractor shall exercise care in the transportation of materials within the AOA. Materials tracked or spilled in the AOA shall be removed immediately. When hauling, loading, grading, or when any of the

Contractor's activities are likely to cause the deposit of loose materials in the AOA, it shall be immediately removed using powered vacuum sweepers which shall continuously patrol the affected areas. The sweepers shall be supplemented by hand sweepers, loaders, trucks, etc., as necessary.

3.02 VEHICLES AND MOBILE EQUIPMENT

- A. All Contractor vehicles and mobile equipment operating in the AOA shall be identified by three foot (3') square orange and white flags whenever such vehicle and equipment is operating on or about the AOA. In addition, such vehicles and equipment shall have the Contractor's name clearly affixed on each side of such vehicles and equipment, all in accordance with current MDAD requirements. During the hours between 30 minutes before sunset and 30 minutes after sunrise and at all times when visibility is impaired, vehicles and mobile equipment shall also be equipped with a revolving yellow beacon light mounted on the top of the vehicle or equipment. Beacon lights shall provide:
- (1) Three hundred sixty-degree azimuth coverage.
 - (2) Effective intensity in the horizontal plane not less than 40 or more than 400 candelas.
 - (3) Beam spread measured to 1/10 peak intensity extending from 10 degrees to 15 degrees above the horizontal.
 - (4) Sixty to ninety flashes per minute.
- B. All Contractor vehicles and mobile equipment not individually authorized by the MDAD for independent operation in the AOA shall be operated under escort while in the AOA. The escort vehicle and its driver must be authorized by the MDAD for escort duty and for operation within the AOA. If access to the construction, staging or storage sites requires the crossing of an active runway or taxiway, all vehicles shall be escorted across said runway or taxiway by either a MDAD escort vehicle or a vehicle equipped with a VHF-AM Transceiver specifically authorized by MDAD to cross these operational pavements. No crossing of active taxiways or runways by vehicles so equipped shall be made without first obtaining specific clearance from the FAA Air Traffic Control Tower.
- C. No crane shall be allowed on the work site until the equipment and its intended operation is approved by MDAD Airside Operations, or the Airport Manager, in accordance with the requirements of General Condition Article 4.14. The Contractor shall provide MDAD Airside Operations with not less than 24-hour advance written notice requesting crane access to the AOA. This request shall utilize the standardized MDAD "Request for Crane Clearance to [Insert Name of Airport] Airport".
- D. When access is approved by MDAD, the tip of the crane boom shall be identified by the orange and white flag mentioned above and, by red obstruction lights if required by FAA.

3.03 CLOSURES

- A. Prior to the commencement of any demolition or other work which will cause an interruption or modification to existing aircraft operations, the Contractor shall confer with, and obtain written authorization from the Field Representative.
- B. When the Contractor's operations require the closure of any runway, taxiway, apron, roadway, service gate, walkway, etc., the Contractor shall notify the Field Representative not less than 48 hours prior to need. No runway, taxiway, apron, roadway, service gate, walkway, etc., shall be closed without prior written authorization from the Field Representative.
- C. If the Contractor requires access to operational areas not delineated on the Construction Safety Plan Drawing(s), the Contractor shall participate in negotiations leading to the imposition of restrictions on airport operations in the affected areas; the Contractor shall strictly abide by all conditions imposed by MDAD relating to its entry and use of such areas and the Contractor shall not enter these areas until granted temporary, conditional entry clearance by MDAD.
- D. Trenching, excavation, and other work requiring temporary runway or taxiway closure shall be limited by the Contractor to that amount of work that can be completed within the hours of minimal operation. All ditches, excavations, etc., shall be restored prior to the end of the work period and affected pavements returned to service. This work shall be scheduled during hours of minimal operations. Unless otherwise noted in the Contract Documents, hours of minimal

operation shall be defined as the hours between 11:00 P.M. and 7:00 A.M. daily. All other hours are considered hours of normal operation.

- E. The Contractor may be required to pursue affected portions of the work on a continuous 24 hour per day basis during construction of the various phases and subphases shown on the Plans and described in the Contract Documents (such as when runways or taxiways, aprons, service or access roadways, or service gates are closed for operation or when hazards of any kind arise).

3.04 LIGHTS, LIGHT LINES, SIGNS AND PAVEMENT MARKINGS

- A. Red and blue lens, ground-mounted, taxiway marker lights, pavement markings, signs, lighted barricades and other measures shall be installed and maintained (except as provided herein below) on a 24-hour basis by the Contractor to delineate construction areas available to the Contractor and limits of aircraft operational areas. At the conclusion of each working day, the Contractor shall verify that the temporary lighting systems are in proper operation condition. Any necessary maintenance repairs shall be performed by the Contractor prior to leaving the site. The detailed layout of marking, lights, signs and barricades and other measures for each construction area are shown on the Plans. The actual field installation of markings, lighting, barricades, signs, and other measures and attendant operational procedures shall be inspected by MDAD Airside Operations and any necessary changes or modifications will be promptly implemented by the Contractor as directed. The revised installation will be reinspected and approved by the Field Representative and the County before the Contractor may commence any construction or any other work which revises operational procedures in each affected area.
- B. The Contractor shall provide all materials for installing pavement marking, marker lights, and lighted barricades. The MDAD Maintenance Division will provide, when so prescribed in the Contract Documents, certain materials to the Contractor for its use in establishing the temporary light lines designated on the Construction Safety Plan Drawings. The Contractor shall be responsible for the installation of these materials and the return to MDAD of all these equipment and materials in good repair and working order, in a condition satisfactory to and acceptable to MDAD.
- C. Connections to power supply for all temporary lighting systems shall be performed by the Contractor under the direction of the MDAD Maintenance Division.
- D. Maintenance of all temporary lighting systems shall be performed by the Contractor except that nighttime trouble shooting of temporary lighting connected to any airfield lighting system will be provided by the MDAD Maintenance Division.
- E. The Contractor shall install the temporary marker lights in the locations shown on the Plans or as directed by the Field Representative; provide cable connections to existing circuits and decommission or mask existing lights as shown on the Plans. If no existing taxiway circuits are available, the Contractor shall provide and install a constant current transformer including connections and cable runs as necessary to energize the temporary light units. All cable runs installed across pavement shall be made along existing pavement joints. Saw kerfs shall be sealed, using approved suitable sealant, after cable installation. The Contractor shall demonstrate the functional integrity of the temporary marker light system by field test before the system is approved by Field Representative for operational use.
- F. The Contractor shall maintain the temporary marker light system in full operational capability during the term of use. Each day at the close of the work shift, the Contractor shall test and repair the system as necessary to restore full operational capability. The Contractor shall provide 24-hour, 7 day per week maintenance service. Trained maintenance technicians shall be available and "On Call" at all times; the Contractor shall provide the Field Representative with address and telephone numbers of the technicians so that they may be contacted at any time.
- G. The Contractor shall relocate and modify the temporary lighting systems as required to accommodate the progress of the construction.
- H. Upon completion of the work within an AOA, and when the temporary marker lights are no longer needed, the Contractor shall remove all such temporary installation and restore the site prior to opening it to aircraft traffic.

3.05 OPERATIONS SAFETY INSPECTION

- A. The entire work site shall be inspected daily and more frequently if construction activities are of a nature that debris may be expected to accumulate on AOA pavements. Special inspections shall be conducted for each work area prior to return to service for aircraft operation. The purpose of these inspections is to ascertain that areas returned to aircraft service are in satisfactory condition and that the overall work site and its activities are within the safety criteria set forth in these Contract Documents. Inspections shall be conducted jointly by representatives of the Contractor, the MDAD Airside Operations Division, the Field Representative and the affected airlines. These inspections shall cover the several safety items noted in and referred by this Article. The report of such inspections shall be filed utilizing the Preoperation and Preconstruction checklist forms, a copy of which is appended to this Section.
- B. Any violations of the Safety Criteria found during these inspections shall be rectified immediately. If a violation cannot be corrected on an immediate basis by the Contractor, the Contractor shall immediately notify the Field Representative. No area shall be approved for aircraft operations while it is in violation unless specifically authorized by MDAD [Airside Operations] [Airport Manager], the Field Representative and the designated airline representative.

3.06 OPERATIONAL EMERGENCIES

- A. During periods of severe weather conditions or other operational emergencies, the Owner may direct the Contractor to relinquish areas under construction and to prepare the areas for aircraft operations. In this event the Field Representative will so direct the Contractor to evacuate the area and the Field Representative will specify the limits of the area to be evacuated, the term of evacuation and the conditions governing the restoration work necessary to prepare the area for aircraft operation. The Contractor shall promptly and fully comply with the Field Representative's directive. Should the directive entail extra work under the Contract, as determined by the Field Representative, the Contractor will be reimbursed for such extra work in accordance with the provisions of the applicable Allowance Account item. Should the directive entail a delay in the completion of the Contract or any defined subdivision of the contract, as determined by the Field Representative, such delay shall be considered a Non-Compensable Excusable Delay in accordance with the requirements of the General Conditions.

3.07 FINAL CLEANUP

- A. After work in any work area has been completed and before opening it to traffic, the Contractor shall remove all temporary traffic control devices, temporary pavements, and other temporary work and devices installed for traffic control. The Contractor shall restore the site to its original condition or to the revised condition shown on the Plans.

4.01 METHOD OF MEASUREMENT (Not Used)

5.01 BASIS OF PAYMENT

- A. Payment for the quantities determined shall be made at the lump sum price bid for the item Maintenance of Aircraft operating Area Traffic for the items Temporary Marker Lights of each category, Barrel Barricades, Plastic Barricades, and Temporary Concrete Barriers which prices and payments shall constitute full compensation for furnishing all labor, materials, equipment and incidentals required to complete the work under this Section. Furnishing, installing, and maintaining yellow flashing lights shall be considered incidental to and included in the unit prices bid for the various barriers and barricades items.
- B. No separate measurement or payment for the cost of removing and/or relocating the various maintenance of traffic devices, but the cost therefore shall be deemed included in the lump sum price bid.
- C. The prices bid for the various items under this section shall include the cost of maintaining the various devices including replacing exhausted batteries, defective lamps, painting, etc. as required to maintain the various devices in good operational condition.
- D. Payment shall be made under:

Item [Maintenance of Aircraft operating Area Traffic - per lump sum]

OR

- Item [Temporary Marker Lights Furnished by Contractor - per light per day]
- Item [Temporary Marker Lights Furnished by Owner and Installed by Contractor - per light per day]
- Item [Barrel Barricades - per barrel per day]
- Item [Temporary Concrete Barriers - per linear foot]
- Item [Plastic Protective Barrier (Water Filled) - per linear foot]
- Item [Railroad Tie Barricades - per linear foot]
- Item [Plastic barricades, 3 feet long - per barricade per day]
- Item [Plastic barricades, 4 feet long - per barricade per day]

END OF SECTION

SECTION 01 57 10

MAINTENANCE OF AIRPORT LANDSIDE TRAFFIC

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work to be performed under this Section shall consist of all work and all measures to be employed to maintain the efficient and orderly movement of airport landside traffic in the area of construction as shown on the Plans and as described in this Section.

1.02 GENERAL

- A. The Contractor shall provide, install, and maintain the temporary traffic control devices, furnish flaggers, and perform all work required to conform to the provisions of this Section.
- B. Before commencing work in any area, the Contractor shall install the temporary traffic control devices, stations, etc., at the work site, and shall obtain the approval of the Field Representative before commencing any work that affects, in any way, the existing traffic flow. The on-site layout shall consist of a mockup of temporary pavements, covered signs and staked or marked locations of all proposed temporary traffic control devices. After obtaining Field Representative approval of the mockup, the Contractor shall implement the revised traffic movement by installation of the approved temporary traffic control devices, flaggers, etc.
- C. The revised traffic movement shall be observed, and the layout altered as necessary to achieve the efficient and orderly flow of traffic through the proposed construction area. Only after the layout has been so tested and approved will the Contractor be permitted to commence construction work in the area.

PART 2 PRODUCTS

- 2.01 Traffic control devices, warning devices and barriers shall be as shown, and meeting the applicable requirements of the current edition of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction and the FHWA Manual or Uniform Traffic Control Devices (MUTCD); subject to the Field Representative's approval.

PART 3 EXECUTION

3.01 MAINTENANCE OF TEMPORARY TRAFFIC CONTROL DEVICES, PAVEMENTS, AND FACILITIES

- A. The Contractor shall maintain all traffic control devices in proper repair and working order. The Contractor shall also maintain all pavements constructed or utilized for temporary traffic movement, and shall maintain all other traffic service facilities such as guardrail, area lighting, etc., necessary for the efficient and orderly movement of traffic within the construction area.
- B. In the event of the Contractor's failure to properly maintain any of these devices, pavements or facilities, the County may cause such maintenance, as it deems necessary, to be performed by its own or another Contractor's forces and the costs of such maintenance shall be deducted from monies due the Contractor for work performed under this Contract.

3.02 INTERFERENCE WITH AIRPORT LANDSIDE TRAFFIC

- A. The Contractor shall conduct their work so as to cause no unnecessary interference with airport landside traffic and it shall comply with all requirements governing its employee parking, areas prohibited to his operation, and access routes to authorized work areas.
- B. The Contractor shall not permit its workers and equipment to interfere with the movement of airport landside traffic in those areas adjacent to its work areas. The

Contractor shall not obstruct sight lines, create obstructions to lighting nor create hazards or nuisance by allowing spills or wind transported materials to accumulate in traffic areas.

- C. The Contractor shall maintain at the work site an approved powered rotary broom sweeper. The Contractor shall promptly remove any spills or wind-transported debris occurring on traveled roadways.

3.03 FINAL CLEANUP

- A. After work in any work area has been completed and before moving to a new work construction area, the Contractor shall remove all temporary traffic control devices, temporary pavements and other temporary work and devices installed for traffic control. The Contractor shall restore the site to its original condition or to the revised condition shown on the Plans.

3.04 OPERATIONAL EMERGENCIES

- A. During periods of unusually heavy traffic movement or other traffic emergencies, the County may direct the Contractor to relinquish areas under construction and to restore the construction area to serve airport landside traffic. In this event, the Field Representative will so direct the Contractor to evacuate the area; and the Field Representative will specify the limits of the area to be evacuated, the term of the evacuation and the construction governing the restoration work to be performed. The Contractor shall promptly and fully comply with the Field Representative directive. Should the directive entail extra work under the Contract, and the Field Representative shall so determine, the Contractor will be reimbursed for such extra work in accordance with the applicable provisions of the General Conditions "Allowance Accounts". Should the directive entail a delay in the completion of the Contract or any defined subdivision of the Contract, and the Field Representative shall so determine, the delay will be considered as Non-Compensable Excusable Delay in accordance with the applicable provisions of the General Conditions.

END OF SECTION

SECTION 01 59 00

FIELD REPRESENTATIVE'S OFFICE AND TESTING LABORATORIES

PART 1 - GENERAL

- 1.01 REQUIREMENTS INCLUDED
- A. Field Representative's Office.
 - B. Testing Laboratories.
 - C. Maintenance and Janitorial Services and Cleaning.
 - D. Removal.
- 1.02 RELATED REQUIREMENTS
- A. Section 01 01 00 Summary of Work.
 - B. Sections 01 51 10 thru 01 51 60 Temporary Utilities.
 - C. Section 01 56 90 Construction Cleaning.
 - D. Section 01 60 00 Material and Equipment.
 - E. Section 01 71 00 Final Cleaning.

PART 2 PRODUCTS

2.01 Temporary construction trailers used for office personnel with more than one desk for support staff of designers, auditors, purchasing agents, computer operators etc. shall comply with the Florida Accessibility Code (FAC) for buildings, and associated local permitting and inspection regulations. Evidence that the building itself has been approved by the state and is not subject to the locally adopted building codes must be provided to and approved by Planning Development and Regulation (Planning and Zoning). Contractor shall provide office space and separate meeting room for Field Representative that meet the minimum work environment requirements for normal office functions.

PART 3 EXECUTION

- 3.01 FIELD REPRESENTATIVE'S OFFICE
- A. Separate space for sole use of the Field Representative with separate entrance door with new lock and five (5) keys.
 - B. Area: Minimum 220 sq.ft. with minimum dimension 10 ft. and separate office of 120 sq.ft. Provide a separate room approximately 100 s.f. for project meetings, furnished with a conference table, folding chairs and a tack board.
 - E. Provide duplex convenience outlets, spaced at 12' intervals, with a minimum of one per wall in each room.
 - F. Switch controlled fluorescent light fixtures, capable of maintaining minimum illumination of 20 foot-candles at desk height.
 - H. Sanitary Facilities, cold water fountain and access to lavatory-toilet facilities with mirror, toilet and towel paper dispensers, soap and waste receptacle.
 - I. Furnishings:

- (1) One standard size desk with six drawers and a swivel arm desk chair.
- (2) One conference table to seat 6 people, 6 folding chairs.
- (3) 1 plan rack(s) to hold a minimum of 12 sticks of project drawings.
- (4) 2 standard four-drawer legal-size metal filing cabinets with file separators and locks provided with not less than 2 keys.
- (5) hours fireproof, four-drawers legal size filing cabinet with lock and not less than 2 keys.
- (6) 6 Lin. Ft. of 12" bookshelves in main space and eight Lin. Ft. of 2-tier shelving in office.
- (7) 2 straight chairs.
- (8) One waste basket per desk and table.

3.02 TESTING LABORATORIES

- A. Provide laboratories and laboratory equipment as required.

3.03 STORAGE AREAS AND SHEDS

- A. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products under provisions of Section 01 60 00.

3.04 PARKING FACILITIES

- A. Provide well drained, graded paved or at least well compacted gravel surface for use by the Field Representative's and MDAD's staff. Provide not less than [] parking spaces.

3.05 MAINTENANCE AND CLEANING

- A. Daily janitorial service for offices; periodic cleaning and maintenance for storage areas. Weekly trash collection.
- B. Maintain approach walks free of mud and water.
- C. The Contractor assumes full responsibility for all costs associated with equipment and services provided for the Field Representative's office (including costs for equipment and/or services which are provided by the Contractor, but which are not specifically required by this Article).

3.06 REMOVAL

- A. At final completion of work or earlier if agreed by MDAD and Field Representative, remove buildings, foundations, utility services and debris. Restore area.

END OF SECTION

SECTION 01 60 00

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Products.
- B. Transportation and Handling.
- C. Storage and Protection.
- D. Product Options.
- E. Product List.
- F. Substitutions.
- G. Product Demonstrations.

1.02 RELATED REQUIREMENTS

- A. General Conditions.
- B. Section 01 01 00 Summary of Work.
- C. Section 01 09 00 Reference Standards.
- D. Section 01 40 50 Contract Quality Control. Submittal of manufacturer's certificates.
- E. Section 01 74 00 Warranties and Guarantees.
- F. Section 01 81 00 Commissioning Requirements.

1.03 PRODUCTS

- A. Products include material, equipment and systems.
- B. Comply with Specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a Specification section shall be the same and shall be inter-changeable.
- D. Do not use materials and equipment removed from existing structure, except as specifically required, or allowed, by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

- A. Transport products by methods to avoid product damage. Deliver materials to job site in manufacturer's original unopened containers clearly labeled with manufacturer's name, brand designation and reference specification.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage. Handle

products in such a manner as to prevent breakage of containers and damage of any kind.

- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged. Damage sustained by products in transit to job site shall be repaired to the satisfaction of the Field Representative. If damage sustained while transporting products to job site is non-repairable, the products shall be replaced with new ones at no cost to MDAD.

1.05 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Exposed metal surfaces, not provided with manufacturer specific storage instructions, shall be protected with a light oil or silicone coating to prevent rust while in storage. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.06 ENCLOSED STORAGE

- A. Store products, subject to damage by the elements, in substantial weather tight enclosures.
- B. Maintain temperature and humidity within ranges stated in manufacturer's instructions.
- C. Provide humidity control and ventilation for sensitive products as required by manufacturer's instructions.
- D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

1.07 EXTERIOR STORAGE

- A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling, staining, and corrosion.
- B. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.
- C. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
- D. Provide surface drainage to prevent erosion and ponding of water.
- E. Prevent mixing of refuse or chemically injurious materials or liquids.

1.08 MAINTENANCE OF STORAGE

- A. Periodically inspect stored products on a scheduled basis. Maintain a log of inspections, make available to Field Representative on request.
- B. Verify that storage facilities comply with manufacturer's product storage requirements.
- C. Verify that stored products exposed to the elements are not adversely affected; that any weathering of

finishes is acceptable under requirements of Contract Documents.

1.09 MAINTENANCE OF EQUIPMENT STORAGE

- A. For electrical equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions shown on exterior of package.

- B. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a record document.

1.10 PRODUCT OPTIONS/SUBSTITUTIONS

- A. Product Options/Substitutions shall be in accordance with the requirements of the General Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 70 10

CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Administrative provisions for Substantial completion and for Final Acceptance.

1.02 RELATED REQUIREMENTS

- A. Section 01 01 00 Summary of work.
- B. Section 01 71 00 Final Cleaning.
- C. Section 01 72 00 Project Record Documents.
- D. Section 01 74 00 Warranties and Guarantees.
- E. Section 01 81 00 Commissioning Requirements.
- F. Respective Technical/Specification Sections of Project Manual.

1.03 SUBSTANTIAL COMPLETION

- A. See General Conditions.

1.04 FINAL COMPLETION

- A. See General Conditions.

1.05 REINSPECTION FEES

- A. Should status of completion of work require reinspection by the Architect/Engineer and/or the Project Testing Laboratory, due to failure of work to comply with Contractor's claims on initial inspection, MDAD will deduct the amount of the Architect/Engineer and/or the Project Testing Laboratory compensation for reinspection services from final payment to Contractor.

1.06 CLOSEOUT SUBMITTALS

- A. Evidence of Compliance with Requirements of Governing Authorities:
 - 1. Certificate of Occupancy or Temporary Certificate of Occupancy at Substantial Completion.
 - 2. Certificates of Final Inspection required for Lightning Protection and Electrical Systems required at Substantial Completion.
- B. Project Record Documents: Under provisions of Section 01 72 00 by Substantial Completion.
- C. Warranties and Guarantees: Under provisions of Section 01 74 00 by Final Acceptance.
- D. The Contractor shall prepare and submit a final actual cost breakdown based on the following category descriptions:
 - 1. BUILDINGS

All costs incident to construction of new buildings and improvements to existing structures. Component items such as electrical wiring, and any other

improvements/additions that are a permanent part of the structure are also included in this category.

2. (PORTABLE) FURNITURE, MACHINERY & EQUIPMENT

The following classes of items are included in this category: Furniture and equipment, radio equipment, computer equipment, revenue control equipment, individual (window type) air conditioner units, all shop equipment and machinery.

A detailed listing including a description, model number, manufacturer, serial number (if any), together with original invoice and must be submitted to the MDAD Accounting Division's Fixed Asset Section as part of the final cost breakdown. Manufacturer's warranty information and operating manuals must also be turned over to MDAD Facilities Division. The Finance Division's Fixed Asset Section will inventory these items upon turnover to the MDAD. Transfer of Title to office trailers must be made to the name of 'Miami-Dade County, Florida' and must be submitted to the MDAD Finance Division with the final cost breakdown.

E. Itemized List for Spare Parts and Extra Stock, Keys and Keying Schedule: Under provisions of Technical Specifications Section for finish hardware by Substantial Completion.

F. Evidence of Payment and Release of Claims: In accordance with the General Conditions and Subcontractor's Affidavit(s) of Satisfaction and/or Consent of Surety to Final Payment.

1.07 STATEMENT OF ADJUSTMENT OF ACCOUNTS - CERTIFICATE OF FINAL ACCEPTANCE

A. MDAD will prepare Final Payment Certificate reflecting adjustment to Contract Amount indicating:

1. Original Contract Amount.
2. Change Orders.
3. Work Orders - Charges against Allowance Accounts.
4. Deductions for uncorrected or deficient work.
5. Deductions for liquidated damages.
6. Additions for compensable excusable delays.
7. Deductions for reinspection fees.
8. Other adjustments to Contract Amount.
9. Total Contract Amount as adjusted.

B. The Architect/Engineer will issue a final Change Order, if required, reflecting approved adjustments to Contract Amount not previously made by Change Orders.

1.08 APPLICATION FOR FINAL PAYMENT CERTIFICATE

A. Submit application for final Payment Certificate in accordance with provisions of General Conditions.

B. Final Payment will not be made until the Contract Closeout Procedures have been completed and executed as specified above.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 71 00

FINAL CLEANING

PART 1 - GENERAL

1.01 REQUIREMENT INCLUDED

- A. Final cleaning of all exterior areas impacted by the project.

1.02 RELATED REQUIREMENTS

- A. Section 01 56 90 Construction Cleaning: Cleaning during construction.
- B. Section 01 70 10 Contract Closeout Procedures.
- C. Individual Specifications Sections: Specific cleaning for product or work.

1.03 DESCRIPTION

- A. Execute cleaning prior to inspection for Beneficial Occupancy or Substantial Completion of each designated portion of the Work.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

- A. Use materials which will not create hazards to health or property, and which will not damage surfaces.
- B. Use only material and methods recommended by manufacturer of material being cleaned.

PART 3 EXECUTION

3.01 CLEANING

- A. Upon completion of the work and before acceptance and final payment is made, remove from the Site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, etc. Repair or replace, in an acceptable manner, private or public property which may have been damaged or destroyed due to the Contractor's operations, except when such property is required to be altered or demolished under the Contract, and leave the Site in a clean and orderly condition. Material cleared from the Site and deposited on adjacent property will not be considered as having been disposed of satisfactorily.
- B. All areas within and contiguous to the work under the Contract, including all exterior and interior surfaces and items where work has been performed, as well as all areas having been used for ingress and egress of materials and personnel or storage of materials, shall be turned over to the MDAD in a neat and "polished" home-clean condition. "Broom-clean", as used in the construction industry, will not suffice.
- C. All roof areas where work is performed shall be cleaned of all debris and excess materials. Particular attention shall be given to gutters, downspouts, leader heads, and scuppers to assure there is no blockage of any kind. Roof areas shall be inspected to ensure that no damage to roof membranes has occurred. Any damage so discovered caused by the Contractor's operations shall be repaired by a licensed roofer at no additional cost to MDAD.
- D. All wall areas shall be free from extraneous paint, splatter or spillage of roofing materials, adhesion of asphaltic paving materials or any other defacement. Walls so defaced shall be cleaned and/or painted in an approved manner at no additional cost to MDAD.

- E. All concrete walks, aprons, etc., including adjacent pavement shall be cleaned and free from building materials, containers, dust, dirt, sand, and all other incidental debris. Areas shall be well swept and, if directed by the Field Representative, shall be hosed down with clean water.
- F. All barricades, fences, Field Representative's office, construction offices, etc., field testing laboratories and all Contractor's tools, equipment, etc., shall be removed from Airport Property.
- G. All glass shall be thoroughly cleaned and polished on both sides.
- H. The paint line for glass in painted surroundings, whether wood, metal, putty or other glazing compounds, shall be neat, clean and straight.
- J. Power-scrub and detergent clean all wall surfaces.

END OF SECTION

SECTION 01 72 00

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

- 1.01 REQUIREMENTS INCLUDED
- A. Maintenance of Record Documents and Samples.
 - B. Submittal of Record Documents and Samples.
- 1.02 RELATED REQUIREMENTS
- A. Section 01 05 00 Surveying and Field Engineering.
 - B. Section 01 34 00 Shop Drawings, Product Data and Samples.
 - C. Section 01 70 10 Contract Closeout Procedures.
 - D. Individual Technical Specifications Sections: Manufacturer's certificates and certificates of inspection.
- 1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES
- A. Follow requirements of project General Conditions for Contract Documents at the Site.
 - B. Store Record Documents and samples in Field Office apart from documents used for construction. Provide files, racks and secure storage for Record Documents and Samples.
 - C. Label and file Record Documents and samples in accordance with Section number listings in Table of Contents of this Project Manual. Label each document 'PROJECT RECORD' in neat, large printed letters.
 - D. Maintain Record Documents in clean, dry and legible conditions. Do not use Record Documents for construction purposes.
 - E. Keep Record Documents and Samples available for inspection by MDAD and Consultant.
- 1.04 AS-BUILT INFORMATION
- A. Record information of actual built conditions shall be provided by the Contractor after substantial completion electronically. The package should include all construction related information in addition to the red-line field set of drawings and project manual, as specified in the General Conditions.
 - B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.
 - C. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
 - D. Contract Drawings and approved Shop Drawings: Legibly mark each item to record actual construction, including:

- (1) Measured depths of elements of foundation in relation to finish grade or first floor datum.
 - (2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - (3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - (4) Field changes of dimensions and details.
 - (5) Changes made by Addenda, Change Order(s) (if any) and Work Order(s) (if any).
 - (6) Details not on original Contract Drawings.
 - (7) References to related Shop Drawings and Modifications.
- E. Specifications: Legibly mark each item to record actual construction, including changes made by Addenda and Change Order.
- F. Other Documents: Maintain manufacturer's certification, inspection certifications, field test records, and as required by individual Specification Sections.
- G. MDAD Maintenance Data Sheets: Complete the database sheets forms in the sections made available from MDAD, for the equipment installed under the Contract. Completed, typed forms shall be included in the appropriate O & M Manuals.

1.05

SUBMITTALS

- A. At Substantial Completion, deliver Record Documents and samples under provision of Section 01 70 10, excluding as-built drawings/specifications as stated below.
- B. Transmit with cover letter in duplicate, listing: (1) Date; (2) Project Title and Number; (3) Contractor's name, address and telephone number; (4) Number and Title of each Record Document; (5) One transparency and two black or blue line copies of all approved shop drawings; (6) copy of approved shop drawing log; (7) Copy of the Field Representative review log attesting to its review of the As-Built Documents.
- C. Submittal of as-built drawings/specifications shall be after resolution of the punch list items are complete. One original marked up set and one complete copy of each shall be provided.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 74 00

WARRANTIES AND GUARANTEES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Preparation and submittal of warranties and guarantees.
- B. Schedule of submittals.

1.02 RELATED REQUIREMENTS

- A. Instruction to Bidders: Bid Bonds.
- B. Contractor's Performance and Payment Bonds.
- C. Section 01 70 10 - Contract Closeout Procedures.
- D. Individual Technical Specifications Sections: Warranties and Guarantees required for specific products or work.

1.03 FORM OF SUBMITTALS

- A. Bind in commercial quality 8 ½ x 11 inch three-ring side binders, with hardback, cleanable, plastic covers. In addition, furnish copy of all the documents electronically in PDF format.
- B. Label cover of each binder with typed or printed title 'WARRANTIES AND GUARANTEES', with Contract No. and Project Title; name, address and telephone number of Contractor.
- C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified and the name of the product or work item.
- D. Separate each warranty or guaranty with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheet as necessary. List subcontractor, supplier and manufacturer, with name, address and telephone number of responsible principals.
- E. Include a copy of the applicable warranty/guaranty in O & M manuals.

1.04 WARRANTY PERIOD AND PREPARATION OF SUBMITTALS

- A. Obtain warranties and guarantees, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work. Date of beginning of time of warranty will be the date of Substantial Completion, or date of Beneficial Occupancy if equipment is put to use by MDAD at date of Beneficial Occupancy. No warranty shall start prior to equipment being put into operation. It is not necessary that all warranties shall start at the same time.
- B. Equipment warranty period: Manufacturer's standard warranty, minimum one year from above date of beginning of warranty, except as stated elsewhere.
- C. Full-service period: Installing contractor shall provide for full service and maintenance for a period of one year for the equipment/systems, except as stated elsewhere. If, within this period, any equipment proves defective, it shall be repaired or replaced at no additional cost to MDAD.

- (1) The service and maintenance shall include monthly inspections and adjustments, based on an Owner approved monthly service schedule.
- (2) Each service and maintenance trip to the project shall be coordinated and reported to MDAD Maintenance and have a separate written report so an accurate log can be kept on the operation and problems of the installation.
- (3) Monthly service schedule, showing tasks and service timetable, shall be submitted to MDAD Maintenance (through the FR), for review and approval prior to substantial completion.
- (4) Coordination with MDAD and distribution of monthly maintenance/service reports to PM, CA, and MDAD Maintenance shall be the responsibility of the General Contractor.

D. Co-execute submittals when required.

E. Retain warranties and guarantees until time specified for submittal.

1.05 TIME OF SUBMITTALS

A. Make submittals per Section 01 70 10 and General Conditions.

B. For items of work when acceptance is delayed beyond date of Substantial Completion, as stated in Section 01 70 10, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty or guaranty period.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 75 00

MEASUREMENT OF QUANTITIES

PART 1 - GENERAL

- 1.01 All work completed under the Contract will be measured by the Field Representative, using United States Customary Units of Measurement. The Field Representative shall afford the Contractor an opportunity to witness or participate in the measurements and to review all calculations relating to final measurements.
- 1.02 The method of measurement and computations to be used in the determination of quantities of material furnished and of work performed under the Contract will be those methods generally recognized as conforming to good engineering practice.
- A. Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 4 square feet or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the Plans or ordered in writing by the Field Representative.
- B. Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
- C. Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, and similar items shall be measured parallel to the base or foundation upon which such items are placed.
- 1.03 The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inches.
- 1.04 The term "ton" will mean the short ton consisting of 2,000 pounds avoirdupois. All materials which are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designated by the Field Representative. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material be paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the Field Representative directs, and each truck shall bear a plainly legible identification mark.
- 1.05 Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Field Representative, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.
- 1.06 Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.
- 1.07 SCALES
- A. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales.

- B. Scales shall be accurate within one-half percent of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of a Florida State certified scale technician before beginning work and at such other times as requested by the Field Representative. Scale weight unit intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of 1 percent of the nominal rated capacity of the scale, but not less than 1 pound. The use of spring balances will not be permitted.
 - C. Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the inspector can safely and conveniently view them.
 - D. Scale installations shall have available ten standard 50-pound weights for testing the weighing equipment.
 - E. Scales must be tested for accuracy, adjusted, sealed and serviced by an approved Florida State certified scale technician, as often as the Field Representative deems necessary, before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.
 - F. Scales shall be State certified and shall meet the requirements of Article 7-18 of the current edition of FDOT Standard Specifications for Road and Bridge Construction.
 - G. Scales "overweighing" (indicating more than correct weight) will not be permitted to operate, and all materials received after the last previous correct weighing-accuracy test will be reduced by the percentage of error in excess of one-half of 1 percent.
 - H. In the event inspection reveals the scales have been "underweighing" (indicating less than correct weight), they shall be adjusted, and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.
 - I. All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this Section, for the weighing of materials for proportioning or payment, shall be included in the contract unit prices for the various items of work in the Contract.
- 1.08 The term "lump sum" when used as an item of payment will mean complete payment for the work described for the item of work. When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.
- 1.09 When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe, conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 02 11 17

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section requires the selective removal and subsequent offsite disposal of the following:
 - 1. Portions of existing building indicated on drawings and as required to accommodate new construction.
 - 2. Removal and protection of existing fixtures, materials, and equipment items indicated "salvage", or that may be required.

- B. Removals:
 - 1. Remove demolished materials from site on a daily basis. Leave no discarded material overnight.
 - 2. Dispose of all wastes only at site locations off the property specifically designated and appropriately licensed to receive construction and demolition waste materials.

1.02 SUBMITTALS

- A. Schedule indicating proposed sequence of operations for selective demolition work to the MDAD's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
 - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of the MDAD's onsite operations personnel.
 - 2. Coordinate with MDAD's on-site personnel, continuing occupation of portions of existing building and with MDAD's on-site partial occupancy of completed portions of the work.

- C. Photograph existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work.

- D. Submit for review by the Design Professional, shop drawings, calculations and erection drawings as required for stucco repair activities.

1.03 JOB CONDITIONS

- A. Occupancy: MDAD will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of MDAD's normal operations. Provide minimum of 72 hours advance notice to MDAD of demolition activities which may affect normal airport operations.

- B. Condition of Structures: MDAD assumes no responsibility for actual condition of items or structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purposes will be maintained by MDAD insofar as practicable. However, minor variations within structure may occur by MDAD's removal and salvage operations prior to start of selective demolition work.

- C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
 - 1. Storage or sale of removed items on site will not be permitted.

- D. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.
 - 1. Provide protective measures as required to provide free and safe passage of MDAD's personnel and general public to occupied portions of building.
 - 2. Erect temporary ornamental barrier walls, covered passageways where and as required prior to proceeding with any demolition work in and adjacent to any area used for normal operations.
 - 3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
 - 4. Protect floors with suitable coverings when necessary.
 - 5. Any work that may be required in operational areas must be scheduled in writing a minimum of 72 hours in advance with permission from MDAD before proceeding. All finish material in that area must be returned to its original condition.
 - 6. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 - 7. Remove protections at completion of work.

- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

- F. Traffic: Conduct demolition operations and removal of debris to ensure no interference with ongoing MDAD and airlines operations. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from MDAD. Provide alternate routes around closed or obstructed traffic ways as approved by MDAD.
- G. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
- H. Utility Services: The Contractor shall not disconnect, cut, cut into, or otherwise interrupt any existing utility service, electrical, water, sewerage or any other wire, pipe or conduit which connects to or serves the adjacent building installations or facilities from either off-site or on-site sources except as follows:
 - 1. The Contractor shall notify MDAD, the Design Professional and Utility Company in writing, thirty (30) full days in advance, of the reasons and necessity of interruption of any utility services as defined herein. The notice shall state the date, the time of day, and the estimated duration of the proposed interruption.
 - 2. The Contractor will coordinate the proposed interruption of service and notify the Design Professional of approval or disapproval of the proposed interruption and the restrictive conditions connected therewith. The Contractor shall not cause any interruption without the prior approval of MDAD and Utility Company and shall provide temporary services during interruption to existing utilities as approved by MDAD and the Design Professional.
 - 3. Perform emergency repairs to any and/or all utilities on site and/or off site damaged as a result of Contractor's actions at no additional cost to the Owner.
 - 4. Maintain fire protection services during selective demolition operations.
- I. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
 - 1. Do not use water when it may create hazardous or objectionable conditions such as flooding, and pollution.
- J. Patching: The Contractor shall be responsible for the proper patching and restoration of all work that is cut into for any reason. Patching shall be neat, shall match the finish of contiguous areas and shall meet with the approval of the Design Professional and the Owner.
- K. Explosives: Explosives are not to be used at any time.

- L. Provide Sound Control for disruptive sound activities that impede normal operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

- A. Cover and protect furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.
 - 1. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
 - a. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building.
 - b. Provide minimum of 72 hours advance notice to MDAD if shutdown of service is necessary during changeover.

3.02 DEMOLITION

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
- B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to the MDAD's Representative in written, accurate detail. Pending receipt of directive from MDAD's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.03 SALVAGED MATERIALS

- A. Salvaged Items: Where indicated on Drawings as "Salvage" carefully remove indicated items, clean, store, and turn over to MDAD and obtain receipt.

3.04 DISPOSAL OF DEMOLISHED MATERIALS

- A. Title to Materials:
 - 1. Title to all materials and equipment to be removed is vested in the Contractor upon receipt of Notice to Proceed.
 - a. MDAD will not be responsible for condition, loss of, or damage to such materials and /or equipment after receipt by contractor of Notice to Proceed.
 - b. Remove excess materials and equipment from site upon completion of

- removal operations.
- c. Contractor shall provide safe, off-site storage for all materials scheduled to be reused.
- d. In the event hazardous substances/materials are encountered during demolition operations, work is to immediately stop, and the area is to be secured. Contractor shall immediately notify the Design Professional.
- e. Burning of removed materials is not permitted on project site.

3.05 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
 - 1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.
- B. Pollution Controls: Use water sprinkling, temporary enclosures and other suitable methods to limit dust and dirt rising in the air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
- C. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.
- D. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations, as directed by MDAD, Design Professional or governing regulations.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data:
 - 1. Structural-steel materials.

2. High-strength, bolt-nut-washer assemblies.
 3. Threaded rods.
 4. Shop primer.
 5. Galvanized-steel primer.
 6. Etching cleaner.
 7. Galvanized repair paint.
- B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 4. Identify members not to be shop primed.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:
1. Power source (constant current or constant voltage).

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, shop-painting applicators, and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural-steel materials, including chemical and physical properties.
- E. Product Test Reports: For the following:
1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 2. Post-Installed Anchors ICC ES Reports
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control reports.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. ANSI/AISC 303.
 - 2. ANSI/AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
 - 1. Connection designs have been completed and connections indicated on the Drawings.

2.2 STRUCTURAL-STEEL MATERIALS

- A. Plate and Bar: ASTM A36/A36M.
- B. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B
- C. Steel Pipe: ASTM A53/A53M, Type S, Grade B.
- D. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. Zinc-Coated High-Strength Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A563M, Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating.

2.4 PRIMER

- A. Steel Primer:
 - 1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanized-Steel Primer: MPI#26, MPI#80, or MPI#134 as applicable for steel installation.
 - 1. Etching Cleaner: MPI#25, for galvanized steel.
 - 2. Galvanizing Repair Paint: Compatible with Primer.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
 - 1. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 3.
- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate and Connection Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces to be field welded.
 - 2. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 3. Galvanized surfaces unless indicated to be painted.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
 - 1. SSPC-SP 3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.
- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum

dry film thickness of 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified testing agency to perform shop tests and inspections.
 - 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 - 2. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Ultrasonic Inspection: ASTM E164.
 - 3. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations and vertical planes of concrete surfaces that receive post-installed anchors for compliance with requirements. Adjustments to horizontal support framing members may be necessary and shall be incidental to the base bid.
 - 1. Prepare a certified survey of existing conditions. Include wall surfaces, and beams that receive post-installed anchors showing dimensions, locations, angles, and elevations.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Support framing connection plates: Clean concrete surfaces of bond-reducing materials. Clean bottom surface of plates.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
 - 1. Joint Type: Snug tightened
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
 - 1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

3.6 FIELD QUALITY CONTROL

- A. Threshold Inspections: Owner will engage a special inspector to perform the following special inspections and those identified on the Threshold Inspection Plan:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high strength bolted connections.

- B. Testing Agency: Contractor shall engage a qualified testing agency to perform tests and inspections.
 - 1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 - 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Ultrasonic Inspection: ASTM E164.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel framing and supports for electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal edgings.
4. Miscellaneous metal trim.
5. Stainless steel trim, closures, bases, corner guards, and accent strips.

1.02 SUBMITTALS

A. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Provide templates for anchors and bolts specified for installation under other Sections.

B. Product Data for galvanized paints.

C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and qualifications of personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" in 1.03 to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Design Professionals and owners, and other information specified.

1.03 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

1. AS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.04 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.05 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.02 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- E. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Malleable-Iron Castings: ASTM A 47, Grade 32510.
- G. Gray-Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.
- H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, hot dip galvanized per ASTM A 153.
- I. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.03 ALUMINUM

- A. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632, alloy 6061-T6.

- 2.04 PAINT
- A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- 2.05 FASTENERS
- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Bolts: ASME B18.2.1.
- F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- G. Plain Washers: Round, carbon steel, ASME B18.22.1.
- H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.
- 2.06 GROUT
- A. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- B. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- 2.07 CONCRETE FILL
- A. Concrete Materials and Properties: Comply with requirements in Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
- 2.08 FABRICATION, GENERAL
- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use

connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Shear and punch metals cleanly and accurately. Remove burrs.
 - C. Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - D. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - E. Provide for anchorage of type indicated, coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
 - G. Fabricate joints that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
 - H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
 - I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
 - J. Remove sharp or rough areas on exposed traffic surfaces.
 - K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- 2.09 LOOSE BEARING AND LEVELING PLATES
- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
 - B. Galvanize plates after fabrication.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. General: Provide steel framing and supports indicated and as necessary to complete the Work.
- C. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4" wide by 1/4" thick by 8" long at 24" o.c., unless otherwise indicated.
 - 3. Furnish inserts if units must be installed after concrete is placed.
- D. Galvanize miscellaneous framing and supports, exterior, and interior where indicated.

2.11 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6" from each end, 6" from corners, and 24" o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
 - 1. Exterior: All steel items
 - 2. Interior, where indicated.

2.12 STAINLESS STEEL WORK

- A. General: Provide metals free from surface blemishes where exposed to view in finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.
- B. Form metal to required shapes and sizes, with true curves, lines, and angles. Provide components in sizes and profiles indicated, but not less than that needed to comply with requirements indicated for structural performance.
- C. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Drill and tap for required fasteners, unless otherwise indicated. Use concealed fasteners where possible.
- D. Comply with AWS for recommended practices in shop welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of all flux, and grind smooth all exposed and contact surfaces.
- E. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
- F. Finish exposed surfaces to smooth, sharp, well-defined lines and arris. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as

necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Remove or blend tool and die marks and stretch lines into finish. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches.

2.13 FINISHES

A. GENERAL

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish metal fabrications after assembly.

B. STEEL AND IRON FINISHES

1. Galvanizing: Hot dip galvanize items as indicated to comply with applicable standard listed below:
 - a. ASTM A 123, Grade 50 (2.0 oz./sq.ft.), for galvanizing steel and iron products.
2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
 - a. Exterior and Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
 - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.

C. ALUMINUM FINISHES

1. Finish designations prefixed by MDAD comply with the system established by the Aluminum Association for designating aluminum finishes.
2. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

D. STAINLESS STEEL FINISHES

1. No. 4 Satin finish, unless otherwise noted.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot dip galvanized after fabrication and are for bolted or screwed field connections.
 - E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- 3.02 SETTING BEARING AND LEVELING PLATES
- A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.
 - B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- 3.03 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS
- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
 - B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- 3.04 ADJUSTING AND CLEANING
- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 - B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09900, Painting.
 - C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 05 52 13

RAILINGS AND HANDRAILS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and DIVISION 01 Specification Sections, apply to this Section.

1.02 SUMMARY:

- A. This Section includes:
 - 1. Steel pipe and tube railings.

1.03 REFERENCED STANDARDS:

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611 - Voluntary Standards for Anodized Architectural Aluminum.
 - 2. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Welding Society (AWS):
 - 1. AWS D1.1/D1.1M - Structural Welding Code – Steel.
 - 2. AWS D1.2/D1.2M - Structural Welding Code – Aluminum.
 - 3. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel.
- C. ASTM International:
 - 1. ASTM A36/A36M - Specification for Carbon Structural Steel.
 - 2. ASTM A47/A47M - Specification for Ferritic Malleable Iron Castings.
 - 3. ASTM A48/A48M - Specification for Gray Iron Castings.
 - 4. ASTM A53/A53M - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 5. ASTM A123/A123M - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 6. ASTM A153/A153M - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 7. ASTM A240/A240M - Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 8. ASTM A312/A312M - Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless-Steel Pipes.
 - 9. ASTM A500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 10. ASTM A510/A510M - Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
 - 11. ASTM A513/A513M - Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
 - 12. ASTM A554 - Specification for Welded Stainless-Steel Mechanical Tubing.
 - 13. ASTM A580/A580M - Specification for Stainless Steel Wire.
 - 14. ASTM A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-

- Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
15. ASTM A666 - Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
 16. ASTM A743/A743M - Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application.
 17. ASTM A780/A780M - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 18. ASTM A1008/A1008M - Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 19. ASTM A1011/A1011M - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 20. ASTM B26/B26M - Specification for Aluminum-Alloy Sand Castings.
 21. ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 22. ASTM B209M - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 23. ASTM B210 - Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
 24. ASTM B210M - Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
 25. ASTM B211 - Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
 26. ASTM B211M - Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire.
 27. ASTM B221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 28. ASTM B221M - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 29. ASTM B247 - Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings.
 30. ASTM B247M - Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings.
 31. ASTM B429/B429M - Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 32. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 33. ASTM C1107/C1107M - Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 34. ASTM D1187/D1187M - Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 35. ASTM E488/E488M - Test Methods for Strength of Anchors in Concrete Elements.
 36. ASTM E894 - Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
 37. ASTM E935 - Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
 38. ASTM F593 - Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 39. ASTM F594 - Specification for Stainless Steel Nuts.
 40. ASTM F836M - Specification for Style 1 Stainless Steel Metric Nuts (Metric).
 41. ASTM F1267 - Specification for Metal, Expanded, Steel.

42. ASTM F1941 - Specification for Electrodeposited Coatings on Threaded Fasteners Unified Inch Screw Threads (UN/UNR).
43. ASTM F1941M - Specification for Electrodeposited Coatings on Threaded Fasteners.
44. ASTM F2329 - Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- D. California Department of Public Health:
 1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.
- E. Master Painters Institute (MPI):
 1. MPI#20 - Primer, Zinc-Rich Epoxy.
 2. MPI#25 - Cleaner, Etching, for Galvanized Metal.
 3. MPI#72 - Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7).
 4. MPI#77 - Epoxy, Gloss.
 5. MPI#79 - Primer, Alkyd, Anti-Corrosive for Metal.
- F. SSPC: The Society for Protective Coatings:
 1. SSPC-PA 1 - Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel.
 2. SSPC-Paint 20 - Paint Specification No. 20: Zinc-Rich Coating (Type I, "Inorganic," and Type II, "Organic").
 3. SSPC-SP 3 - Surface Preparation Specification No. 3: Power Tool Cleaning.
 4. SSPC-SP 6/NACE No. 3 - Commercial Blast Cleaning.

1.04 COORDINATION:

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.05 SUBMITTALS:

- A. Product Data: For the following:
 1. Manufacturer's product lines of mechanically connected railings.
 2. Railing brackets.
 3. Grout, anchoring cement, and paint products

1.06 DELIVERY, STORAGE, AND HANDLING:

Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.07 FIELD CONDITIONS:

Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product

indicated on Drawings or comparable product by one of the following:

- a. Wagner, R & B, Inc.
 - b. Blum, Julius & Co., Inc.
 - c. Tri Tech, Inc.
 - d. Tubular Specialties Manufacturing, Inc.
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- 2.02 PERFORMANCE REQUIREMENTS:
- A. Delegated Design: Engage a qualified professional engineer to design railings, including attachment to building construction.
- B. Structural Performance: In accordance with the Florida Building Code, railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, but not less than:
1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120°F (67°C), ambient; 180°F (100°C, material surfaces).
- 2.03 METALS, GENERAL:
- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides clearance from inside face of handrail to finished wall surface as indicated on the drawings.
- 2.04 STEEL AND IRON:
- A. Tubing: ASTM A500 (cold formed) or ASTM A513/A513M.
- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- 2.05 FASTENERS:
- A. General: Provide the following:
1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5 for zinc coating.
 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329 for zinc coating.
 3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
 - C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 3. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.
 - D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594 (ASTM F836M)).
- 2.06 MISCELLANEOUS MATERIALS:
- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
 - B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
 - D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
 - E. Shop Primers: Provide primers that comply with Section 09 90 00 "Painting."
 - F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
 - G. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
 - H. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
 - I. Intermediate Coats and Topcoats: Provide products that comply with Section 09 90 00 "Painting."
 - J. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
 - K. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
 - L. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

- M. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
 - N. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.
- 2.07 FABRICATION:
- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
 - B. Shop-assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
 - C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
 - D. Form work true to line and level with accurate angles and surfaces.
 - E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
 - F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
 - G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.
 - H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
 - I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
 - J. Form Changes in Direction as detailed.
 - K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - L. Close exposed ends of railing members with prefabricated end fittings.
 - M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
 - N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise

indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
 - O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
 - P. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
 - Q. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
 - R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.
- 2.08 STEEL AND IRON FINISHES:
- A. Galvanized Railings:
 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 - B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
 - C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
 - D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
 - E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC- SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 1. Shop prime uncoated railings with primers specified in Section 09 90 00 "Painting."
 2. Do not apply primer to galvanized surfaces.
 - G. Shop-Painted Finish: Comply with Section 09 90 00 "Painting."
 1. Color: Match Architect's sample.
 - H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Color: As selected by Architect from manufacturer's full range.
- 2.09 STAINLESS-STEEL FINISHES:
- A. Remove tool and die marks and stretch lines, or blend into finish.
 - B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches.
 - C. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL:

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS:

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.04 ANCHORING POSTS:

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's

- written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
 - D. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.
 - E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
 - 2. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
 - F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.
- 3.05 ATTACHING RAILINGS:
- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.
 - B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
 - C. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 - 6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.
- 3.06 ADJUSTING AND CLEANING:
- A. Clean railing by washing thoroughly with clean water and soap and rinsing with clean water.
 - B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
 - C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in and Section 09 90 00 "Painting."
 - D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.
- 3.07 PROTECTION:
- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes wood blocking, all fire-retardant treated, and rough hardware.

1.02 REFERENCES

- A. APA - Plywood Construction Guide
- B. American Society for Testing and Materials: ASTM E 84 - Surface Burning Characteristics of Building Materials.
- C. American Wood Preservers Association:
1. WPA C20 - Structural Lumber, Fire-Retardant Treatment by Pressure Processes.
 2. AWPA C27 - Plywood, Fire-Retardant Treatment by Pressure Processes.
- D. U.S. Product Standards:
1. PS 1 - Construction and Industrial Plywood (1995)
 2. PS 20 - American Softwood Lumber Standard (1999)
- E. NFPA - National Design Specification for Stress Grade Lumber and its Fastening.

1.03 SYSTEM DESCRIPTION

- A. Structural Requirements:
1. Identify lumber and plywood by official grade mark.
 2. Preservative treated lumber and plywood shall comply with American Wood Preservers Bureau, Quality Mark.
 3. Comply with Underwriters Laboratories for treated lumber and plywood, and ASTM E 84, maximum flame spread of 25.

1.04 SUBMITTALS

- A. Preservative Treated Certification:
1. Certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and compliance with applicable standards.
 2. For water-borne treated products include statement that moisture content of treated materials was reduced to 25 percent maximum prior to shipment to Project site.
- B. Fire-Retardant Treated-Certification: Certification by treating plant stating that treated materials comply with specified standard, governing ordinances and that treatment will

not bleed through finish paint coats.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Immediately upon delivery to job site, place materials in area protected from weather.
- B. Do not store seasoned materials in wet or damp portions of building.
- C. Protect fire-retardant materials against high humidity and moisture during storage and erection.
- D. Stack lumber and plywood and provide air circulation within stacks.
- E. Protect installed carpentry work from damage by work of other trades until acceptance of work.

1.06 SEQUENCING

- A. Time delivery and installation of work to avoid delaying other trades whose work is dependent on or affected by work of this section, and to comply with protection and storage requirements.
- B. Correlate locations of furring, nailers, blocking and similar supports so that attached work will comply with design requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fire Retardant Treatment:
 - 1. Lumber: AWPA C20.
 - 2. Plywood: AWPA C27.
 - 3. Provide appropriate treatment for intended use that will not corrode metal fasteners or steel studs.
 - 4. If used in contact with roof, provide treatment that will not deteriorate when exposed to temperatures of 160 degrees or higher.
- B. Lumber:
 - 1. All lumber shall be fire-retardant treated per Paragraph. 2.01A.
 - 2. Grading Rules: PS 20.
 - 3. Dimensions: Lumber dimensions are nominal; actual dimensions conform to industry standards established by American Lumber Standards Committee and rules writing agencies.
 - 4. Moisture Content: 19 percent maximum moisture content at time of dressing; kiln dry to 15 percent moisture content after wood treatment except wood in contact with ground.
 - 5. Surfacing: Surface four sides (S4S).
 - 6. Species: No. 2 grade Southern Yellow Pine or equivalent West Coast Douglas Fir.

- C. Plywood: Comply with PS-1 "US Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS-1 provisions, with APA PRP-108.
 - 1. All plywood shall be fire-retardant treated per Paragraph. 2.01A.
 - 2. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D Plugged, Exposure 1, in thickness indicated but not less than 15/32".

- D. Preservative Treated Wood:
 - 1. Above Ground: AWPB LP-2.
 - 2. Ground Contact: AWPB LP-22.
 - 3. Use treatment which is noncorrosive to metal.

- E. Fasteners:
 - 1. Bolts: FS FF-B-575 or FF-B-584.
 - 2. Nuts: FS FF-N-836.
 - 3. Expansion Shields, Lag Screws and Bolts: FS FF-B-561C.
 - 4. Toggle Bolts: FS FF-B-588.
 - 5. Wood Screws: FS FF-S-111.
 - 6. Nails and Staples: FS FF-N-105.
 - 7. Metal Nailing Discs: Flat caps, minimum 1" diameter; 30 gage minimum sheet metal; formed to prevent dishing; bell or cup shapes not acceptable.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Climatize materials according to material manufacturer's recommendations.

3.02 INSTALLATION

- A. Discard units of material with defects which might impair quality of work and units which are too small to fabricate work with minimum joints or optimum joint arrangement.

- B. Use preservative pressure treated lumber in contact with concrete or masonry.

- C. Set carpentry work accurately to required levels and lines, with members plumb and true, and accurately cut and fitted. Construct members of continuous pieces of longest possible lengths.

- D. Securely attach carpentry work to substrate by anchoring and fastening as required by recognized standards. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood. Pre-drill as necessary. Comply with APA E30a requirements for plywood. Install fasteners at spacings recommended by NFPA National Design Specifications for Stress Grade Lumber and Its Fastening, for lumber and APA Form E30a.

- E. Wood Grounds, Nailers, and Blocking:
 - 1. Provide where required for screeding or attachment of other work.
 - 2. Form to shapes cut as necessary for true line and level of work to be attached.
 - 3. Coordinate location with other work involved.
 - 4. Attach to substrate to support applied loading.
 - 5. Countersink bolts and nuts flush with surfaces and built into masonry work.
 - 6. Where possible, anchor to formwork before concrete placement.
 - 7. Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of material involved.
 - 8. Remove temporary grounds when no longer required.

- F. Apply two coats of same preservative used in original treatment to cut surfaces of treated wood.

3.03 CLEANUP

- A. Remove stain and soil that would show through finish or interfere with painting. Repair or replace work damaged after installation.

3.04 SCHEDULE

- A. Preservative Treated Wood: Provide pressure-treated wood for framing, blocking, furring, or nailing strips built into or in contact with exterior masonry walls, concrete or roofing.

- B. Rough Hardware: Bolts, nuts, washers, nails, screws, anchors, powder actuated anchorage devices, toggle type fasteners, and expansion anchorage devices.

END OF SECTION

SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the following:
 - 1. Wall Sheathing.
 - 2. Building paper.
 - 3. Sheathing joint and penetration treatment.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for plywood backing panels.

1.02 REFERENCES:

- A. American Society for Testing and Materials:
 - 1. ASTM C 954: Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch to 0.110 inch in Thickness.
 - 2. ASTM C 1002: Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 3. ASTM C 1280: Standard Specification for Application of Gypsum Sheathing.
 - 4. ASTM D 226: Standard Specification for Asphalt-Saturated Organic Felt Used in Waterproofing.
 - 5. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E119: Test Method for Fire Tests of Building Construction and Materials.
 - 7. ASTM E 1677: Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.
- B. Gypsum Association:
 - 1. GA 253: Recommended Specification for the Application of Gypsum Sheathing.

1.03 SUBMITTALS:

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
- B. Shop Drawings: Show type and layout of wall sheathing.
 - 1. Show shop drawing coordination and structural analysis data coordination with Section 05 50 00 Metal Fabrications.
- C. Research/Evaluation Reports: For the following:
 - 1. Preservative-treated plywood.

1.04 DELIVERY, STORAGE, AND HANDLING:

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS:

- A. Fire-Resistance Ratings: As tested in accordance with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's 'Fire Resistance Directory' or from the listings of another qualified testing agency.

- B. Air-Barrier and Water-Resistive Glass-Mat Gypsum Sheathing Performance: Air Barrier and water-resistive glass mat gypsum sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, tie-ins to other installed air barriers, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- 2.02 PRESERVATIVE-TREATED PLYWOOD:
- A. Preservative Treatment by Pressure Process: AWPA C9.
 - B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - C. Application: Treat all plywood.
- 2.03 WALL SHEATHING:
- A. Plywood Wall Sheathing: Exterior, Structural I sheathing. Size as indicated on drawings.
 - B. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/C1177M.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide GP Gypsum; Densglass sheathing or approved equal product by one of the following:
 - a. National Gypsum Company.
 - b. USG Corporation.
 - c. Type and Thickness: Type X - 5/8 inch thick.
 - d. Size: 48 by 96 inches or 48 by 108 inches or 48 by 120 inches.
 - 2. Air-Barrier and Water-Resistive Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M, Type X, fiberglass mat gypsum sheathing with integral weather-resistant barrier and air barrier complying with ASTM E2178 and ICC-ES AC212.
 - C. Cementitious Backer Units: ASTM C 1325, Type A.
 - 1. Thickness: 5/8".
- 2.04 FASTENERS:
- A. General: Provide fasteners of size and type indicated.
 - 1. Provide stainless steel fasteners having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Brand Steel or USG Sheathing SF steel drill screws 2-1/4 inch with corrosion-resistant coating.
 - 1. For steel framing less than 0.0329-inch-thick, attach sheathing to comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112-inch-thick, attach sheathing to comply with ASTM C 954.
- 2.05 WEATHER-RESISTANT SHEATHING PAPER:
- A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), un-perforated, self-adhered as manufactured by GAF or approved equal.
- 2.06 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS:
- A. Sealant for Glass-Mat Gypsum Sheathing Board: Elastomeric silicone joint sealant recommended by sheathing manufacturer.
 - B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, of type recommended by sheathing and tape manufacturers.
 - C. Sheathing Tape for Foam-Plastic Sheathing: Tape recommended by sheathing manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL:

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Securely attach to substrate by fastening as indicated or recommended by manufacturer to meet or exceed requirements set forth by Florida Building Code 2017 (6th Edition).
- C. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that exclude exterior moisture.
- D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.02 GYPSUM SHEATHING INSTALLATION:

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials.

3.03 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION:

- A. General: Cover sheathing with weather-resistant sheathing paper as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

3.04 SHEATHING JOINT-AND-PENETRATION TREATMENT:

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed tape in sealant. Apply sealant to exposed fasteners. Seal other penetrations and openings.

END OF SECTION

SECTION 07 42 13.6

MODULAR METAL WALL PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concealed fastener, coil coated, rainscreen wall panel as part of the wall assemblies described in Section 2.01.

1.02 RELATED REQUIREMENTS

- A. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.
- B. Division 07 Section "Joint Sealers" for field-applied joint sealants.

1.03 REFERENCE STANDARDS

- A. American Architectural Manufacturer's Association (AAMA):
 - 1. AAMA 620 - Voluntary Specification High Performance Organic Coatings on Coil Coated Architectural Aluminum.
 - 2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (ASTM):
 - 1. ASTM B 209 - Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - 2. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 3. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Tests.
 - 4. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
 - 5. ASTM E 72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide modular metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.
- B. Structural Performance: Design modular metal wall panel system fabricated to withstand the effects of wind loads under conditions indicated below.
 - 1. Wind Loads: Determine loads based on uniform pressure, building category, exposure category, and basic wind speed indicated on drawings.
- C. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum 10 years' experience in manufacture of similar products in successful use in similar applications.
 - 1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Samples of each component.
 - c. Sample submittal from similar project.
 - d. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
 - e. Sample warranty.
 - 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 - 3. Approved manufacturers must meet separate requirements of Submittals Article.
- B. Wall Systems Installer Qualifications: Experienced Installer with minimum of 5 years' experience with successfully completed projects of a similar nature and scope.
- C. Mockups: Build mockup in size and location indicated. Show details of modular metal panel system. Demonstrate methods and details of installation. Show details of vertical joints, penetrations, doors, windows, louvers, pipe openings, inside and outside corners, top and bottom of wall, horizontal and vertical joints.
 - 1. Approval of mockup does not relieve Contractor of responsibility to comply with all requirements of contract documents.
 - 2. Approved mockup may become part of installation if approved by Architect.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, and other trade contractors.
 - 1. Coordinate building framing in relation to modular metal panel system.
 - 2. Coordinate installation of building air and water barrier behind composite wall panel system.
 - 3. Coordinate window, door and louver, and other openings and penetrations of modular metal panel system.

1.07 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products.
- B. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized dealer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale 3-inch per foot of all required trim and extrusions needed for a complete installation
 - 1. Include data indicating compliance with performance requirements.

- 2. Indicate points of supporting structure that must coordinate with modular metal panel system installation.
 - C. Field Measurements by installer: It is the panel installer's responsibility to verify locations of structural members, adjoining construction, and wall openings dimensions by field measurement before panel fabrication and indicate measurements on final shop drawings.
 - D. Samples for Initial Selection: For each product specified including sealants and gaskets. Provide representative color charts of manufacturer's full range of colors.
 - E. Samples for Verification: Provide 24-inch (600 mm) section of wall panel showing, horizontal joinery, vertical joint return, panel stiffener and anchoring details. Provide 12-inch (300 mm) long pieces of each extruded aluminum trim.
- 1.08 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.
 - B. Manufacturer's warranty: Submit sample warranty.
- 1.09 CLOSEOUT SUBMITTALS
- A. Maintenance data.
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Protect products of modular metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage.
 - 1. Deliver, unload, store, and erect modular metal wall panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
- 1.11 WARRANTY
- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.
 - B. Special Panel Finish Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace wall panels that display evidence of deterioration of finish within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 System Description

- A. Modular metal wall panel system consisting of aluminum panels in a rainscreen application as part of the assembly described below.

1. Modular Metal Wall Panels over Cold-Formed Metal Framing: Modular metal panels applied as exterior rainscreen cladding over wall framing specified in Division 05 Section "Metal Fabrications" Metal wall panel installation specified in this Section includes mounting clips for panel attachment.

2.02 MANUFACTURERS

- A. Basis of Design: CENTRIA Intercept Entyre Modular Metal Wall Panel System. Provide basis of design product in conjunction with Florida Product Approval No. FL20676-R1.
 1. CENTRIA Architectural Systems; Moon Township, PA 15108-2944. Tel: (941) 893-3411. Tel: (812) 603-5498 Email: wsford@CENTRIA.com. Web: www.CENTRIA.com.

2.03 MATERIALS

- A. Aluminum Sheet: Smooth surface coil-coated sheet, ASTM B209, 3105-H14 Alloy.
 1. Aluminum Material: Tension-leveled
 2. Thickness: 0.060" nominal
 3. Weight: Approximately 1.5 lb. per square foot

2.04 Modular Metal Panels

- A. Modular Metal Panels: Factory-formed, aluminum-faced panels fabricated from 0.60" thick aluminum coil coated sheet.
 1. Panel Depth: 1-3/8"(35mm).
 2. Panel Flatness: Maximum allowable distortion: 1/32 inch in 24 inches (0.813 mm in 610 mm) in any direction. Panel lines, breaks, and angles shall be sharp and true, and surfaces shall be free from warp or buckle.
 3. Clips: Manufacturer's standard clips as required to meet performance requirements.
 4. Panel Joints: 3/4"(19mm)
 5. Panel Sizes: Max panel module 34". See drawings.
- B. Sheet Surface: Smooth.
- C. Aluminum Face Sheet Coil-Coated Finish:
 1. Fluoropolymer Three-Coat System: 0.8 mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, and a 0.8 mil 70 percent PVDF fluoropolymer clear coat, AAMA 621.
 - a. Basis of Design: CENTRIA Duragard Plus.
- D. Unexposed Finish: Manufacturer's standard nominal 0.5 mil nominal DFT backer coating.
- E. Exposed Trim, flashings, and Fastener Finish: Match panel finish.
 1. Thickness: 0.060" nominal
 2. Refer to section 07 6200

2.05 SECONDARY METAL FRAMING

- A. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating.

1. Hat Channels: 16 ga. minimum thickness.
2. Sill Channels: 16 ga. minimum thickness.
3. As noted on drawings.

2.06 ACCESSORIES

- A. Provide manufacturer's factory-formed clips, shims, flashings, sealants, and tapes for a complete installation.

2.07 FABRICATION

- A. General: Fabricate modular metal panels and accessories at factory identical to tested units using manufacturer's standard procedures and processes necessary to meet performance requirements.
 1. Provide components of modular metal panel system that are products of one manufacturer, including modular metal panels, head and sill trim, bottom weep, starter flash, and metal copings.
- B. Modular Metal Panels: Fabricate modular metal panels requiring no further fabrication or modification in field.
 1. Horizontal Joints: Dry seal, drained and back ventilated.
 2. Vertical Joints: Pre-formed returns
 3. Reveals: 3/4"(19mm)
 4. Standard System Depth: 1-3/8"(35mm)

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine modular metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of modular metal panel system.
 1. Inspect framing that will support modular metal panel system to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to modular metal wall panel system manufacturer.
 - a. Maximum deviations acceptable to modular metal panel system manufacturer:
 - 1) 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.
 - 2) 1/2-inch (12.7 mm) maximum deviation from flat substrate on any building elevation.
 - 3) 1/8-inch in 5 feet (3.2 mm in 1.5 m).
 2. Confirm presence of acceptable framing members to match installation requirements of modular metal panel system.
 - a. Confirm framing minimum 16 ga. at maximum 16 inch spacing.
 3. Verify that penetrations match layout on shop drawings.
- B. Advise General Contractor of out-of-tolerance work and other deficient conditions prior to proceeding with modular metal wall panel system installation.

3.02 MODULAR METAL PANEL SYSTEM INSTALLATION

- A. General: Install modular metal panel system in accordance with approved shop drawings and manufacturer's recommendations.
- B. Installation: Attach panels to metal sub-framing using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.
 - 1. Horizontal Joinery: Working from base of installation to top, connect upper panel to lower panel at joinery.
 - 2. Vertical Joinery: Provide reveal between vertical ends of panels as shown on shop drawings.
 - 3. Galvanic Action: Where elements of modular metal wall system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.
- C. Rainscreen Installation: Proceed with installation of manufacturer's dry seal horizontal joinery. Keep open spaces in horizontal joinery intended to ventilate cavity behind system.
- D. Use detail provided by manufacturer that allows removal of panels where indicated on drawings.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a service representative authorized by metal wall panel manufacturer to inspect completed installation. Submit written report. Correct deficiencies noted in report.

3.04 CLEANING AND PROTECTION

- A. Remove temporary protective films within 2 weeks of erection. Clean finished surfaces as recommended by metal wall panel manufacturer. Clear weep holes and drainage channels of obstructions, dirt, and sealant. Maintain in a clean condition during construction.
- B. Replace damaged panels and accessories that cannot be repaired by field repair.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Drip metal.
 - 2. Two-Piece Counterflashing over bituminous base flashing.
 - 3. Coping over parapets.
 - 4. Reglets and accessories.
 - 5. Gutter and Downspout.

1.02 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking and nailers.
- B. Section 07 90 00 - Joint Sealers.

1.03 REFERENCES

- A. AISI American Iron and Steel Institute - Stainless Steel - Uses in Architecture.
- B. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- C. ASTM A 653 - Steel Sheet, Zinc Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvanealed), by the Hot-Dip Process.
- D. ASTM B 209 - Aluminum and Alloy Sheet and Plate.
- E. ASTM B 32 – Standard Specifications for Solder Metal.
- F. ASTM B 486 – Standard Specifications for Paste Solder.
- G. ASTM D 226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- H. ASTM D 4586-86 - Asphalt Roof Cement, Asbestos-Free.
- I. FS O-F-506 - Flux, Soldering, Paste and Liquid.
- J. NRCA National Roofing Contractors Association - Roofing Manual.
- K. SMACNA - Architectural Sheet Metal Manual.

1.04 SUBMITTALS

- A. Submit under provisions of the Contract.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashing terminations, and installation details for all conditions. Detail and submit a Shop Drawing for any condition not shown on the Plans or Details.
- C. Samples: Submit three 8" square samples of each specified sheet material to be exposed as a

finished surface.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA and standard details and requirements.
- B. Failure to install the work in strict accordance with provisions of this Section, is subject to total rejection of work specified herein.
- C. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

- A. Fabricator and Installer: Company specializing in sheet metal flashing work with five (5) years documented experience.

1.07 PRE-INSTALLATION CONFERENCE

- A. Convene one (1) week prior to commencing work on this Section, under provisions the Contract.
- B. Pre-Installation Conference: Attendance at the conference by a qualified representative is required.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver to site, store, protect and handle products under provisions of Division 01.
- B. Stack pre-formed material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

1.09 COORDINATION

- A. Coordinate work under provisions of this Section.
- B. Coordinate application of flashings with application of roofing, protruding material, and roof accessories to provide a complete weathertight installation according to the specified warranty requirements.
- C. For areas where counter-flashing is scheduled to be replaced, coordinate material and scope of work with MDAD and manufacturer of existing roofing to maintain in place existing roofing warranty.

PART 2 - PRODUCTS

2.01 SHEET MATERIALS

- A. Stainless Steel: ASTM A 167, Type 304, soft temper, 18, 20, 22, and 24 gage thick unless otherwise indicated; smooth 2D finish.
- B. Galvanized Steel: ASTM A 526, G90 zinc coating: 16 gage thick unless otherwise indicates; mill finish.
- C. PVC Coated Sheet Metal for Thermoplastic Roofs: Membrane manufacturer's approved coating laminated to 22 or 24 gage steel, ASTM A 525-91b, G90 hot-dip galvanized. (For use at existing roof repairs only).

- D. Aluminum: ASTM B 209, alloy 3003, temper H14, AA-C22A41 mill finish; 0.040" thick; 0.125" at conduit covers.
- E. Termination Bar: Aluminum ASTM B-209, Alloy 6061, Temper T-6, mill finish; sizes 1/8" thick by 1-1/2" with rounded edges.

2.02 ACCESSORIES

- A. Fasteners: Stainless Steel
- B. Primer: Asphaltic based primer for flanges set in adhesive.
- C. Protective Backing Paint: FS-TT-C-494, Bituminous.
- D. Sealant: Specified in Section 07 90 00.
- E. Flashing Cement: MBD type only.
- F. Plastic cement: ASTM D 4586, Type
- G. Solder: ASTM B-32; 50/50 lead/tin type.
- H. Flux: Acid - Chloride Type.
- I. Flux Cleaner: Washing Soda Solution - 5% to 10%.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of stainless steel.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2". Miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Pre-tin edges of stainless-steel sheet. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.
- G. Perform soldering work slowly, with properly heated irons to thoroughly heat seam material and sweat solder through full width of seam that shall show not less than 1" of evenly flowed solder.
 - 1. Start soldering immediately after application of flux.
 - 2. Solder flat locked seams.
- H. Do not place in contact with nor in positions where drainage across such paint or other materials will occur.
- I. Solder or weld per metal type all miters, corners or transitional changes to form one continuous piece.

- J. Fabricate corners form one piece with 18-inch-long face; solder/weld for rigidity.
- K. Fabricate vertical faces with bottom edge formed outward 1/4" and hemmed to form drip.
- L. Fabricate flashing to allow toe to extend 1-1/2" over wood nailers. Return and brake edges.
- M. Form sheet metal pans (pitch pockets) 6" nominal size, with 4" upstand, and 4" flanges.
- N. Fabricate gutters to profiles and sizes indicated by the project details.
- O. Fabricate downspouts to profile and size indicated by the drawings and details using extruded stainless-steel tube.
- P. Fabricate accessories in profile and size to suite gutters and downspouts.
 - 1. Anchorage Devices: As indicated by details and in accordance with SMACNA requirements.
 - 2. Gutter Supports: Brackets - stainless steel
 - 3. Downspout Supports: Brackets - stainless steel
- Q. Seal metal joints.

2.04 FINISH

- A. Prepare metal surfaces in accordance with Section 09 90 00.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.
- C. Isolate dissimilar metals with accepted isolation paint or other accepted materials.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify roofing termination and base flashing are in place, sealed, and secure. Coordinate with manufacturer of existing roofing system.
- B. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in acceptable manner.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

3.03 INSTALLATION

- A. Apply plastic cement compound between metal flashings and felt flashings.
- B. Fit flashing tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

- C. Solder/weld joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
- D. Seal metal joints watertight.

3.03 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01410.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.04 SCHEDULE: The following schedule is a guideline, specific information shown on the drawings or details shall govern.

	<u>LOCATION</u>	<u>METAL TYPE</u>	<u>THICKNESS</u>	<u>FINISH</u>
A.	Edge Metal	Stainless steel	22 gauge	Mill
B.	Cont. Cleat	Stainless steel	20 gauge	Mill
C.	Exp. Jt. Cover	Stainless steel	22 gauge	Mill
D.	Exp. Jt .Cleats	Stainless steel	20 gauge`	Mill
E.	Area Divider Covers	Stainless steel	22 gauge	Mill
F.	Area Divider Cleats	Stainless steel	20 gauge	Mill
G.	Gutters	Stainless steel	22 gauge	Mill
H.	Downspouts	Stainless steel	22 gauge	Mill
I.	Downspout Brackets	Stainless steel	1/8" x 1"	Mill
J.	Counterflashing	Stainless steel	22 gauge	Mill
K.	Coping	Stainless steel	22 gauge	Mill
L.	Sill Flashing	Stainless steel	22 gauge	Mill
M.	Scuppers	Stainless steel	22 gauge	Mill
N.	Thru-Wall Flashings	Stainless steel	24 gauge	Mill
O.	C.F. Receiver	Stainless steel	22 gauge	Mill
P.	Reglet (C.I.B.)	Stainless steel	24 gauge	Mill
Q.	Curb Caps	Stainless steel	22 gauge	Mill
R.	Extension Curbs	Stainless steel	18 gauge	Mill
S.	Mounting Frame	Stainless steel	18 gauge	Mill
T.	Exp. Joint Curbs	Galvanized steel	16 gauge	Mill
U.	Existing PVC Roofs	Galvanized steel	22 gauge	PVC

Miscellaneous metal flashing: Stainless Steel, 22 gauge, Mill or painted finish as required by the Design Professional.

END OF SECTION

SECTION 07 81 23

INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Intumescent Mastic and Fire-resistive coatings (Intumescent).

1.3 PRE-INSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Samples for Verification: For each type of product indicated and for each color, and texture required in manufacturer's standard-size Samples, but not less than 12 inches long.

- C. Shop Drawings: Structural framing plans indicating the following:

- 1. Extent of fireproofing for each construction and fire-resistance rating.
- 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
- 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
- 4. Treatment of fireproofing after application.

1.5 INFORMATIONAL SUBMITTALS:

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE:

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

- 1.7 FIELD CONDITIONS:
- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50°F (10°C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
 - B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

- 2.1 MATERIALS, GENERAL:
- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
 - B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
 - C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - D. Steel members are to be considered unrestrained unless specifically noted otherwise.
 - 1. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 2. Flat Paints and Coatings: 50 g/L.
 - 3. Non-flat Paints and Coatings: 150 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 6. Fireproofing Exterior Coatings: 350 g/L.
 - E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - F. Asbestos: Provide products containing no detectable asbestos.
- 2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS:
- A. MIFRC Manufacturer's standard, factory-mixed formulation or factory-mixed, multi- component system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Carboline Company, subsidiary of RPM International, Fireproofing Products Division.
 - b. Isolatek International.
 - 2. Application: Designated for 'exterior' use by a qualified testing agency acceptable to authorities having jurisdiction.
 - 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design. Meet or Exceed Fire resistance of Structural Slabs and Beams of 2 hours.
 - 4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 5. Flame-Spread Index: 25 or less.
 - 6. Smoke-Developed Index: 50 or less.
 - 7. Hardness: Not less than 80 Type D durometer, according to ASTM D 2240.
 - 8. Finish: As selected by Architect from manufacturer's standard finishes.
 - 9. Color and Gloss: As indicated by manufacturer's designations.
- 2.3 AUXILIARY MATERIALS:
- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for

- use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
 - D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
 - E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 - 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application. Field Coordinate with existing conditions.
- B. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire- resistive products after application.

3.3 APPLICATION:

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing piping, and other items that would interfere with applying fireproofing until

application of fireproofing is completed.

- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
 - E. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
 - F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
 - G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
 - H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish.
 - I. Cure fireproofing according to fireproofing manufacturer's written recommendations.
 - J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
 - K. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
 - 3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.
 - 4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
- 3.4 FIELD QUALITY CONTROL:
- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, 1704.11.
 - B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
 - C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
 - D. Prepare test and inspection reports.
- 3.5 CLEANING, PROTECTING, AND REPAIRING:
- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
 - B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
 - C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
 - D. Repair fireproofing damaged by other work before concealing it with other construction.
 - E. Repair fireproofing by reapplying it using same method as original installation or using manufacturers' recommended trowel-applied product.

END OF SECTION

SECTION 07 84 00

THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes filling of openings in floors, walls, and fire-rated partitions where pipe, conduit, ducts, and other installations (penetrations) are passing through fire-rated construction; and required fillers and accessories. Include both empty openings and openings containing penetrating items.

1.02 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
 - 3. Fire-resistance-rated floor and roof assemblies.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - 1. Penetrations located outside wall cavities.
 - 2. Penetrations located outside fire-resistive shaft enclosures.
 - 3. Penetrations located in construction containing fire-protection-rated openings.
 - 4. Penetrating items larger than 4-inch diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide through penetration firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as per ASTM E 84.

1.03 SUBMITTALS

- A. Product data for each type of through-penetration firestop system specified.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include through penetration firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of through-penetration firestop systems with requirements including fire performance characteristics.
- D. Manufacturer's Certificates - signed by manufacturers of through-penetration firestop systems:
 - 1. Certification that products meet or exceed specified requirements. Evidence of UL Certification, Warnock Hersey, or Factory Mutual Systems Approval.
 - 2. Certification that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- E. Installer Qualification Data attesting that installer has completed through-penetration firestopping systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance. In addition, Installer has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" and successfully trained for product installation by through-penetration firestop system manufacturer
 - 1. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- F. Submit copies of field quality-control testing and inspection reports.
- G. Provide manufacturer's engineering judgment identification number and drawing details when there is no UL, Warnock Hersey or OPL system available for an application. Engineering judgment must include both project name and the contractor's name who will install through penetration firestop system as described in judgment drawing.
- H. Submit copy of Warranty specified herein.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide through-penetration firestop system materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
- B. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements to achieve a fire rating as noted on Drawings:
 - 1. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - 2. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following: UL in "Fire Resistance Directory."
- C. Single Source Responsibility: Provide through-penetration firestop systems, primers, and accessories from a single manufacturer.
- D. Installer Qualifications: Company specializing in installation of firestopping specified, licensed, trained and approved by manufacturer of firestop materials submitted, with experience on at least five projects of similar nature
 - 1. Installer must provide evidence of performance on at least three successful similar size and type projects.
 - 2. Installer must be FM approved per FM Standard 4991.
 - 3. Installer must be licensed by the state or local authority where applicable.
 - 4. Installer must be a member in good standing of the Firestop Contractor's International Association (FCIA).
- E. All through-penetration firestop systems will be installed by one company that will coordinate with all trades requiring through-penetration firestop systems to complete their respective installations.
- F. Inspection Requirements: ASTM E 2174-01 - Standard Practice for on-Site Inspection of Installed Fire Stops=.
- G. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".
- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01310 - "Project Management and Coordination."
- I. Information within construction documents referring to specific design designations of through penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.

- 1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver through-penetration firestop systems to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
 - B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- 1.06 PROJECT CONDITIONS
- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
 - B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.
- 1.07 COORDINATION
- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
 - B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
 - C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
 - D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.
- 1.08 WARRANTY
- A. General Warranty: The special warranty specified in this Article shall not deprive MDAD of other rights they may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
 - B. Submit written agreement on through-penetration firestop system manufacturer's standard form, signed by manufacturer, installer, and contractor, agreeing to repair or replace defective materials that do not comply with these specifications or fail to provide the fire-stopping requirements of the referenced standards for a period of three (3) years after the date of Substantial Completion and MDAD Final Acceptance.
 - C. When available submit written agreement on through-penetration firestop system manufacturer's standard form, signed by manufacturer, agreeing to repair or replace defective materials that fail to provide an air and watertight condition after materials have cured for a period of five (5) years after the date of Substantial Completion and Owner Final Acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following manufacturers are approved for use upon condition of submittal of shop drawings with UL assembly designations equivalent to the types indicated on the drawings. Final Record Documents will reflect the appropriate UL assembly designations for the selected manufacturer:

1. Basis of Design: Hilti, Inc., www.hilti.com
2. 3M Brand Fire Protection Products, www.3m.com
3. Tremco, Inc., www.tremcosealants.com

2.02 FIRESTOPPING - GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

1. For penetrations involving CPVC piping, provide through-penetration firestop systems which include materials that have been tested to be compatible with CPVC piping.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Ceramic Fiber.
 - c. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - d. Fire-rated form board.
 - e. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Under normal environmental conditions, all material used shall be non-corrosive to metal and compatible with synthetic cable jackets.

D. Provide all miscellaneous items required to attach materials as specified and shown on Drawings.

2.03 FILLER MATERIALS

A. Pliable, hand applied, putty-like or foamed material, with enough consistency to retain its shape during and after installation, and which provides an immediate fire seal, is incombustible, emits no hazardous or toxic fumes when exposed to fire or high temperatures, and complies with requirements of the- following standards:

1. Underwriters Laboratories classification standards for 3-hour fire rating and 3-hour cold side temperature rating or fire-ratings as required for the project.

2. National Electric Code.
 3. Florida Building Code 6TH Edition, 2017 Edition.
 4. NFPA 101 Life Safety Code.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
 - C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
 - D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
 - E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
 - F. Intumescent Putties: Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
 1. Use intumescent putties utilizing graphite-based expansion agents in lieu of sodium silicate to prevent degradation by rain or high humidity.
 - G. Intumescent Wrap Strips: Single-component intumescent elastomeric strips.
 - H. Putty Pads: Wall opening protective materials for use with UL listed metallic and specified non-metallic outlet boxes.
 - I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of plastic or glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
 - J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
 - K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping, gunnable sealant, unless indicated through penetration firestop system limits use to non-sag grade for both opening conditions.
 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 3. Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.
 - L. Firestop Mortar based on fire-resistive microsilica compounds.

2.04 MISCELLANEOUS MATERIALS

- A. Backup fillers, support frames, backup board for single access openings, primers, etc., as recommended and approved by the filler manufacturer.

- B. Primer: Type recommended by through-penetration firestop system manufacturer for specific substrate surfaces.
- C. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

2.05 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Clean opening to be sealed and remove loose material. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 1. Remove laitance and form release agents from concrete.
- D. Anchor, position, and secure in place materials passing through the opening.
- E. Make sure there is enough clearance between materials passing through and none are resting against the side of the opening, so that filler material can surround each item.
- F. Protect adjacent finished surfaces.

3.02 INSTALLATION

- A. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces. Apply primer and materials in accordance with manufacturer's instructions. All products used must be from same manufacturer for all applications.
- B. Make sure there is enough clearance between materials passing through and none are resting against the side of the opening, so that filler material can surround each item.
- C. Install material at walls or partition openings which contain penetrating sleeves, piping, duct work, conduit and other items, requiring through-penetration firestop system.
- D. Apply through-penetration firestop system material in sufficient thickness to achieve rating to uniform density and texture.
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- E. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.
- F. Examine installation including sealant materials and any damming or support materials to verify integrity of installation. Where system design permits, remove damming or support materials only after it has been determined that sealant materials have fully cured or dried.
- 3.03 FIELD QUALITY CONTROL
- A. Inspecting Agency: MDAD may engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.
1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.
- B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
- C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements of tested and listed system design.
- D. After installation is complete, qualified independent inspecting agency shall submit inspection findings in writing with certification that Systems and Designs were installed in compliance with requirements of tested and listed firestop system.
- 3.04 REPAIRS AND MODIFICATIONS
- A. Identify damaged, improperly installed or reentered seals for repair or modification.
- B. Modifications to penetrants shall be accomplished as per the through penetration firestop manufacturer's recommendations.
- C. Only materials used in the original seal and designated by the manufacturer as suitable for said repair, shall be used for this purpose.

3.05 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

- B. Provide final protection and maintain conditions during and after installation that ensure through - penetration firestop systems are without damage or deterioration at time of Substantial Completion and Owner Final Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION

SECTION 07 90 00

JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide joint sealers and associated materials required for complete installations at exterior and interior locations to prevent moisture, light and sound leakage at exposed joints at:
 - 1. Expansion and contraction joints.
 - 2. Wet areas such as around plumbing fixtures.
 - 3. Other locations, as necessary.

1.02 REFERENCES

- A. American Society for Testing and Materials: ASTM D 1056: Flexible Cellular Materials - Sponge or Expanded Rubber.
- B. Federal Specifications:
 - 1. FS TT-S-00227E - Sealing Compound, Elastomeric Type, Multi-Component.
 - 2. FS TT-S-00230C - Sealing Compound, Elastomeric Type, Single-Component.
 - 3. FS TT-S-001543 - Sealing Compound, Silicone Rubber Base.
 - 4. FF TT-S-001657 - Sealing Compound, Single-Component, Butyl Based, Solvent Release Type.

1.03 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Exterior: Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
 - 2. Interior: Provide joint sealants that have been produced and installed to maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, specifications, recommendations and instructions for surface preparation, sealant and backing installation, and related materials.
- B. Samples: Submit standard color charts for selection; furnish samples of custom colors as applicable.
- C. Certificates: Submit letter of certification from manufacturer or certified test laboratory reports that materials meet the following:
 - 1. Sealant materials are chemically compatible with each other and proposed substrate, comply with Specification requirements, and are intended for applications indicated.
 - 2. Sealant, primers, and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

1.05 QUALITY ASSURANCE

- A. Qualifications - Applicator: Provide documentation of minimum three years experience approved by sealant manufacturer.

- B. Pre-Installation Meeting: Prior to installation of sealant, meet at project site to review material selections, joint preparations, installation procedures and coordination with other trades. Meeting shall include the sealant Installer, Contractor, Manufacturer's representative, and representatives of other trades or subcontractors affected by sealant installation. Examine sample installations which have been prepared and determine and record whether everyone present is in agreement that the proposed installations are likely to perform as required. Notify Design Professional prior to meeting as to time, place and date of meeting.

1.06 DELIVERY STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendation to prevent their deterioration or damage due to moisture, high or low temperatures, contaminates, or other causes.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate conditions are outside limits permitted by joint sealant manufacturer or below 40 deg. F.
 - 2. When temperature conditions cause joint widths to be at either maximum or minimum design conditions.
 - 3. When joint substrates are wet.

1.08 WARRANTY

- A. Exterior Sealants: Warrant materials and installation against air and water leakage for minimum five-year period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Substitutions: Comply with Division 01 Sections.

2.02 SEALING AND CAULKING MATERIALS

- A. Polyurethane Sealant - Type No. 1:
 - 1. One-component, non-sag, low modulus, moisture curing, polyurethane joint sealant; FS TT-S-00230C, Class A, Type II.
 - 2. Acceptable Products:
 - a. Dymonic 100 by Tremco.
 - b. NP-1 by Sonneborn.
 - c. QSC-101 by QSC Products, Ltd.
 - d. Dynatrol I by Pecora
 - e. Vulkem 116 by Mameco International.

2.03 ACCESSORIES

- A. Joint Cleaner: Non-corrosive type recommended by sealant manufacturer, compatible with joint forming materials.

- B. Primer: Non-staining type recommended by sealant manufacturer to suit application and substrate materials.
- C. Backer Rod:
 - 1. Combination open/closed, compatible with sealant; sized and shaped to control depth of sealant; and to maintain 25 to 50 percent compression of material, ASTM D 1056.
 - 2. Acceptable Product: Sof Rod by I.T.D.
- D. Bond Breaker: Pressure sensitive adhesive polyethylene tape recommended by sealant manufacturer to suit application.
- E. Masking Tape: Pressure sensitive adhesive paper tape.

2.04 MIXING

- A. Mix components in accordance with manufacturer's recommendations.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine joints to be sealed for construction defects which could adversely affect execution of Work.
- B. Ensure that concrete has cured 28 days minimum before commencing sealing operations.
- C. Determine in conjunction with sealant manufacturer's representative if adhesion testing is necessary prior to application of materials. Submit letter of certification from sealant manufacturer accepting substrate conditions for sealant.

3.02 PREPARATION

- A. Clean joint surfaces using joint cleaner as necessary, free of dust, dirt, oil, grease, rust, lacquers, laitance, release agents, liquid water repellent, moisture or other matter which might adversely affect adhesion of sealants.
- B. Etch concrete, masonry and plaster joint surfaces to remove excess alkalinity. Etch with 5 percent solution of muriatic acid. Neutralize with dilute ammonia solution. Rinse thoroughly with water and allow to dry.
- C. Steel Surfaces: Scrape and wire brush to remove loose mill scale. Remove dirt, oil or grease by solvent cleaning. Wipe surfaces with lintless paper towels.
- D. Aluminum Surfaces:
 - 1. Clean off temporary protective coatings.
 - 2. When masking tape is used for a protective cover, remove tape just prior to applying sealant.
- E. Roughen joint surfaces on non-porous materials. Rub with fine abrasive cloth or wool to produce a dull sheen.
- F. Mask areas adjacent to joints as necessary.

- G. Apply primer as recommended by manufacturer. Do not allow primer or sealants to spill or migrate onto adjoining surfaces.
- 3.03 APPLICATION
- A. Install sealant materials in accordance with manufacturer's instructions.
 - B. Install backing material in joints using blunt instrument to avoid puncturing.
 - C. Do not twist rod while installing.
 - D. Install backing to form joint depth of 50 percent of joint width, minimum of 1/4" deep.
 - E. Apply sealant in joints using pressure gun with nozzle cut to fit joint width.
 - F. Deposit sealant in uniform, continuous bead.
 - G. Tool joints to required configuration within manufacturer's recommended setting time.
 - H. If masking materials are used, remove immediately after tooling.
- 3.04 FIELD QUALITY CONTROL
- A. Manufacturer's Representative:
 - 1. No sealants may be used unless a qualified representative is present at start up of work to advise installer of proper procedures and precautions for use of materials and to check installation.
 - 2. Contractor shall give manufacturer notice one week prior to start-up that his presence will be required, to ensure proper installation of his materials.
- 3.05 CLEANING
- A. Remove excess materials adjacent to joints as Work progresses to eliminate evidence of spillage or damage to adjacent surfaces.
 - B. Remove and replace improperly sealed joints.
 - C. Clean or replace materials or surfaces that are damaged by sealing operations.
- 3.06 SCHEDULE OF SEALANTS AND CAULKS
- A. Exterior building joints subject to dynamic movement, not exposed to foot or vehicular traffic: Sealant Type No.
 - B. Exterior horizontal joints subject to foot and vehicular traffic Sealant Type No. 3 or 4.
 - C. Sealants in adjacent to Roof Membrane: Sealant Type 1.
- 3.07 COLOR SCHEDULE
- A. Other Exposed Locations: Manufacturer's standard color line as selected by Design Professional.
 - B. Non-exposed Locations: Manufacturer's standard.

END OF SECTION

SECTION 07 95 00

EXPANSION CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY:

- A. Section Includes:
 - 1. Exterior wall expansion control systems.
 - 2. Open-air structure expansion control systems.
- B. Related Requirements:
 - 1. Section 07 92 00 'Joint Sealants' for liquid-applied joint sealants and for elastomeric sealants.

1.03 ACTION SUBMITTALS:

- A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, block out requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches (150 mm) long in size.
- C. Samples for Initial Selection: For each type of expansion control system indicated.
 - 1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.
- D. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches (150 mm) long in size.
- E. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion control system.
 - 2. Expansion control system location cross-referenced to Drawings.
 - 3. Nominal joint width.
 - 4. Movement capability.
 - 5. Classification as thermal or seismic.
 - 6. Materials, colors, and finishes.
 - 7. Product options.
 - 8. Fire-resistance ratings.

1.04 INFORMATIONAL SUBMITTALS:

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs,

cross-connections, and other accessories as required to provide continuous expansion control systems.

- B. Coordination: Coordinate installation of exterior wall and soffit expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.02 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.
- B. All products must be certified by independent laboratory test report to be free in composition of any waxes or wax compounds using FTIR and DSC testing.
- C. All products shall be certified in writing to be: a) capable of withstanding 150°F (65°C) for 2 hours while compressed down to the minimum of movement capability dimension of the basis of design product (-50% of nominal material size) without evidence of any bleeding of impregnation medium from the material; and b) that the same material after the heat stability test and after first being cooled to room temperature will subsequently self-expand to the maximum of movement capability dimension of the basis-of-design product (+50% of nominal material size) within 24 hours at room temperature 68°F (20°C).
- D. Quality and Environmental control: Manufacturer shall be certified to both ISO-9001:2015 (quality management) and ISO-14001:2015 (environmental management), and shall provide written confirmation that formal Quality and Environmental management systems and processes have been adopted.

2.03 EXTERIOR EXPANSION CONTROL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. EMSEAL or approved equal
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Wall-to-Wall:
 - 1. Basis-of-Design Product: EMSEAL JOINT SYSTEMS, LTD 25 Bridle Lane, Westborough, MA 01581-2603, Toll Free: 800-526-8365. (Canada) EMSEAL, LLC 120 Carrier Drive, Toronto, Ontario, Canada M9W 5R1 Toll Free: 800-526-8365. www.emseal.com
 - a. Provide watertight, energy-efficient, 2 hour fire rated, exterior and interior joints in vertical-plane walls (above-grade). Typical locations include applications for exterior wall joints and interior wall joints where a 2 hour fire rating is required or desired. System shall perform waterproofing, fire-rating, movement-accommodation functions as well as contribute to thermal insulation and sound attenuation as the result of a single installation and without the addition of ancillary fire-blankets, mineral wool, coverplates, etc.
 - b. Provide EMSHIELD WFR2 as manufactured by EMSEAL JOINT SYSTEMS LTD and as indicated on drawings for vertical-plane expansion joint locations.
 - c. Sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, 2 hour-rated, sealant system. Sealant system shall be comprised of the following components: 1.) fire-retardant-impregnated foam pre-coated at the outer layers with waterproof silicone, 2.) field-applied epoxy adhesive primer, 3.) field-injected silicone sealant bands.
 - d. Material shall be capable of movements of up to +50%, -50% (100% total) of nominal

material size. Standard sizes from 1/2" (25mm) to 6" (150mm). Depth of seal is 4" (100 mm).

- e. Silicone external color facings to be low-modulus, waterproof silicone factory-applied to the foam while it is partially pre-compressed to a width greater than maximum joint extension and cured before final compression. When compressed to final supplied dimension, a bellow(s) to handle movement must be created in the silicone coating. Silicone coatings to be available in a range of not less than 26 standard colors for coordination with typical building materials. Separate colors may be chosen for each coated surface.
- f. Select the sealant system model appropriate to the movement and design requirements at each joint location that meet the project specification or as defined by the structural engineer of record.
- g. Manufacturer's Checklist must be completed by expansion joint subcontractor and returned to manufacturer at time of ordering material.

2.04 FABRICATION

- A. EMSHIELD WFR2 by EMSEAL must be supplied precompressed to less than the joint size, packaged in shrink-wrapped lengths (sticks).
- B. Directional changes and terminations into horizontal plane surfaces to be provided by factory-manufactured Universal-90-degree single units containing minimum 12-inch long leg and 6-inch long leg or custom leg on each side of the direction change or through field fabrication in strict accordance with published installation instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. The contractor shall provide properly formed and prepared expansion joint openings constructed to the exact dimensions and elevations shown on manufacturer's standard system drawings or as shown on the contract drawings. Deviations from these dimensions will not be allowed without the written consent of the engineer of record.
- B. The contractor shall clean the joint opening of all contaminants immediately prior to installation of expansion joint system. Repair spalled, irregular or unsound joint surfaces using accepted industry practices for repair of the substrates in question. Remove protruding roughness to ensure joint sides are smooth. Ensure that there is sufficient depth to receive the full depth of the size of the EMSHIELD WFR2 being installed. Refer to Manufacturers Installation Guide for detailed step-by-step instructions.
- C. No drilling, or screwing, or fasteners of any type are permitted to anchor the sealant system into the substrate.
- D. System to be installed by qualified sub-contractors only according to detailed published installation procedures and/or in accordance with job-specific installation instructions of manufacturer's field technician.

3.03 PROTECTION

- A. Protect the system and its components during construction. Subsequent damage to the expansion joint system will be repaired at the general contractor's expense. After work is complete, clean exposed surfaces with a suitable cleaner that will not harm or attack the finish.

END OF SECTION

SECTION 08 11 00

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the following:
1. SDI Level 3 (extra-heavy-duty Level A according to ANSI A250.8) Model 1 Full Flush, non-fire-rated, fire-rated doors and frames for interior locations, of standard steel construction as scheduled.
 2. SDI Level 4 (maximum-duty Level A according to ANSI A250.8) Model 1A Full Flush, non-fire-rated doors and frames for exterior locations, of standard galvanized steel construction as scheduled.
 3. Door louvers for steel doors – Not applicable.
- B. Definitions:
1. Uncoated steel sheet thickness is indicated as the minimum thickness according to ANSI A250.8, Steel Tables.
 - a. .053" min. for Level 3
 - b. .067" min. for Level 4
 2. Metallic-coated steel sheet thickness is indicated as the minimum thickness of the uncoated base metal.

1.02 SUBMITTALS

- A. Product Data: Submit for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, profiles, and finishes.
- B. Shop Drawings:
1. Submit for fabrication and installation of doors and frames.
 2. Include details of each frame type, elevations of door design types, conditions at opening, details of construction, location, and installation requirements of finish hardware and reinforcements, and details of joints and connections.
 3. Show anchorage and accessory items.
 4. Provide Door and Frame Schedule using same reference numbers for details and openings as those on Drawings.
 5. Show the direction of all graining for the stainless-steel doors and frames.
- C. Construction Samples, approximately 12" x 12", representing the required construction of stainless-steel doors and frames for Project.
1. Doors: Show vertical-edge, top, and bottom construction; insulation; face stiffeners; and hinge and other applied hardware reinforcement. Include louver section, if applicable.
 2. Frames: Show profile, welded corner joint, welded hinge reinforcement, dust-cover boxes, floor and wall anchors, stops, and silencers.
- D. Door Schedule: Use same reference designations indicated on Drawings. Prepare schedule in tabular format with following minimum columns and information:
1. Reference designation.
 2. SDI Door Level.
 3. SDI Model Designation.

4. Minimum face sheet thickness.
 5. Overall door thickness.
 6. Door core construction.
 7. Frame construction.
 8. Frame sheet metal thickness.
 9. Door and frame metal material type.
 10. Fire rating at door opening, as applicable.
- E. Equipment substitutions must be approved in writing by the Design Professional of Record (DPR) and MDAD'S Project Manager.
- F. All exterior doors and frames require submission of copy of Product Control division, Notice of Acceptance in compliance with requirements of Florida Building Code 2017 (6th Edition).
- G. Fire Egress/Security Doors: Comply with requirements of Sections 087100 for performance requirements, maintenance, testing and acceptance, operation and maintenance, and security requirements.
- 1.03 QUALITY ASSURANCE
- A. Reference Standards:
1. Steel Door and Frame Standard: Comply with ANSI A250.8.
 2. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by testing and inspecting agency acceptable to authorities having jurisdiction based on testing according to NFPA 252.
 - a. Test Pressure: Test at atmospheric pressure.
 - b. Temperature Rise Rating: Max. 450 deg. F (250 deg. C) in 30 minutes of fire exposure.
- 1.04 DELIVERIES, STORAGE AND HANDLING
- A. Delivery:
1. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage.
 2. Provide additional protection to prevent damage to factory-finished doors and frames.
 3. Inspect doors and frames on delivery for damage.
 4. Minor damages may be repaired, provided refinished items are equal in all respects to new work and acceptable to the Design Professional.
 5. Remove and replace damaged items as directed.
- B. Storage:
1. Store doors and frames at building site under cover.
 2. Place units on min. 4" high wood blocking.
 3. Avoid use of no vented plastic or canvas shelters that could create humidity chamber.
 4. If cardboard wrapper on door becomes wet, remove carton immediately.
 5. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Steel Doors and Frames: Provide doors manufactured by one of the following manufacturers: Ceco Door Products, Curries Co., Firedoor, Mesker Door Co., Steelcraft,

2.02 MATERIALS

A. Steel:

1. Cold-Rolled Steel Sheets: Commercial Quality carbon steel, complying with ASTM A366, Type B, stretcher-leveled standard for flatness.
2. Galvanized Steel Sheets: Zinc-coated carbon steel, Commercial Quality cold rolled steel, comply with ASTM A653/A, Type B, with A40 (ZF126) zinc-iron alloy (galvannealed) coating; stretcher-leveled standard for flatness.
3. Stainless-Steel Sheets: ASTM A 666, stainless steel, Type 304.

B. Anchors and Fasteners:

1. Supports and Anchors: Fabricate of minimum .042" steel, galvanized where used with galvanized frames.
2. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, comply with ASTM A153, Class C or D, as applicable.
3. Stainless Steel doors and frames shall have reinforcements, supports, anchors, (Jamb Anchors .053" / Floor Anchors – .067") bolts and fasteners manufactured from stainless steel, Type 304.

C. Shop-Applied Paint for Steel Doors and Frames:

1. Rust-inhibitive primer enamel or paint, either air-dried or baked, suitable as base for specified finish paints.
2. Comply with ANSI A224.1, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

2.03 FABRICATION

A. General:

1. Fabricate door and frame units to be rigid, neat in appearance and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at Project site.
2. Wherever practicable, fit and assemble units in manufacturer's plant.
3. To assure proper assembly at Project site, clearly identify work that cannot be permanently factory-assembled before shipment.
4. Comply with ANSI/SDI-100 requirements.
5. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
6. Clearances:
 - a. Max. 1/8" at jambs and heads; except max. 1/4" between nonfire-rated pairs of doors.
 - b. Max. 3/4" at bottom.
 - c. Tolerances: Comply with SDI 117, Manufacturing Tolerances Standard Steel Doors and Frames.
7. Finish Hardware Preparation:
 - a. Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier.
 - b. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.
 - c. For concealed overhead door closers, provide space, cutouts, reinforcing, and

- provisions for fastening in top rail of doors or head of frames, as applicable.
 - d. Reinforce doors and frames to receive surface-applied hardware.
 - e. Drilling and tapping for surface-applied finish hardware may be done at Project site.
 - f. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with Recommended Locations for Builder's Hardware, published by Door and Hardware Institute.

- B. Steel Door Construction:
 1. Provide metal doors of types and styles or grades and models indicated on Drawings or Schedules.
 2. Face Thickness for Steel Doors:
 - a. Level 3: 0.053" – Interior (Cold Rolled Steel)
 - b. Level 4: 0.067" – Exterior (Galvanized)
 3. Internal Construction:
 - a. Non-Rated Doors: Honeycomb, Polystyrene or Polyurethane
 - b. Rated Doors: Mineral fiberboard.
 4. Exterior Doors: Close top and bottom edges of exterior doors as integral part of door construction or by addition of min. 0.053" inverted steel channels.

- C. Steel Frame Construction:
 1. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled steel or stainless steel.
 2. Frame Thickness - Steel Doors:
 - a. Level 3: 0.0625" – Interior (Cold Rolled Steel)
 - b. Level 4: 0.0747" – Exterior (Galvanized)
 3. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single doorframes and 2 silencers on heads of double doorframes.
 4. Plaster Guards: Provide min. 0.0179 in. Steel plaster guards or mortar boxes frame, at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

- D. Labeled and Fire-Rated Assembly: In addition to general fabrication requirements for doors and frames, provide assemblies complying with following performance criteria.
 1. Doors: 0.1719" steel plate hinge reinforcement, 0.1094" closer reinforcement, and 0.1094" lock front reinforcement.
 2. Frames: welded at miter point and ground smooth.
 3. Labeling: Underwriter's Laboratories (UL), Factory Mutual (FM), or Warnock Hersey.

- E. Shop-Painting Steel Doors and Frames:
 1. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
 2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
 3. Apply shop coat of prime paint of even consistency to provide uniformly finished surface ready to receive finish paint per ANSI A250.10.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as specified.
- B. Placing Frames:
 - 1. Comply with provisions of SDI-105, Recommended Erection Instructions for Steel Frames, unless otherwise indicated.
 - 2. Except for frames located at in-place concrete or masonry and at drywall installations, place frames before construction of enclosing walls and ceilings.
 - 3. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
 - 4. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 5. Masonry Construction: Locate 3 wall anchors per jamb at hinge and strike levels.
 - 6. In-Place Concrete or Masonry Construction: Set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
 - 7. Install fire-rated frames in accordance with NFPA 80.
 - 8. Metal Stud Partitions: Install at least 3 wall anchors per jamb at hinge and strike levels.
- D. Door Installation:
 - 1. Fit hollow metal doors accurately in frames within clearances specified in ANSI A250.8 and shim as required to comply with SDI 122 and ANSI/DHI A115.1G.
 - 2. Place fire-rated doors with clearances as specified in NFPA 80.
 - 3. Install smoke control doors to comply with NFPA 105.

3.02 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply compatible air-drying primer touchup.
- B. Protection Removal: Immediately before final inspection, remove protective plastic wrappings from pre-finished doors.
- C. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08 30 50

ACCESS DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes access doors at plumbing chases, gypsum board walls or ceilings, or other surfaces that conceal work that will require maintenance by MDAD.

1.02 SUBMITTALS

- A. Product Data: Submit specifications, details and installation instructions, including methods of anchoring.
- B. Shop Drawings: If modifications from manufacturer's details is required, submit drawings indicating modifications, opening size, attachment details, and hardware.
 - 1. Size Verification: Obtain location and sizes for access doors from trades requiring access to concealed equipment and indicate on submittal schedule.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Provide access door assembly with panel door, frame, hinge and latch from manufacturer listed in Underwriters Laboratories, Inc. Classified Building Materials Index for ratings indicated.

1.04 SEQUENCING AND SCHEDULING

- A. Furnish inserts and anchoring devices which must be built into other work for installation of access doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. J.L. Industries, Inc.
 - 2. Birmingham Ornamental Iron Company.
 - 3. Hohmann & Barnard, Inc.
 - 4. Karp Associates, Inc.
 - 5. Nystrom, Inc.
 - 6. Milcor Inc.
- B. Substitutions: Must be approved in writing by the Design Professional of Record (DPR) and MDAD'S Project Manager.

2.02 NON-RATED - WALLS AND CEILINGS

- A. Frame: 16-gauge steel.
- B. Door Panel: 14-gauge steel.
- C. Hinges: Continuous type, 175-degree swing, steel with stainless steel pin.
- D. Locking Device:
 - 1. Master-keyed cylinder lock Medeco to match MDAD's existing system.
 - 2. Number as recommended by manufacturer for size of door.

- E. Acceptable Products - Concealed Flange:
 - 1. Model WB by J.L. Industries, Inc.
 - 2. APWB Series by Nystrom, Inc.
 - 3. Style DW by Milcor, Inc.

- F. Acceptable Products - Plaster Flange:
 - 1. Model PW by J.L. Industries, Inc.
 - 2. APPW Series by Nystrom, Inc.
 - 3. Style K by Milcor, Inc.

2.03 RATED WALLS

- A. Frame: 16-gauge steel, with perimeter casing bead for flush appearance.
- B. Door Panel:
 - 1. 20-gauge sheet steel.
 - 2. 2" thick insulated sandwich panel assembly.
 - 3. Automatic closer and latch.
 - 4. Interior latch release device.
 - 5. UL 1-1/2 hour "B" Label.
- C. Hinges: Concealed, pin type.
- D. Locking Device:
 - 1. Master-keyed cylinder lock, Medeco to match MDAD's existing system.
 - 2. Number as recommended by manufacturer for size of door.
- E. Acceptable Products:
 - 1. Model FD by J.L. Industries, Inc.
 - 2. APFR-WP Series by Nystrom, Inc.
 - 3. Style FR by Milcor, Inc.

2.04 RATED - PLASTER AND DRYWALL CEILINGS

- A. Frame: 10-gauge steel.
- B. Door Panel: 18-gauge sheet steel.
- C. Hinges: Continuous.
- D. Finish: Manufacturer's electrostatically applied white epoxy over phosphate dipped steel.
- E. Locking Device:
 - 1. Master-keyed cylinder lock, Medeco to match MDAD's existing system.
 - 2. Number as recommended by manufacturer for size of door.
- F. Acceptable Products:
 - 1. Model FRC J.L. Industries, Inc.
 - 2. Style ATR Milcor, Inc.
 - 3. APAW Series Nystrome, Inc.

2.05 FABRICATION

- A. Fabricate from cold-rolled steel, welded components, exposed welds dressed smooth and flush with adjacent surfaces.
- B. Form doors with flush panel design.
- C. Furnish accessories with adjustable metal anchors for securing to substrate.
- D. Furnish each access door assembly manufactured as a complete unit with parts ready for installation.
- E. Provide plastic grommets at cylinder core through sandwich panels.

2.06 FINISH

- A. Manufacturer's standard baked enamel prime coated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify size and dimension requirements at site.
- B. Verify that openings are correctly dimensioned to receive doors.

3.02 INSTALLATION

- A. Comply with manufacturer's instructions for secure attachment, proper relation to adjacent finished surfaces and proper operation.
- B. Set assemblies plumb and level, properly anchored in place.

3.03 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation. Adjust latching and locking mechanism to operate smoothly.

END OF SECTION

SECTION 08 46 20

AUTOMATIC SWINGING DOORS

PART 1 - GENERAL

1.02 SUMMARY

- A. This Section includes automatic entrance door systems operating as follows:
 - 1. Automatic Swinging Doors
 - 2. Stainless steel panel closures, cladding, and access panels.
 - 3. Activation and safety device for automatic door operation.

1.03 DEFINITIONS

- A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.
- B. Safety Device: Device that prevents a door from opening or closing.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide automatic door systems that have the following capabilities based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:
 - 1. Door Operator Performance: Provide door operators that will open and close doors and maintain them in fully closed position when subjected to the design pressures.
 - 2. Opening Force: Single action emergency breakaway 5 lb. max force.
 - 3. Opening Force for Low-Energy Power-Operated Doors: Provide operators that require no more than 15 lbf (67 N) to stop door movement.
 - 4. Compliance with ADA Requirements.
 - 5. Installer is responsible to coordinate his work with all related trades.

1.05 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic entrance doors.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other Work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by a qualified Florida structural engineer responsible for their preparation.
 - 2. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
- B. Hardware Schedule: Organize schedule into sets based on hardware specified. Include name of item and manufacturer, and complete designation of every item required for each automatic entrance door.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. Size: 12" long sections of extrusions or formed shapes.
- E. Product Certificates: Signed by manufacturers of automatic entrance doors certifying that products furnished comply with emergency exit door requirements.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Design Professionals and MDADs, and other information specified.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current automatic entrance door systems comply with requirements.
- H. Maintenance Data: For door operators and control systems to include in maintenance manuals specified in Division 1. Include instructions on how to perform safety tests, and the name, address, and telephone number of nearest authorized service representative.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer with a minimum of five-year equipment and systems installation experience similar to the work required by this section and who is an authorized representative of the automatic entrance door manufacturer for both installation and maintenance of units required for this Project.
 - 1. Certified Inspector: Installer shall employ an inspector certified by the American Association of Automatic Door Manufacturers.
 - 2. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of automatic entrance door systems that are similar to those indicated for this Project in material, design, and extent.
- C. Manufacturer Qualifications: A firm experienced, minimum ten years, in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Company Certificate: Provide Certification that the manufacturer is a member of the American Association of Automatic Door Manufacturers.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- E. Source Limitations: Obtain automatic entrance doors through one source from a single manufacturer.

- F. Welding Standards: Comply with AWS D1.2, "Structural Welding Code." ANSI/BHMA Standards: Comply with the following:
 1. ANSI/BHMA A156.10, "Power Operated Pedestrian Doors."
 2. ANSI/BHMA A156.19, "Power Assist and Low Energy Power Operated Doors."
- H. UL Standard: Provide power door operators that comply with UL 325.
- I. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.
- J. Pre-installation Conference: Conduct conference at Project site to comply with requirements in "Section 01200 - Project Meetings." Conference shall be coordinated within the approved construction schedule. Actual conference shall be coordinated with Design Professional's regular site meetings.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify automatic entrance door openings by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating automatic entrance doors without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

1.08 COORDINATION

- A. Cut recesses in existing concrete floors for recessed controls for automatic entrance doors to size and location indicated in templates provided by automatic door system manufacturer. Coordinate cutting of existing structural concrete to prevent damage to reinforcing in concrete or damage to existing concrete to remain. If patching of concrete is required, comply with requirements of Section 03710, Concrete Repairs.
- B. Provide all necessary hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrance doors with hardware required for the rest of Project.

1.09 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive MDAD of other rights MDAD may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, jointly signed by manufacturer, installer and contractor, warranting work to be free from defective material and workmanship and agreeing to repair or replace components of the automatic entrance door system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 1. Lateral deflection of glass lite edges in excess of 1/175 of their length or 3/4" (75 mm), whichever is less.
 2. Excessive air leakage.
 3. Faulty operation of operators and hardware.

4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: 3 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

- A. Maintenance: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic entrance door Installer. Include quarterly planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment.
 1. Engage an inspector certified by the American Association of Automatic Door Manufacturers to perform a safety inspection after each adjustment or repair, and at the end of the maintenance period. Submit the completed inspection form to MDAD's representative and MDAD security.
 2. Perform maintenance, including emergency callback service, during normal working hours. Certain work in secure areas may have special MDAD, Federal, and Insurance requirements. These requirements may cause the work to be scheduled between 11:30 p.m. and 5:00 a.m.
 3. Include 24-hour-per-day, 7-day-per-week emergency callback service.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Electromechanical-Operated Swinging Units:
 - a. Horton Automatics
 - b. Dash Door
 - c. Dor-O-Matic
 - d. KM Systems, Inc.
 - e. Besam, Inc.

2.02 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
 1. Extruded: ASTM B 221 (ASTM B 221M). 6063T5 alloy, minimum 0.125" thick for structural sections with safety radius cover and 204-Ri alloy for exposed section.
 2. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 3. Welding Rods and Bare Electrodes: AWS A5.10
- B. Glazing: As specified in Section 08 80 00 - Glazing.
- C. Sealants and Joint Fillers: Refer to Division 7 Section "Joint Sealers" for joints at perimeter of entrance system.
- D. Brackets and Reinforcements: Manufacturer's standard; compatible with adjacent materials. Provide non-staining, nonferrous shims for aligning system components.
- E. Fasteners and Accessories:

1. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding; compatible with adjacent materials.
2. Reinforcement: Reinforce members as required to retain fastener threads.
3. Exposed Fasteners: Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

2.03 AUTOMATIC ENTRANCE DOOR SYSTEMS

A. General: Provide manufacturer's standard automatic entrance door system, complete with doors, transom framing, operators, controls, activation devices, safety devices, and accessories as indicated. Comply with the following:

1. Configuration: As indicated on plans.
- B. Activation Devices: Refer to electrical drawings.

2.04 OPERATOR COMPONENTS

A. Door Operators - Construction: Completely electromechanical; comply with ANSI A156.10 and UL 325.

1. Gear box operator: Self-contained cast aluminum housing, with precision-machined gears and bearing seals and all-weather lubricant, mounted on vibration isolators.
2. Gears: Manufactured by door operator manufacturer specifically for operators.
3. Motor: DC permanent magnet motor with shielded ball bearings. Motor will stop when the door stops or is fully open and when breakaway is operated.
4. Door operating arm: Forged steel, attached at natural pivot point of door; do not use slide block in top of door.
 - a. Exposed arms: Factory-polished and finished to match operator enclosure.
5. Microprocessor control: 115 VAC. Do not use microswitches. Mount control in snap-in type control box.
6. "On/Off/Hold-Open" switch: Three-position rocker type.
7. Control circuits for actuators and safeties: Low-voltage, NEC Class II.
8. Service conditions: Satisfactory operation between -30 degrees F (-34 degrees C) and 160 degrees F (71 degrees C).
9. Power supply required: 115 VAC.

B. Operator Enclosure: Extruded header concealing all operating parts except arms and manual control switches.

1. Surface Mounting: On surface of door frame/wall, maximum of 1/8" (3 mm) above top of door.
2. Size: 5-3/4" (146 mm) high x 4-1/2" (114 mm) deep by full doors width.
3. Provide bottom-loading header for access to controls and removable components without removal of door or operator.
4. No exposed fasteners.
5. Color: As selected by the Design Professional.
6. Hydraulic Power Open – Powered Closed

2.05 ACTUATORS

- A. Door-Mounted Infrared Safety Sensors: Dor-O-Matic #87500 or equivalent by qualified manufacturer. Provide on both sides of swinging door.
 - 1. Door Operator Control: Microprocessor.
 - a. Inoperative: Prevent closed door from opening, prevent open door from closing; allow manual opening.
 - b. Object detected on active side, door closed: Open door.
 - c. Object detected on safety side before door starts to open: Prevent door opening.
 - d. Object detected in safety zone, during door opening: Switch door operator to safety-slow-stop.
 - e. Object detected in safety zone, door open: Continue to hold door open.
 - 2. Provide safety-slow-stop function for door operator, with manual switch between options:
 - a. Safety-slow: Immediately slow down to creep speed and continue to full open position.
 - b. Safety-stop: Immediately stop for 6 seconds, then continue to full open position at creep speed.
- B. Signs: Provide signs complying with ANSI A156.10 and applicable codes.
 - 1. Approach side: Black arrow on white background inside green circle.
 - 2. Reverse side: "DO NOT ENTER" in white letters on a red circle.
 - 3. Traffic in both directions through same door: Yellow circle with "AUTOMATIC DOOR" in black letters and "CAUTION" across the middle in yellow letters on black.

2.06 FABRICATION

- A. General: Fabricate automatic entrance door system components to designs, sizes, and thickness specified and to comply with indicated standards.
- B. Prefabrication: Provide automatic entrance doors as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
 - 1. Perform fabrication operations, including cutting, fitting, forming, drilling, and grinding of metalwork in manner that prevents damage to exposed finish surfaces. For hardware, perform these operations before applying finishes.
 - 2. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
 - 3. Prepare components to receive concealed fasteners and anchor and connection devices.
 - 4. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
- C. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."
- D. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

- E. Hardware: Install hardware, except surface-mounted hardware, at fabrication plant. Remove only as required for final finishing operation and for delivery to and installation at Project site.
- F. Doors: Fabricate doors in profiles indicated. Reinforce as required to support imposed loads and for installing hardware. Factory assemble door units.
1. Finger Guards: Anchor gasketing into frame at hinge jamb of each pivoted door.
- G. Stainless Steel Work:
1. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness, .0053" thick.
 2. Sound-Deadening Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C665, Type I, and passing ASTM E136 test.
 3. Insulation Adhesive: Duct thermal-insulation adhesive complying with ASTM C916, Type I or Type III.
 4. Fasteners and Anchors:
 - a. Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - b. Provide concealed fasteners for interconnecting formed-metal fabrications and for attaching them to other work, unless otherwise indicated.
 - c. Structural Anchors: For applications indicated to comply with certain design loads, provide anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
 - d. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
 - e. Structural Anchors: For applications indicated to comply with certain design loads, provide anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
 5. Shop Assembly:
 - a. Preassemble formed-metal fabrications in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
 - b. Coordinate dimensions and attachment methods of formed-metal fabrications with those of adjoining construction to produce integrated assemblies with closely-fitting joints and with edges and surfaces aligned, unless otherwise indicated.
 - c. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2 in. wide hem on the concealed side, or ease edges to a radius of approximately 1/32 in. and support with concealed stiffeners.

- d. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness specified for stretcher-leveled sheet metal and sufficient strength for indicated use.
 - e. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
 - f. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.
 - g. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install formed-metal fabrications.
 - h. Incorporate hinged access panels in enclosures for access to controls.
6. Finish: Bright, Directional Polish: No. 4 finish.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrance doors.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary for coordinating automatic entrance door installation.

3.03 INSTALLATION

- A. General: Comply with automatic entrance door manufacturer's written installation instructions, unless more stringent requirements are indicated. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Entrances: Install entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place. Lubricate operating hardware and other moving parts.
 - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
- D. Door Operators: Install door operator system, including control wiring, as follows:
 - 1. Refer to Division 26 Sections for connection to electrical power distribution system.
- E. Activation and Safety Devices: Install control devices and wiring, including connections to door operators, as follows:
 - 1. Wall Key Switches: Provide push plates on both sides of opening as indicated.

2. Matrix Card Reader

- F. Glazing: Comply with installation requirements in Division 8 Section "Glazing", unless Otherwise indicated: Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites, uncoated clear fully tempered float glass, Kind FT (fully tempered). Clear Tempered Float Glass: Grade B (fully tempered), Style I (uncoated surfaces), Type I (float), Quality q3 (glazing quality), Class I (transparent).

3.04 FIELD QUALITY CONTROL

- A. Inspection: After completing installation, an inspector certified by the American Association of Automatic Door Manufacturers shall test and inspect each automatic entrance door for compliance with applicable ANSI/BHMA standards.
1. Inspection Report: Submit report in writing to Design Professional and Contractor within 24 hours after inspection.
- B. Repair or remove and replace Work that does not comply with requirements.

3.05 ADJUSTING

- A. Adjust door operators, controls, and hardware for smooth and safe operation.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

3.06 CLEANING AND PROTECTION

- A. Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.
1. Comply with requirements in Division 8 Section "Glazing" for cleaning and maintaining glass.
- B. Provide final protection and maintain conditions, including limiting construction traffic, that ensure automatic entrance doors are without damage or deterioration at time of Substantial Completion.

3.07 DEMONSTRATION

- A. Engage manufacturer's inspector certified by the American Association of Automatic Door Manufacturers to train MDAD's maintenance personnel to adjust, operate, and maintain automatic entrance doors as specified below:
1. Train MDAD's maintenance personnel on procedures and schedules for starting up and shutting down, troubleshooting, servicing, complying with safety requirements, and maintaining equipment and schedules.
 2. Review data in maintenance manuals.
 3. Review data in maintenance manuals
 4. Schedule training with MDAD with at least 7 days advance notice.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes securing and furnishing to the job site all Finish Hardware in accordance with this section and applicable drawings. It is intended that the following list of hardware cover all items required to complete the project and supplement the electronic security doors. Omissions and/or discrepancies shall be brought to the Design Professional's attention during the bidding period and as needed, be corrected by ASI.

B. Items covered include, but are not necessarily limited to:

1. Astragals
2. Closers
3. Dust Proof Strikes
4. Fire Exit Devices
5. Hinges
6. Keys
7. Kickplates
8. Locks and Latches
9. Lock Cylinders
10. Magnetic locks
11. Mutes
12. Overhead Stops and Holders
13. Push button Locks
14. Surface Bolts
15. Thresholds
16. Wall Stops
17. Weatherstripping

1.02 RELATED SECTIONS AND DRAWINGS

- A. Section 08 11 00 – Steel doors
- B. Section 08 46 20 – Automatic Swinging Doors
- C. Section 26 - Electrical
- D. Section 28 – Low voltage Systems including Card Access
- E. Architectural Drawings
- F. Electrical Drawings

1.03 SPECIFIC OMISSIONS

- A. The following items are specified elsewhere.
1. Card Readers
 2. Power Supplies for Magnetic Locks utilized at Security Doors.

1.04 REFERENCES:

- A. State and Local Codes including Authority having jurisdiction.

- B. Florida Building Code, 2017 (6th Edition)
 - C. Dade County Product Approval Protocol PA201, 202, 203.
 - D. ANSI 156.18 - Materials and Finishes.
 - E. ANSI 117.1 - Specifications for Making Buildings and Facilities Usable by Physically Handicapped People.
 - F. Florida Accessibility Code for Building Construction.
 - G. ADA - Americans with Disabilities Act of 1990.
 - H. BHMA - Builders Hardware Manufacturers Assoc.
 - I. NFPA - National Fire Protection Assoc.
 - 1. NFPA80 - Fire Doors and Windows
 - 2. NFPA101 - Life Safety Code
 - J. SDI - Steel Door Institute
- 1.05 SUBMITTALS:
- A. Submit copies of vertically formatted Hardware Schedule in accordance with Section 013400.
 - B. Format Hardware Schedule into Hardware Groups to clearly identify each door and frame with the following.
 - 1. Unique number; Descriptive location; Size; Hand; Degree of swing.
 - C. List within Hardware Groups all items required for each door or pair of doors, including the following.
 - 1. Quantity; Item description; Manufacturers name and catalog number; Size; BHMA finish.
 - D. Electrically related items and instructions furnished within this Section shall be *italicized* in the Finish Hardware Schedule.
 - E. Furnish numerically sorted cross reference of door numbers to Hardware Groups.
 - F. Furnish copies of catalog cuts for each item of hardware.
 - G. Furnish index and explanation of abbreviations, symbols and/or codes contained in Hardware Schedule.
 - H. Furnish chart of mounting heights and locations.
 - I. Provide templates to manufacturer's indicating location and reinforcing required for hardware items.
 - J. Approval of the Hardware Schedule will not relieve the supplier's responsibility of furnishing all hardware to complete the project.
- 1.06 COORDINATION:
- A. Furnish templates and approved Hardware Schedule in a timely manner to respective material suppliers and trades to ensure accurate reinforcing and fitting of finish hardware.

1.07 QUALITY ASSURANCE:

- A. Supplier to be a directly franchised distributor of the products to be furnished, with warehousing facilities within 50 miles of the project. An Architectural Hardware Consultant (AHC), or person of equivalent experience, shall be in their employ and available for consultation to the Design Professional, Owner and General Contractor at reasonable times during the course of work.
- B. Single Source Responsibility: Obtain each category of hardware; (lockset, latchset, deadbolt); (hinges); (closers), etc. from a single manufacturer when possible.
- C. Hardware for fire rated openings shall comply with NFPA 80, State and Local Fire Safety Codes.
- D. Hardware shall comply with requirements of the Americans With Disabilities Act, ADA, A117.1.
- E. Manufacturers shall supply both pre-installation instruction and post-installation walk thru to insure proper function and installation of all items. Recommendations, as needed, will be made for adjustment or replacement of any hardware items deemed unacceptable.

1.08 DELIVERY, STORAGE AND IDENTIFICATION:

- A. Package hardware items individually in manufacturer's original cartons, clearly marked to indicate contents and cross referenced to Hardware Schedule.
- B. Deliver, Store and Protect all items under provisions of the General Conditions.
- C. Provide locked storage area protected from moisture, sunlight, paint, chemicals, etc.

1.09 MAINTENANCE:

- A. Furnish copies of any specialized tools and maintenance instruction manuals to Owner's Representative. Manuals are to be bound in three ring hard backed binders, incorporate a master index at the front and separation of manufacturer's products by plastic tabs.

1.10 WARRANTY:

- A. Provide a one (1) year warranty against defects in materials and workmanship, commencing with substantial completion of the project. Extended warranties are specifically mentioned in each product category.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. To assure consistency and compatibility with other systems currently in place within the Airport the following manufacturer's products are specified. Acceptable alternates, where applicable, are noted in each product category.

2.02 FINISHES:

- A. Satin Chromium: US26D, BHMA 626: Lock, Latch trim; Cylinders; Overhead Stops; Wall Stops and Surface Bolts.
- B. Satin Stainless Steel: US32D, BHMA 630: Hinges; Exit Device trim; Push, Pull and Kickplates; Push Pull Latch trim.
- C. Aluminum Powder Coat: BHMA 689: Closers.
- D. Aluminum: US27, BHMA 719: Thresholds.

2.03 HINGES, ELECTRIC HINGES:

- A. Unless specifically noted otherwise in Hardware Groups, as manufactured by Hager, five knuckle, flat button tip design.
- B. Provide three hinges on all doors up to and including 90 inches in height.
- C. Add one hinge for each additional 30 inches in height.
- D. All exterior doors to have non-removable pins.
- E. Sizes:
 - 1. 4.5 X 4.5
- F. Electric Hinges:
 - 1. As noted in Hardware Groups.
 - 2. Coordinate with Division 130000.
- G. Provide shims and instructions for proper door adjustment.
- H. Stanley and McKinney are acceptable alternates in this product category.
- I. Warranty all items against defects in material and workmanship for a period of three (3) years.

2.04 LOCKSETS, LATCHSETS AND RIM CYLINDERS:

- A. As manufactured by the Schlage Lock Company D and L Series, in Rhodes and 06 designs capable of accepting either Medeco traditional cylinders or Best Lock (SFIC) interchangeable core cylinders where required.
- B. Functions as noted in Hardware Groups.
- C. Provide a three (3) year warranty against defects in material and workmanship.
- D. No substitutions.

2.05 KEYING, KEYS:

- A. There may be multiple key systems within this project. Supplier shall be responsible for furnishing both temporary and permanent pin tumbler cylinders and cores.
- B. MDAD:
 - 1. Mechanical Rooms; Electrical Rooms; Telephone and Data Equipment Rooms; Janitors Closets; Storage Rooms; Elevator Machine Rooms; Maintenance Shops and Offices; MDAD offices and open spaces on the roof utilize an existing Medeco key system containing traditional mortise, rim and key in lever cylinders.
 - 2. Provide new Medeco cylinders keyed as required to the existing MDAD key system.
 - 3. Keying details and authorization to purchase keyed cylinders from Medeco will be provided supplier by MDAD Maintenance Division Locksmith.
 - 4. All permanent keyed cylinders shall be shipped directly from Medeco to MDAD Maintenance Division, Attention: Carlos Tellez 305 876-0349.
 - 5. Provide 2 keys ea cylinder; 4 keys ea keyed alike set, and 4 Masterkeys.
- C. Construction Keying:
 - 1. Furnish a temporary Schlage Lock Co. key system for use during construction.

2. Key all temporary construction cylinders alike and furnish 5 Construction keys.
3. As specific areas of the project are completed, the General Contractor shall in concert with an MDAD representative, replace the MDAD construction cylinders with permanent Medeco cylinders provided to MDAD in accordance with 2.05B4 above.
4. All construction cylinders and cores shall be returned to supplier for credit.

2.06 ELECTROMAGNETIC LOCKS:

- A. As manufactured by Locknetics.
- B. Types as noted in Hardware Groups.
- C. Install on inside of exterior doors and on non public side of interior doors.
- D. Thru bolt to door with sex bolts.
- E. Coordinate with Division 28.
- F. Provide a three (3) year warranty on all 390 series coils against defects in material and workmanship.
- G. No substitutions.

2.07 HARDWARE GROUPS:

Hardware Group No. 01 – Not Used

Hardware Group No. 02 - MIA SECURITY TYPE: C-1

For use on Door #(s):

ET204 ET206 ET304 ET306

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	?	630	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW4	?	630	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-98-L-F-06-CON	?	626	VON
1	EA	RIM CYLINDER - MEDECO 10-0300	10-0300		630	MED
1	EA	RIM CYLINDER	20-022	?	630	SCH
1	EA	MAGNETIC LOCK	M490P 12/24 VDC	?	628	SCE
1	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	?	630	IVE
1	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	CONTACT SEAL	S88 D17			PEM
2	EA	WIRE HARNESS	CON-50			SCH
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-C1 DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE C SECURITY			DAS
1	EA	CARD READER - BY MATRIX				
1	EA	DASH DOOR - STROBELITE	202A BLUE-BLUE			DAS

1 EA DASH DOOR - BLUE DD-MT-121575W-FW-BLUE DAS
HORN

INTERIOR - FIRE RATED

Hardware Group No. 03 - MIA SECURITY TYPE: C

For use on Door #(s):

E06101 E07101 ET104 ET106

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP	?	630	IVE
2	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW4	?	630	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-9827-EO-F-CON	?	626	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-98-L-F-06-CON	?	626	VON
1	EA	RIM CYLINDER - MEDECO 10- 0300	10-0300		630	MED
1	EA	RIM CYLINDER	20-022	?	630	SCH
2	EA	MAGNETIC LOCK	M490P 12/24 VDC	?	628	SCE
2	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
2	EA	KICK PLATE	8402 10" X 2" LDW B-CS	?	630	IVE
2	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	SEAL SET	303AV-72X84			PEM
1	EA	DOOR TOP WEATHERSTRIP	347A 76			PEM
2	EA	DOOR TOP WEATHERSTRIP	68AR 36			PEM
2	EA	DOOR SWEEP	368CN 36			PEM
2	EA	WIRE HARNESS	CON-50			SCH
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-C DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE C SECURITY			DAS
1	EA	CARD READER - BY MATRIX				
1	EA	DASH DOOR - STROBELITE	202A BLUE-BLUE			DAS
1	EA	DASH DOOR - BLUE HORN	DD-MT-121575W-FW-BLUE			DAS

EXTERIOR NOA - FIRE RATED

Hardware Group No. 04 - MIA SECURITY TYPE: C-1

For use on Door #(s):

E02202	E02302	E04202	E04302	E05202A	E05301
E06202	E06203	E07202	E07203	E10202	E11202
E11302					

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5 NRP	?	630	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW4	?	630	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-98-L-F-06-CON	?	626	VON
1	EA	RIM CYLINDER - MEDECO 10- 0300	10-0300		630	MED
1	EA	RIM CYLINDER	20-022	?	630	SCH
1	EA	MAGNETIC LOCK	M490P 12/24 VDC	?	628	SCE
1	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	?	630	IVE
1	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	CONTACT SEAL	S88 D17			PEM
1	EA	WIRE HARNESS	CON-50			SCH
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-C1 DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE C SECURITY			DAS
1	EA	CARD READER - BY MATRIX				
1	EA	DASH DOOR - STROBELITE	202A BLUE-BLUE			DAS
1	EA	DASH DOOR - BLUE HORN	DD-MT-121575W-FW-BLUE			DAS

INTERIOR - FIRE RATED

Hardware Group No. 05 - MIA SECURITY TYPE: C-1

For use on Door #(s):

E04102B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	4" X 4 1/2" US32D RADIUS - HINGE BY DOOR MANUF			
1	EA	ELECTRIFIED HINGE	4" X 4 1/2" US32D RADIUS - ETW-4 - HINGE BY DOOR MANUF			
1	EA	ELEC PANIC HARDWARE	RX-9847-L-06-CON	?	626	VON
1	EA	RIM CYLINDER - MEDECO 10- 0300	10-0300		630	MED
1	EA	RIM CYLINDER	20-022	?	630	SCH
1	EA	MAGNETIC LOCK	M490P 12/24 VDC	?	628	SCE
1	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	?	630	IVE
1	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	Weather Seals - PER NOA	BY MANUFACTURER			
1	EA	Threshold - PER NOA	BY MANUFACTURER			
1	EA	WIRE HARNESS	CON-50			SCH
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-C1 DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE C SECURITY			DAS
1	EA	CARD READER - BY MATRIX				
1	EA	DASH DOOR - STROBELITE	202A BLUE-BLUE			DAS
1	EA	DASH DOOR - BLUE HORN	DD-MT-121575W-FW-BLUE			DAS

EXTERIOR - NO FIRE RATING

Hardware Group No. 06 - MIA SECURITY TYPE: C-1

For use on Door #(s):

E02102 E04101 E05101 E05205 E10101 E11101

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5 NRP	?	630	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW4	?	630	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-98-L-F-06-CON	?	626	VON
1	EA	RIM CYLINDER - MEDECO 10-0300	10-0300		630	MED
1	EA	RIM CYLINDER	20-022	?	630	SCH
1	EA	MAGNETIC LOCK	M490P 12/24 VDC	?	628	SCE
1	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
1	EA	KICK PLATE	8402 10" X 2" LDW B-CS	?	630	IVE
1	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	SEAL SET	303AV-36X84			PEM
1	EA	DOOR TOP WEATHERSTRIP	347A 40			PEM
1	EA	DOOR TOP WEATHERSTRIP	68AR 36			PEM
1	EA	DOOR SWEEP	368CN 36			PEM
1	EA	WIRE HARNESS	CON-50			SCH
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-C1 DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE C SECURITY			DAS
1	EA	CARD READER - BY MATRIX				
1	EA	DASH DOOR - STROBELITE	202A BLUE-BLUE			DAS
1	EA	DASH DOOR - BLUE HORN	DD-MT-121575W-FW-BLUE			DAS

EXTERIOR NOA - FIRE RATED

Hardware Group No. 07 - MIA SECURITY TYPE: C-MOD

For use on Door #(s):

E01103

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	4" X 4 1/2" US32D RADIUS - HINGE BY DOOR MANUF			
2	EA	POWER TRANSFER	EPT10 CON	?	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9847-EO-CON-SNB 24 VDC	?	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9847-L-06-CON-SNB 24 VDC	?	626	VON
1	EA	RIM CYLINDER - MEDECO 10-0300	10-0300		630	MED
1	EA	RIM CYLINDER	20-022	?	630	SCH
2	EA	MAGNETIC LOCK	M490P 12/24 VDC	?	628	SCE
2	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
1	EA	SURF. AUTO OPERATOR	9553 REG/STD STD72 MS 60 AS REQ (120/240 VAC)	?	ANCLR	LCN
4	EA	DASH DOOR - DOM Activation / Safety Mat				
2	EA	DASH DOOR - Activation Sensor w/ Extension Kit				
2	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	Weather Seals - PER NOA	BY MANUFACTURER			
1	EA	Threshold - PER NOA	BY MANUFACTURER			
2	EA	WIRE HARNESS	CON-192			SCH
2	EA	WIRE HARNESS	CON-50			SCH
2	EA	WIRE HARNESS	CON-6W			SCH
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-C- MOD DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE C- MOD			DAS
1	EA	CARD READER - BY MATRIX				
1	EA	DASH DOOR - STROBELITE	202A BLUE-BLUE			DAS
1	EA	DASH DOOR - BLUE HORN	DD-MT-121575W-FW-BLUE			DAS
1	EA	POWER SUPPLY	PS904 900-2RS 900-4RL-FA 120/240 VAC	?	LGR	SCE

EXTERIOR NOA - NO FIRE RATING -BASIS OF HARDWARE DESIGN: IMPACT APPROVAL: FL 20701.5

ENVIRALUM ENV-350 ALUMINUM/GLASS IMPACT DOOR BALANCE OF
HARDWARE BY DASH DOOR & GLASS

Hardware Group No. 08 - MIA SECURITY TYPE: F-6-MOD EXTERIOR SLIDING BUS STATION DOOR (WITH FULL BREAKAWAY)

For use on Door #(s):

E01101 E01102

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-F6- MOD DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE F6- MOD SECURITY		DAS
1	EA	CARD READER - BY MATRIX			

BALANCE OF HARDWARE BY DASH DOOR & GLASS - INCLUDES CUSTOM TOUCH BAR / POWER- BOLT DELAYED EGRESS SEQUENCE ON (2) AUTO SLIDING DOOR LEAFS

Hardware Group No. 09 - MIA SECURITY TYPE: G - SLIDING JETWAY DOOR WITH BREAKAWAY

For use on Door #(s):

E02201 E04201 E05201 E06201 E07201 E08201
 E09201 E10201 E11201

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	DASH DOOR PLC CONTROLLER	SERIES #MIA17-0826 - PLC-G DASH DOOR & GLASS - LOGIC CONTROLLER - MIA TYPE G SECURITY		DAS
1	EA	CARD READER - BY MATRIX			

BALANCE OF HARDWARE BY DASH DOOR & GLASS

Hardware Group No. 10 - TEMPORARY DOOR For use on

Door #(s):

TS2.7 TS2.10 TS3.1 TS3.2 TS3.3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	? 626	IVE
1	EA	FIRE EXIT HARDWARE	98-L-NL-F-06	? 626	VON
1	EA	RIM CYLINDER	20-022	? 630	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	? 689	LCN
1	EA	WALL STOP	WS401/402CCV	? 626	IVE
1	EA	CONTACT SEAL	S88 D17		PEM
3	EA	SILENCER	SR64	? GRY	IVE

INTERIOR - FIRE RATED

Hardware Group No. 11 - TEMPORARY DOOR

For use on Door #(s):

TS1.3	TS1.4	TS1.6	TS1.7	TS1.8	TS1.9
TS2.1	TS2.2	TS2.3	TS2.4	TS2.5	TS2.6
TS2.8	TS2.9	TS3.4			

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	?	626	IVE
1	EA	FIRE EXIT HARDWARE	98-L-NL-F-06	?	626	VON
1	EA	RIM CYLINDER	20-022	?	630	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
1	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	CONTACT SEAL	S88 D17			PEM
3	EA	SILENCER	SR64	?	GRY	IVE

INTERIOR - FIRE RATED

Hardware Group No. 12 - TEMPORARY DOOR For use

on Door #(s):

TS1.1	TS1.5	TS1.10	TS1.11	TS1.12	TS1.13
TS1.14	TS3.5	TS3.6			

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	?	626	IVE
1	EA	FIRE EXIT HARDWARE	9827-EO-F-LBR-499F	?	626	VON
1	EA	FIRE EXIT HARDWARE	9827-L-NL-F-LBR-06-499F	?	626	VON
1	EA	RIM CYLINDER	20-022	?	630	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	?	689	LCN
1	EA	WALL STOP	WS401/402CCV	?	626	IVE
1	EA	CONTACT SEAL	S88 D20			PEM
2	EA	SILENCER	SR64	?	GRY	IVE

INTERIOR - FIRE RATED

PART 3 - EXECUTION:

3.01 INSPECTION:

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION:

- A. Utilize instructions and templates provided with each item of hardware. Where cutting and fitting is required to install hardware onto or into surfaces that are to be later painted or finished in another way, coordinate removal, storage and reinstallation of hardware items with finishing work specified in Division 9. Do not install surface mounted items until finishes have been completed on the substrates involved.
- B. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with other governing regulations.

1. Recommended Locations for Builders Hardware for Standard Steel Doors and Frames X DHI.
 2. NWWDA Industry Standard I.S. 1.7, Hardware Locations for Wood Flush Doors.
 3. ADAG – Americans with Disabilities Act Guidelines.
 4. FBCA – Florida Building Code – Accessibility.
- C. Set units level and plumb. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchoring or fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic complying with requirements specified in Division 7, Joint Sealers.
- 3.03 ADJUST AND CLEAN:
- A. Check and adjust the operation of each door and item of hardware to ensure proper function and operation. Replace units that cannot be adjusted to operate freely and smoothly.
 - B. Final adjustments are to be made after all ventilating systems are in operation.
 - C. Clean all hardware items and adjacent surfaces after installation.
 - D. Where door hardware is installed more than one month prior to acceptance of the space all items shall be revisited to assure operation and cleanliness.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes glass, and glazing for the following:
 - 1. Swinging Doors – Clear Tempered Laminated Safety Glass (2 layers of 3/8" min.).
 - 2. Automatic Sliding Doors - Clear Tempered Laminated Safety Glass (2 layers of 3/8" min.).

1.02 REFERENCES

- A. American National Standard Institute: ANSI Z97.1 - Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.
- B. American Society of Civil Engineers: ASCE 7-02 - Minimum Design Loads for Buildings and Other Structures.
- C. American Society for Testing and Materials:
 - 1. ASTM C 1036 - Flat Glass.
 - 2. ASTM C 1048 - Heat Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
 - 3. ASTM C 1172 - Specification for Laminated Architectural Flat Glass.
 - 4. ASTM E 163 - Standard Methods of Fire Test of Window Assemblies.
 - 5. ASTM E 1300 - Practice for Determining the Minimum Thickness of Annealed Glass Required to Resist a Specified Load.
- D. Glass Association of North America: GANA - Glazing Manual and Sealant Manual.
- E. Federal Specification:
 - 1. FS TT-G-410 - Glazing Compound, Sash (Metal) for Back Bedding and Face Glazing (Not for Channel or Stop Glazing).
 - 2. FS TT-S-230 - Sealing Compound, Synthetic Rubber Base, Single Component, Chemical Curing for Caulking, Sealing and Glazing in Building Construction.
 - 3. FS TT-S-001543 - Sealing Compound, Silicone Base (For Caulking and Glazing in Buildings and Other Structures).
- F. Laminators Safety Glass Association: LSGA - Design Guide.
- G. NAAMM #SS-1B-68 - Non-skinning Resilient Preformed Compounds - Tapes, Ribbons, Beads with Release Paper.
- H. National Fire Protection Association: NFPA 80 - Fire Doors and Windows.
- I. Consumer Products Safety Commission: CPSC - 16 CFR Part 1201 - "Safety Standard for Architectural Glazing Materials."

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable) without failure including loss or glass breakage attributed to the following:

- a. Defective manufacturing, fabrication, or installation.
 - b. Failure of sealants or gaskets to remain watertight and airtight.
 - c. Deterioration of glazing materials.
2. Glass thickness, when shown, are for convenience of detailing only and are to be confirmed by Contractor and glass manufacturer by analyzing project loads and in-service conditions to meet or exceed the following.
 - a. Exterior Glass, if any: Minimum 1/4" thick with all tinted or coated glass the same thickness.
 - b. Interior Glass: Minimum 1/4" thick.
 3. All exterior glass shall be provided in thickness so that the worst-case probability of breakage at "Design Wind Pressure" when tested in accordance with ASTM E 1300 will not exceed the following:
 - a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical under wind loading.
 - b. 1 lite per 1000 for lites set at over 15 degrees off vertical under wind or snow loading.
 4. Thermal Movement: Design, fabricate and install component parts to provide for noiseless expansion and contraction of glazing system over 120 deg. F. ambient and 180 deg. F. material temperature range without failure.
 5. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.
 6. Perform work in accordance with and Laminated Safety Glass Association (LSGAA) and Glass Association of North America (GANA) requirements.

1.04 SUBMITTALS

- A. Product Data:
 1. Glass: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 2. Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements.
 3. Identify available colors; indicate special precautions required.
- B. Shop Drawings: Sections and details of glass installation at framing members including head, mullions, transoms, jambs and sills.
- C. Samples: Submit 12" x 12" samples of each type and thickness of tint, patterned and coated glass.
- D. Certificates: Submit glass and glazing manufacturer's certifications that materials meet Specification requirements and are compatible with each other.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum two years experience on comparable projects.
- B. Regulatory Requirements: Comply with ANSI Z97.1 and CPSC 16 CFR Part 1201 break safe characteristics.

- C. Coordinate glass type with N.O.As for doors and glazing and manufacturer's products. Refer to Structural drawings for wind pressures.
- 1.06 DELIVERY, STORAGE AND HANDLING
- A. Deliver glass to job in original containers bearing manufacturer's label indicating quality of contents of each package.
 - B. Store glass under cover at site and protect from edge and surface damage.
 - C. Do not remove labels until glass has been installed. Keep glass free from contamination by materials capable of staining glass. Do not apply marking materials to either side of glass.
- 1.07 PROJECT CONDITIONS
- A. Environmental Requirements:
 - 1. Do not install glazing materials when ambient temperature is less than 50 degrees F. unless recommended by glazing material manufacturer.
 - 2. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
 - 3. Do not install glazing materials when glazing channel substrates are wet from rain, frost, condensation, or other causes.
- 1.08 SEQUENCING AND SCHEDULING
- A. Coordinate Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.
- 1.09 WARRANTY
- A. Special Warranty: Warranty period covers only defects or failure due to normal conditions of use and not to handling, installing, glass breakage, and improper cleaning practices contrary to glass manufacturer's directions.
 - 1. Laminated Glass: Provide five-year manufacturer's warranty against defects developed from normal use and replacement of same. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.

PART 2 - PRODUCTS

2.01 GLASS

- A. Types:
 - 1. Tempered Laminated Safety Glass: Comply with ASTM C 1172 for kinds of laminated glass indicated and other requirements specified. Two sheets (layers) of 3/8" thickness clear tempered glass according to ASTM C1036, Type I, Class 1, Quality q3 permanently laminated with interlayer material as manufactured Globe Amerada, LOF, Viracon Corp.
 - a. If existing adjacent exterior glass contains tinted glass, provide matching tint in this glass.
 - 2. Interlayer: Interlayer material as indicated below, clear, and of 0.090-inch thickness with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. Interlayer Material: Polyvinyl butyral sheets.

3. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:
 - a. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.
 - B. Tempered Glass: (3/4" min.) thick Clear, manufactured by PPG Industries, Inc, LOF, Guardian.
- 2.02 GLAZING ASSEMBLIES
- A. Swinging Doors – Clear Tempered Laminated Safety Glass (2 layers of 3/8" min.).
 - B. Automatic Sliding doors – Clear Tempered Laminated Safety Glass (2 layers of 3/8" min.).
- 2.03 SETTING MATERIALS
- A. Glazing Compound: One (1) part acrylic terpolymer in accord with Federal Specification TT-S-23A (1).
 - B. Unshimmed Glazing Tape: Width equal to height of stop by length as required, butyl polysobutylene with twenty (20) to thirty (30) "Shore A" hardness, self- sticking.
 - C. Pre-Shimmed Glazing Tape: Width equal to height of stop by length as required; butyl polysobutylene with built-in synthetic rubber spacer; twenty (20) to thirty (30) "Shore A" hardness, self-sticking.
 - D. Setting Blocks: One-fourth (1/4) inch thick, minimum, solid neoprene, seventy (70) to ninety (90) "Shore A" hardness; sizes as required.
 - E. Shims: Three-sixteenths (3/16) inch to one-fourth (1/4) inch thick solid neoprene; sizes as required.
 - F. Silicone Rubber Sealant: "Clear Silicone Construction Sealant 1200" as manufactured by General Electric; "781 Building Sealant", manufactured by Dow Corning.
 - G. Neoprene Gasket: Tongue and groove, "H" Section for half (1/2) inch glazing, Maloney Company, Trenco or approved substitute.
- 2.01 GLASS - FLOAT GLASS/HEAT-STRENGTHENED GLASS
- A. Float Glass: ASTM C 1036, Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).
 - B. Heat-Strengthened Glass: ASTM C 1048, Kind HS (heat-strengthened, Condition A (uncoated), Type 1 (transparent glass, flat) Class 1 (clear), Quality q3 (glazing select).
 - C. Glass Types:
 1. Type 1A - Clear.
- 2.02 GLASS - FULLY TEMPERED
- A. Fully Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).
 - B. Glass Types:
 1. Type 2A-1: Clear.
 2. Type 2A-2: Clear with 4" horizontal edge bands as shown on the drawings

2.03 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, Kind LA (two lites of flat float glass). Kind LHS (two lites of flat glass, both of which are heat-strengthened glass). [Kind LT (two lites of flat glass, one or both of which are fully tempered glass).

- B. Interlayer:
 - 1. Material: Polyvinyl butyryl sheet.
 - 2. Thickness: as required to meet loads.
 - 3. Color: Clear.

- C. Glass Types:
 - 1. Type 7-1:
 - a. Outer Lite: Type 1A.
 - b. Inner Lite: Type 1A.

 - 2. Type 7-2:
 - a. Outer Lite: Type 2A.
 - b. Inner Lite: Type 2A.

2.04 GLAZING COMPOUNDS AND ACCESSORIES

- A. Silicone Sealant:
 - 1. One-component, medium modulus, moisture cured elastomeric silicone joint sealant; FS TT-S-001543A.
 - 2. Acceptable Products:
 - a. DC - 999A by Dow Corning.
 - b. Silglaze N by General Electric.
 - c. 863 by Pecora.
 - d. Spectrum 2 by Tremco.

- B. Wood and Metal Sash Bedding Compound:
 - 1. Soft, elastic compound composed of polymerized oil, fiber calcium carbonate, and other inert pigments, FS TT-P-791, Type II; color as selected by Design Professional.
 - 2. Acceptable Product: No. 33 Glazing Compound by D.A.P.

- C. Primer, Sealers, and Cleaners: Type as recommended by glass and sealant manufacturers.

- D. Plastic Film:
 - 1. Acceptable Products, all as manufactured by 3M, Commercial Graphics Division:
 - a. Type 1: Dusted Crystal (sand-blasted look), No. 7725-314 to match film used on the Admirals Club as approved by the DP.
 - b. Type 2: Matte Black, No. 3635-22B, Black Blockout.
 - c. Type 3: Opaque White, No. 3650-10.

- E. Setting Blocks: Neoprene, EPDM or silicone, 80-90 Shore A hardness, length of 0.1 inch for each square foot of glazing or minimum 4" x width of glazing rabbet space minus 1/16" x height to suit glazing method and pane weight and area.

- F. Spacer Shims: Neoprene or silicone, 50 to 60 Shore A durometer hardness, minimum 3" long x one half height of glazing stop x thickness to suit application.

- G. Glazing Clips: As recommended by glass manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerances.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry. Remove protective coatings from surface to be glazed.
- B. Prime surfaces scheduled to receive sealant when recommended by sealant manufacturer.
- C. Measure size of frame to receive glass and compute actual glass size allowing for edge clearances.
- D. Cut glass accurately to fit frame, edges smooth without sharp or ragged edges.

3.03 INSTALLATION

- A. Comply with GANA Glazing Manual and Sealant Manual. Glaze fire rated doors with metal stop and glazing compound to comply with NFPA 80.
- B. Orient draw of glass pieces in same direction.
- C. Erect members true to line, level square and in proper planes with other work free from twists, sags, waves, buckles or other objectionable defects. Provide adequate anchorage to safely resist all stresses to which members will normally be subjected.
- D. Avoid point loading or contact with hard materials. Provide setting blocks and spacers as required.
- E. Tempered Glass:
 - 1. Do not cut, seam, nip or abrade tempered glass.
 - 2. Set tempered glass with tong marks completely concealed or in as inconspicuous a location as possible.
 - 3. Install tempered glass in hazardous locations:
 - a. Ingress and egress doors.
 - b. Operable or inoperable panels adjacent to a door in building and within same wall plane as door whose nearest vertical edge is within 12" of door in closed position and whose bottom edge is less than 60" above floor or walking surface.
 - c. Fixed panels which have glazed area in excess of 9 sq. ft. and lowest edge is less than 18" above finished floor level or walking surface within 36" of such glazing where panels are not protected with horizontal member not less than 1-1/2" in width located between 24" and 36" above walking surface.
 - d. Other locations required by building code.

3.04 INTERIOR - DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16" above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6" from corners.

- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
 - D. Place glazing tape on free perimeter of glazing in same manner described above.
 - E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
 - F. Knife trim protruding tape.
- 3.05 INTERIOR - WET METHOD (COMPOUND AND COMPOUND)
- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24" centers, kept 1/4" below sight line.
 - B. Locate and secure glazing pane using glazers' clips.
 - C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.
- 3.06 INSTALLATION - PLASTIC FILM
- A. Install plastic film with adhesive, applied in accordance with film manufacturer's written instructions on a clean glass surface.
 - B. Place without air bubbles, creases or visible distortion.
 - C. Fit tight to glass perimeter with razor cut edge.
- 3.07 MANUFACTURER'S FIELD SERVICES
- A. Glass and glazing product manufacturers shall provide field surveillance of installation of their products. Monitor and report installation procedures and unacceptable conditions.
- 3.08 ADJUSTMENT
- A. Replace breakage that occurs in execution of work or caused by faulty installation.
 - B. Replace or reset improperly set glass or glass that does not meet grade requirements.
- 3.09 CLEANING
- A. Remove glazing materials from finish surfaces.
 - B. Remove labels after work is complete.
 - C. Clean glass. Wash and polish glass on both faces not more than one week prior to Owner's acceptance of work. Comply with glass manufacturer's recommendations for final cleaning.
- 3.10 PROTECTION OF FINISHED WORK
- A. After installation, mark pane with 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09 22 00

PORTLAND CEMENT PLASTER (STUCCO)

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes Portland cement plaster (stucco).

1.02 SUBMITTALS

- A. Submit properly identified product data including material specifications, printed mixing and application directions and other data as may be required to show compliance with the specifications.
- B. Submit sample panel (1 foot by 1 foot minimum) of specified cement plaster, stucco finish for review and acceptance. Samples shall remain on job site as the quality standard desired for finished work.

1.03 QUALITY ASSURANCE

- A. Unless otherwise specified comply with applicable requirements of governing codes and authorities and ASTM C926.

1.04 WARRANTY

- A. Furnish MDAD warranty for a period of five (5) years from date of final acceptance. Warranty shall provide for prompt repair of imperfections at no additional cost to MDAD.
- B. Warranty shall be signed by Contractor and installer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Expanded Metal Lath: Alabama Metal Industries Corp., CEMCO; California Expanded Metal Products Co., Carl Dietrich Building Systems, MarinoWare, Phillips Manufacturing Co.
- B. Stucco: Euclid Chemical Company, California Stucco Products Corp., Florida Stucco Corp., Highland Stucco, United States Gypsum Co.
- C. Stucco Accessories: Alabama Metal Industries Corp., Plastics Components, Inc., Vinyl Corp; a division of Clark Dietrich Building Systems.

2.02 MATERIALS

- A. Metal Lath:
 - i. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized-zinc coating.
 - ii. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd. (1.8 kg/sq. m).
 - iii. Flat-Rib Lath: Rib depth of not more than 1/8 inch (3 mm), 3.4 lb/sq. yd. (1.8 kg/sq. m).
- B. Trim Accessories:
 - i. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
 - ii. Plastic Accessories: Manufactured from high-impact PVC.

- 1. Corner Beads: 2-1/2" x 2-1/2" perforated flanges by Vinyl Corp., Miami, FL, (305) 477-4108; VinylTech, Miami, FL, (305) 885-0561.

2. Casing Beads: 1-3/4" flange width, perforated flanges single rib and reinforced rib by Vinyl Corp., Miami, FL, (305) 477-4108; VinylTech, Miami, FL, (305) 885-0561.
 3. Control Joints: 2" overall width, perforated flanges by Vinyl Corp., Miami, FL, (305) 477-4108; VinylTech, Miami, FL, (305) 885-0561.
 4. Control Joints: 2-1/2" overall width, perforated flanges with removable tape by Vinyl Corp., Miami, FL, (305) 477-4108; VinylTech, Miami, FL, (305) 885-0561.
 5. Expansion Joints: 1" reveal, 4"-4-3/8" overall width, perforated flanges with removable tape by Vinyl Corp., Miami, FL, (305) 477-4108; VinylTech Plastic Components, Inc., Miami, FL, (305) 885-0561.
 6. Reveal Channels: 1" reveal, perforated flanges by Vinyl Corp., Miami, FL, (305) 477-4108; VinylTech, Miami, FL, (305) 885-0561.
 7. Weep Screeds: 2-1/2-inch overall width, perforated flanges.
 - a. Basis-of-Design: Vinyl Corp.; WS 58-250.
- C. Portland Cement Plaster Materials:
1. Portland cement: ASTM C150, Type I, White Portland Cement.
 - a. Base Coat Cements: Portland cement, ASTM C150, Type I or II (sulfate-resistant).
 - b. Finish Coat Cement: Portland cement, ASTM C150, Type I, white.
 - c. Lime: Special hydrated lime for finishing purposes, ASTM C206, Type S, or special hydrated lime for masonry purposes, ASTM C207, Type S.
 - d. Sand Aggregate - Base Coats: ASTM C897.
 - e. Aggregate - Finish Coats: ASTM C897, manufactured or natural sand, white color.
 - f. Fiber - Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 in. long, free of contaminants, manufactured for use in portland cement plaster.
- D. Miscellaneous Materials:
1. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
 2. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in cement plaster.
 3. Bonding Compound: ASTM C 932.
 - A. Subject to compliance with requirements, provide products by one of the following:
 - i. Larsen Products Corp.; Acrylic Admixture 101.
 - ii. Thoro; Acryl 60.
 - iii. Lambert; Acrylbond Acrylic Admixture.
 4. Cementitious Waterproofing: For use at all reveal joints, control joints and at intersections of dissimilar materials.
 - A. Subject to compliance with requirements, provide Euco seal Masonry Coating, by the Euclid Chemical Company.
 5. Fiberglass Lath: Nominal 4.8 oz/sq. yd., symmetrical interlaced open-weave glass fiber fabric made with minimum 25% by weight, alkaline-resistant coating.
 - A. Subject to compliance with requirements, provide products the following, or approved equal:

i. Sto Corp.; Sto Mesh.

6. Fasteners for Attaching Metal Lath to Substrates: ASTM C 1063.

7. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter unless otherwise indicated.

2.03 MIXES

A. Mixes and Compositions - Base Coats:

1. General: Comply with ASTM C926 for portland cement plaster base and finish coat mixes as applicable for bases, materials, and other requirements indicated.
2. Base Coat:
 - a. Proportion materials for respective base coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious materials for aggregates to comply with following requirements for each method of application and plaster base indicated.
 - b. Adjust mix proportions below within limits specified to attain workability.
3. Fiber Content-Scratch Coat:
 - a. Add fiber to mixes after ingredients have mixed min. 2 minutes.
 - b. Comply with fiber manufacturer's directions; do not exceed 2 lbs. per cu. ft. of cementitious materials.
 - c. Reduce aggregate quantities accordingly to maintain workability.
4. Exterior Three-Coat Work Over Concrete Masonry Unit Stucco Work. (3/4" thickness):
 - a. Scratch Coat: 1-part Portland cement, 0 to 3/4-parts lime, 2-1/2 to 4-parts sand.
 - b. Brown Coat: 1-part Portland cement, 0 to 3/4-parts lime, 3 to 5-parts sand.
 - c. Finish Coat: Add water only; comply with stucco manufacturer's written instructions.
5. Fire Rated Three-Coat Work. (3/4" thickness):
 - a. Scratch Coat: 1-part Portland cement, 0 to 3/4-parts lime, 2-1/2 to 4-parts sand.
 - b. Brown Coat: 1-part Portland cement, 0 to 3/4-parts lime, 3 to 5-parts sand.
 - c. Finish Coat: Add water only; comply with stucco manufacturer's written instructions.

B. Mixes and Compositions - Finish Coats:

1. Job-Mixed:
 - a. Proportion materials for finish coats in parts by volume.
 - b. 1-part Portland cement, 3/4 to 1-1/2-parts lime, 3-parts sand.

C. Mixing: Mechanically-mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with plaster manufacturer's recommendations.

2.04 PROPORTIONS BY VOLUME

A. Scratch Coat:

1. 1-part Portland Cement.
2. 1 to 2 parts Masonry Cement.
3. 5 to 7 parts sand.
4. 1 lb. fiber per sack of cement.

- B. Brown Coat:
 - 1. 1-part Portland Cement.
 - 2. 1 to 2 parts Masonry Cement.
 - 3. 6 to 9 parts sand.

- C. Finish Coat:
 - 1. 1-part Portland Cement.
 - 2. 3/4 to 1-1/2 parts hydrated lime.
 - 3. 5 to 7 parts sand.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Concrete Surfaces:
 - 1. Mechanically roughen excessively smooth concrete, clean off dust, loose particles and other foreign matter.
 - 2. Apply bonding compound in accord with manufacturer's published directions; bonding agent must be wet while applying the stucco or plaster. At Contractor's option mix bonding agent with first coat of stucco or plaster in proportions according to manufacturer's published recommendations.

- B. Masonry: Dampen excessively dry surfaces for proper suction.

3.02 GENERAL APPLICATION REQUIREMENTS

- A. Application to Metal Lath:
 - 1. Apply scratch coat with sufficient pressure to key well into lath. Trowel after initial set and scratch to roughen surface. Add fiber reinforcing to scratch coat only, at the rate of 3/4 pound of fiber reinforcing per two (2) bags of stucco mix.
 - 2. Apply brown coat after scratch coat has set firm and hard and has been straightened to a true surface without the use of additional water. Leave rough to receive finish coat.
 - 3. Dampen brown coat evenly prior to application of finish coat. Apply finish coat and bring finish coat to a true, even surface, finished as specified herein.

- B. Avoid use of excessive water. Do not re-temper plaster or stucco. Dampen bases, if required for proper suction. Do not saturate bases and do not apply plaster or stucco until visible surface water disappears.

- C. Dampen previous coats which have dried out prior to time for application of next coat. Determine the most effective procedure for curing and time lapse between application of coats based on climatic and job conditions.

- D. Run drip grooves in stucco. Provide run drip grooves in exterior doorway heads and exterior window heads.

- E. Plaster and stucco which is excessively cracked or crazed will not be accepted. Remove and replace unacceptable plaster and stucco including base materials if damaged.

3.03 TROWELED OR SPRAYED STUCCO APPLICATION (EXTERIOR)

- A. Three Coat Work: Apply three coat stucco troweled or spray to poured concrete and masonry areas; total thickness, 5/8 inch minimum.
 - 1. At curved poured concrete areas and curved masonry areas, provide additional stucco

coats as required to provide smooth, curved walls without ridges or flat spots.

- B. Three Coat Work: Apply three coat stucco troweled or spray applied to metal lath plaster base; total 7/8 inch thick.
- C. Three Coat Work: Apply three coat stucco troweled or spray applied to suspended metal lath soffits; total 3/4 inch thick.

- C. Finishes:
 - 1. Smooth sand finish.
 - 2. Light textured finish.
 - 3. Rough textured finish.
 - 4. Locations as indicated and as directed by Architect.

3.04 TOLERANCE

- A. Tolerance Allowed: 1/8 inch in 10 feet.

3.05 PATCHING AND REPAIRS

- A. Repair defects and damaged areas to match adjacent surfaces.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
- B. Related Requirements:
 - 1. Section 06 10 00 " Rough Carpentry" for wood blocking and bracing installed with non-structural metal framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation Reports: For firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Minimum Performance Requirements: Non-structural metal framing shall comply with ASTM C64, ASTM C754, referenced UL Designs, and requirements specified herein and on Drawings.
 - 1. In instances where referenced standards or Contract Documents establish different or conflicting requirements for minimum thicknesses or quality levels, comply with the most stringent requirement.
- B. Design Performance per ASTM C 645: Unless indicated otherwise, non-structural metal studs for partition types shown on Drawings shall have steel thicknesses, section properties, and configurations such that the systems in which they are used will carry design transverse loads without exceeding either the allowable stress of the steel or deflection limits indicated.
 - 1. Limiting Heights per ASTM C 754: In addition to minimum 5 psf lateral pressure, design loads shall include the weight of drywall shown for each partition type and additional loading from wall

mounted items indicated on Drawings.

- a. Maximum Allowable Deflection: $L/360$.
 - C. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
 - D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
 - E. Horizontal Deflection: For composite wall assemblies, limited to $1/360$ of the wall height based on horizontal loading of 10 lbf/sq. ft.
- 2.2 FRAMING SYSTEMS
- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 Insert value percent.
 - B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 1. Steel Sheet Components: Comply with ASTM C 645 requirements for steel unless otherwise indicated.
 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
 - C. Studs and Tracks: ASTM C 645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.
 1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) ClarkDietrich Building Systems.
 - 2) MarinoWARE.
 - 3) MBA Building Supplies.
 - b. Minimum Base-Steel Thickness: 0.0329 inch.
 - c. Depth: As indicated on Drawings.
 - D. Framing that Supports Doors, Framed Openings, and Windows: ASTM C 955.
 1. King Studs, Box Girders, Headers, and Jambs: Provide cold-rolled C-shapes, punched, with stiffened flanges.
 - a. Minimum Base-Metal Thickness: 0.0538-inch (54 mil).
 - b. Flange Width: $1-3/8$ inches .
 - c. Depth: As indicated on Drawings.
 - E. Partial Height Wall Framing: ASTM C 955.
 1. Studs and Runners:

- a. Minimum Base-Metal Thickness: 0.0538-inch (54 mil).
 - b. Flange Width: 1-3/8 inches .
 - c. Depth: As indicated on Drawings.
 - 2. Reinforcement: ASTM A 1003.
 - a. Basis-of Design Products: Subject to compliance with requirements provide, TSN, The Steel Network, Inc; MidWall partial wall framing and base connection system.
- F. Slip-Type Head Joints: Where indicated, provide one of the following:
- 1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch Insert dimension minimum vertical movement.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.; Deflex Clips.
 - 2) ClarkDietrich Building Systems; FTC3.
 - 3) Fire Trak Corp; PosiKlip.
 - 2. Single Long-Leg Track System: ASTM C 645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 3. Double-Track System: ASTM C 645 top outer tracks, inside track with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 - 4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: provide one of the following:
 - 1) BlazeFrame Industries; Bare Slotted Track (BST/BST 2).
 - 2) CEMCO; California Expanded Metal Products Co.; CST Slotted Deflection Track.
 - 3) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.
 - 4) MBA Building Supplies; FlatSteel Deflection TrackSlotted Deflecto Track.
- G. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BlazeFrame Industries; Intumescent Framing, Fire Stop System.
 - b. CEMCO; California Expanded Metal Products Co.; FAS Track.
 - c. ClarkDietrich Building Systems; BlazeFrame.
 - d. Fire Trak Corp; Fire Trak System attached to studs with Fire Trak Posi Klip.
- H. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. ClarkDietrich Building Systems.
 - b. MRI Steel Framing, LLC.
- 2. Minimum Base-Steel Thickness: 0.0329 inch.
- I. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- 2.3 AUXILIARY MATERIALS
 - A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
 - B. Isolation Strip at Exterior Walls: Provide the following:
 - 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
 - B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 PREPARATION
 - A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
 - B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Continuous Horizontal Bridging: Install cold-rolled channel bridging every 4 feet o.c., starting 4 feet above floor track and continuing for the full height of framing.
 - 3. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 4. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 5. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

- a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- 6. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- 7. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
 - 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09 25 00

GYPSUM WALLBOARD SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes:
1. Erection of steel stud partitions, installation of wallboard and application of taping and joint treatment.
 2. Additional strengthening of steel studs at cabinet locations, if any, and additional furring, nailing, and bolting necessary to allow for the installation of work which is to be concealed by the gypsum board installation.
 3. Coordination of the work and cooperation with other trades to fit and conform to requirements for anchoring and installation of their equipment and furniture, using guides and templates furnished by the trade involved.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions, including data as may be required to show compliance with these specification for each type of product specified.

1.03 QUALITY ASSURANCE

- A. Tolerances:
1. Vertical: Maximum 1/8" out of plumb, maximum warp equal to horizontal.
 2. Horizontal: Measured off a straight line from corner to corner of any wall, 1/4" if warp is to one side only; 1/8" if each side.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Bestwall Gypsum Company, Genstar Building Products (FlintKote), Georgia Pacific, Gold Bond Building Products, or United States Gypsum.
- B. Manufacturers of equal products approved by Design Professional.

2.02 MATERIALS

- A. Wallboard: Standard tapered edge, 5/8" thick, 48" wide, in lengths as long as practical to minimize number of end joints, complying with ASTM C36 and Fed. Spec. SS-L-30D. Provide Type "X" where indicated on the drawings.
- B. Fiber-Reinforced Backing Boards: Glass fiber mesh reinforcing, water resistant coating on both faces, Durock Cement Board as manufactured by Durabond Division, USG Industries Inc. or equal.
- C. Studs and Runners: size and gauge as indicated on drawings, galvanized steel, channel type CW and SW, roll formed, punched out for passage of other materials, width indicated on the drawings.
- D. Screw Fasteners: Self-drilling, cadmium plated, 1-1/8" for single ply, 1-5/8" for double ply wallboard.

- E. Nails: GWB-54 annular grooved nails, 1-3/8" long, 1/4" diameter head, bright finish, meeting ASTM C646.
- F. Joint Treatment Materials: Joint compound and tape, conforming to ASTM C475 (compound only) and Fed. Spec. SS-J-570B.
- G. Trim and Accessories: Galvanized steel, ASTM A525, recommended and approved by the manufacturer of the wallboard. Casing and corner beads with perforated attachment strips for embedment in joint compound.
- H. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation complying with ASTM C 665 for Type I, flame spread Class 25, 3" thick.
- I. Flat-Strap and Backing Plate for Fixture Attachment: Steel sheet for blocking and bracing, minimum 0.027" thick, length and width as required.
 - A. Wood blocking is not allowed.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Install materials in accordance with current printed directions of their manufacturer, in compliance with applicable codes, and the best standards of the trade contained in publications of the Gypsum Association.

3.02 INSTALLATION

- A. Stud System:
 1. Align runners accurately, plumb and true at floor and ceiling, anchored with suitable fasteners spaced not more than 24" o.c. Position studs in the runners, spaced no more than 24". Anchor studs to runner flange at ceiling and floor by positive screw engagement through each stud and runner flange, with two screws at top and two at the bottom, and end studs to walls or other construction. Brace top runners not attached to overhead structural or other substantial support, or braced by intersecting partitions, to provide lateral rigidity at intervals not to exceed 10'.
 2. When necessary, studs may be spliced with a minimum 8" nested lap with each stud facing the other so that one flange of each stud is between two flanges of the mating stud. Fasten together with two Type S pan head screws in each flange.
 3. Stud splicing and stud attachment tools may be used in lieu of screw attachment where studs are spliced or engaged to runner flange.
 4. Reinforce stud framework at intersections, corners and openings. Carry studs to structural members or provide bracing for a rigid installation.
 5. Provide metal straps and backing plates for equipment to be mounted against wallboard surfaces to ensure a stable, rigid, non-sagging installation.
- B. Wallboard:
 1. Arrange joints on opposite sides of the partition to occur on different studs.
 2. Space screw fasteners along each stud 12" o.c. in the field of the board and along the abutting end joints. Do not drive screws closer than 3/8" from edges and ends of the board. Screw boards firmly to runner flanges at proper intervals between studs as well as on studs, both at floor and ceiling.

- C. Levels of Gypsum Board Finish:
1. Level 0: No taping, finishing or accessories required.
 2. Level 1:
 - a. Joints: Tape set in joint compound.
 - b. Interior Angles: Tape set in joint compound.
 - c. Surface: Tool marks and ridges acceptable. Surface free of excess joint compound.
 3. Level 2: Not Used
 4. Level 3: Not Used.
 5. Level 4:
 - a. Joints: Taped as in level #2, then covered with two separate coats of joint compound.
 - b. Interior Angles: Taped as in level #2, then covered with one separate coat of joint compound.
 - c. Accessories: Shall be covered by three separate coats of joint compound.
 - d. Fasteners: Shall be covered by three separate coats of joint compound.
 - e. Surface: Joint compound shall be smooth and free of tool marks and ridges.
 6. Level 5: Not Used

3.03 GYPSUM BOARD FINISHING SCHEDULE

- A. Level 0: Provide in areas for temporary construction or whenever the final decoration has not been determined or in other areas not normally open to view; do not use in areas where fire and smoke code are required.
- B. Level 1: Provide in plenum areas above ceilings, in attics, in areas where the assembly would generally be concealed, or in building service corridors and other areas not normally open to view.
- C. Level 2: Not Used
- D. Level 3: Not Used.
- E. Level 4: Provide in areas that receive flat, satin or semi-gloss paint.
- F. Level 5: Not Used.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Vinyl base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 5 percent, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL BASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product by Tarkett or

approved equal by one of the following:

1. Shaw Contract.
 2. Mannington Commercial
- B. Product Standard: ASTM F 1861, Type TV (Vinyl).
1. Group: II (layered).
 2. Style and Location: At interior temporary walls and as indicated in the drawings.
- C. Thickness: 0.080" (min.)
- D. Height: 4"
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors: Black
- 2.2 INSTALLATION MATERIALS
- A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

- 3.1 EXAMINATION
- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Installation of resilient products indicates acceptance of surfaces and conditions.
- 3.2 PREPARATION
- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.
- 3.3 RESILIENT BASE INSTALLATION
- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to temporary and permanent walls, columns, pilasters, and other areas where base is required.

- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
 - D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - E. Do not stretch resilient base during installation.
 - F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
 - G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.
 - a. Miter or cope corners to minimize open joints.
- 3.4 CLEANING AND PROTECTION
- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
 - B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Surface preparation and field application of paints and coatings.
- B. Work not requiring finish, the following items are not required to be finished under this Section.
 - 1. Items with factory applied final finish.
 - 2. Aluminum, brass, bronze, chromium plate, copper, nickel and stainless steel.
 - 3. Code required labels such as UL or equipment identification plates.

1.02 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM D 16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
 - 2. ASTM D 523 - Test Method for Specular Gloss.
 - 3. ASTM D 2016 - Test Method for Moisture Content of Wood.

1.03 DEFINITIONS

- A. Comply with ASTM D 16 for interpretation of terms used in this Section.
- B. Gloss Factors: Values of various degrees of luster when tested in accordance with ASTM D 523 shall comply with following:
 - 1. Flat: Below 5 units at 85 degree test angle.
 - 2. Eggshell/Satin: 10 to 30 units at 60 degree test angle.
 - 3. Semi-Gloss: 30 to 65 units at 60 degree test angle.
 - 4. Gloss: Over 70 units at 20 degree test angle.

1.04 SUBMITTALS

- A. Product Data: Furnish manufacturer's technical information, including label analysis, instruction for handling, storage, surface preparation procedures and application recommendations for each paint system including primers and sealers.
- B. Shop Drawings: Submit painting schedule including manufacturer's product name, color, and substrate proposed for painting, and method of application.
- C. Samples: Provide stepped samples defining each separate coat, including block fillers and primers - of each color, texture and material to be applied on the following substrates:
 - 1. Concrete: Provide two 4" square samples for each color and finish.
 - 2. Concrete Masonry: Provide two 4" x 8" samples of masonry, with mortar joint in each center, for each finish and color.
 - 3. Ferrous Metal: Provide two 4" square samples of flat metal and two 8" long samples of

solid metal for each color and finish.

- D. Quality Control Submittals: Furnish certificates from manufacturer that all products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Applicator: Company specializing in performing work of this section with minimum five years commercial and three projects of similar scope documented experience.
2. Single Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

- B. Regulatory Requirements: Comply with requirements of governing authorities relative to volatile organic compounds (VOC) content.

C. Field Samples:

1. Prepare 100 sq. ft. field sample panel illustrating each special coating color, texture, sheen, and finish.
2. Locate where directed by Architect.
3. Simulate finished lighting conditions for review of in-place work.
4. Accepted sample may remain as part of Work.
5. Final acceptance of colors will be from job applied samples.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in manufacturer's sealed and labeled containers. Examine to verify acceptability.

- B. Container label to include manufacturer's name, type of paint, brand name, lot number and date of manufacturer, brand code, coverage rate, surface preparation, instructions for mixing and reducing drying time, cleanup requirements, color designation, and application instructions.

- C. Store paint materials at minimum ambient temperature between 45 degrees F and 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not apply exterior coatings during rain, or when relative humidity is outside humidity ranges required by paint product manufacturer.
2. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior.
3. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior.
4. Provide lighting level of 80-foot candles measured mid-height at substrate surface.

1.08 EXTRA MATERIALS

- A. Provide two gallons of each color, type, and surface texture to MDAD.

- B. In addition to manufacturer's label, identify each container with color, type, texture, and room location.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. The Sherwin-Williams Company. (S-W)
 - 2. PPG Architectural Coatings. (PPG)
 - 3. Mapei Corporation
- B. Substitutions: Comply with Division 01 Sections.

2.02 MATERIALS

- A. Coatings:
 - 1. Ready mixed, except field catalyzed coatings.
 - 2. Process pigments to soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified, of commercial quality.
- C. Patching Materials: Latex filler.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine the substrates, adjoining constructions, and the conditions under which the work is to be installed. Do not proceed with the work until unsatisfactory conditions detrimental to the work have been corrected.
 - 2. Verify that substrate conditions are ready to receive work as instructed by product manufacturer.
 - 3. Test shop applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. General:
 - 1. Mask electrical and mechanical, plates, hardware and hardware accessories, light fixture, escutcheons, fittings, and similar items prior to preparing surfaces or finishing.
 - 2. Correct defects and clean surfaces which affect work of this section.
 - 3. Schedule cleaning and surface preparation so that dust and other containments will not fall on wet, newly painted surfaces.
 - 4. Seal with shellac marks which may bleed through surface finishes.
 - 5. Provide barrier coats over incompatible primers or remove and reprime.

- B. Surface Preparation:
 - 1. Exterior Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
 - 2. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat.
- E. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
- F. Allow applied coat to dry before next coat is applied.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, and except where items are prefinished.
- B. Paint exposed conduit and electrical equipment occurring in general areas.
- C. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated and/ or as per DGM Guideline applicable sections. Color band and identify with flow arrows, names, and numbering.
- D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 CLEANING

- A. Collect waste material which may constitute fire hazard, place in closed metal containers and remove daily from site.

3.06 SCHEDULE – EXTERIOR PAINT

- A. Portland Cement Plaster Substrates:
 - 1. High-Build Latex System MPI EXT 9.1H: Dry film thickness of not less than 10 mils (0.25 mm).
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Latex, exterior, high build, MPI #40.
 - i. PPG Perma-Crete 100% Acrylic High Build Flat Coating System 4-22XI.
 - ii. SW: Loxon XP Waterproofing System, LX11-50 series.
 - iii. Mapei: Elastocolor Coat, High Build, 100% Acrylic.
- B. Ferrous Metal, Galvanized-Metal, and Aluminum Substrates:
 - 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, water based.
 - i. S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water-based eggshell.
 - i. S-W Pro Industrial Eg-Shel Acrylic B66-660 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.

3.07 SCHEDULE - INTERIOR PAINT

- A. Gypsum Board:
 - 1. Finish: Satin latex enamel; two finish coats, 3.0 mils minimum dry film thickness.

2. Primer:
 - a. S-W: PrepRite high Build Interior Latex Primer/Surfacers.
 - b. PPG: Speedide High Build Interior Latex Primer/Surfacers; 6-4.
 3. First and Second Coats:
 - a. ICI: 1414 Ultra-Hide Latex Low Lustre Interior Wall & Trim Enamel.
 - b. P&L Pro-Hide Plus Latex Satin Enamel.
 - c. S-W: Pro-Mar 200 Interior Latex Eggshell B20W200 Series.
 - d. Moore: Regal AquaVelvet #319.
- B. Metal - Ferrous:
1. Finish: Semigloss enamel finish; two coats over primer with 2.5 mils minimum total dry film thickness.
 2. Primer: Synthetic, quick-drying, rust-inhibiting primer.
 - a. ICI: 4100 Devguard Alkyd Metal Primer.
 - b. Moore: Ironclad Retardo Rust-Inhibitive Paint #163.
 - c. PPG: 6-208 Red Inhibitive Metal Primer.
 - d. S-W: Kem Kromik Metal Primer B50N2/B50W1.
 3. Undercoat: Interior enamel undercoat.
 - a. ICI: 1120 Ultra-Hide Oil/Alkyd Interior Wood Undercoater.
 - b. Moore: Moore's Alkyd Enamel Underbody #217.
 - c. PPG: 6-6 Speedhide Quick-Dry Enamel Undercoater.
 - d. S-W: Pro-Mar 200 Alkyd Enamel Undercoater B49W200.
 4. Finish Coat: Interior, semigloss, odorless, alkyd enamel.
 - a. ICI: 1507 Dulux Ultra Traditional Semi-Gloss Interior Alkyd Wall & Trim Enamel.
 - b. Moore: Moore's Satin Impervo Enamel #235.
 - c. PPG: 27 Line Wallhide Semigloss Enamel.
 - d. S-W: Classic 99 Semigloss Enamel A40 Series.
- C. Metal - Zinc-Coated:
1. Finish: Semigloss alkyd enamel; two coats over primer, with 2.5 mils minimum total dry film thickness.
 2. Primer: Galvanized metal primer.
 - a. ICI: 4120 Devguard All Purpose Metal & Galvanized Primer.
 - b. Moore: Ironclad Galvanized Metal Latex Primer #155.
 - c. PPG: 6-215/216 Speedhide Galvanized Steel Primer.
 - d. S-W: Galvite B50W3.
 3. Undercoat: Interior enamel undercoat.
 - a. ICI: 1120 Ultra-Hide Oil/Alkyd Interior Wood Undercoater.
 - b. Moore: Moore's Alkyd Enamel Underbody #217.
 - c. PPG: 6-6 Speedhide Quick-Dry Enamel Undercoater.
 - d. S-W: Pro-Mar 200 Alkyd Enamel Undercoater B49W200.
 4. Finish Coat: Interior, semigloss, odorless, alkyd enamel.
 - a. ICI: 1507 Dulux Ultra Traditional Semi-Gloss Interior Alkyd Wall & Trim Enamel.
 - b. Moore: Moore's Satin Impervo Enamel #235.
 - c. PPG: 27 Line Wallhide Semigloss Enamel.
 - d. S-W: Classic 99 Semigloss Enamel A40 Series.

END OF SECTION

SECTION 10 52 20

FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes fire extinguishers, fire protection cabinets and accessories.

1.02 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
1. Fire Extinguishers: Include rating and classification.
 2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 3. Show location of knockouts for hose valves.
- B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed factory-applied color finish required for fire-protection cabinets, prepared on Samples of size indicated below.
- D. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Regulatory Requirements: Fire extinguisher and fire protection cabinets shall bear UL Label, and shall comply with applicable provisions of NFPA including the inspection and tagging of fire extinguishers; approved for intended use and locations by applicable governing authority.

1.04 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
- B. Warranty Period: Six years from date of Substantial Completion.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver fire protection cabinets and brackets in manufacturer's original cartons, properly labeled and intact.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fire Protection Cabinets:

1. Provide cabinets as manufactured by J.L. Industries, 4450 W. 78th Street Circle Bloomington, MN 55435. 1(800) 554-6077
2. Products equal in appearance and functional characteristics by the following manufacturers may be provided subject to approval by the Design Professional and MDAD's Project Manager and compliance with requirements of this section and Section 01630 - Substitutions and Product Options.
 - a. Larsen's Manufacturing Company, Florida Division, 3130 N.W. 17 Street, Ft. Lauderdale, FL 33311, 954-486-3325.
 - b. Potter Roemer, 8306 NW 14th Street, Miami, FL 33126, (866) 961-3473
 - c. Watrous; Div of American Specialties, Inc., 441 Saw Mill River Road, Yonkers, NY 10701-4913, (914) 476-9000

B. Fire Extinguishers:

1. Products from the following manufacturers are acceptable. Products from other manufacturers equal in appearance and functional characteristics may be provided subject to approval by the Design Professional and Program Manager and compliance with requirements of this section and Section 01630 - Substitutions and Product Options.
 - a. Amerex Corporation, 7595 Gadsden Highway, Trussville, Alabama 35173-0081, (205) 655-3271
 - b. Ansul Incorporated, Fire Suppression Products, 222 Pennbright, Suite 104, Houston TX 77090, (281) 876-1731

2.02 FIRE PROTECTION CABINETS:

B. Surface Mounted Cabinets: FB Series by J.L. Industries.

1. Door and Tub: UV-resistant fiberglass with high-visibility red finish and 5" x 9" Fire Extinguisher Lettering. Gasketed door with 6" x 9" Gasketed view window and corrosion-resistant aluminum handle. All cabinets come standard with a full-length stainless-steel hinge attached by rivets. Door is tightly latched against the silicone gasket by (2) stainless steel snap latches.

2.03 FIRE EXTINGUISHERS

A. General:

1. Type: Multi-purpose dry chemical.
2. Heavy-duty cylinder with epoxy finish; chrome valve and siphon tubes, replaceable molded valve steam seal; large pressure indicating gages, pull pin; up-right squeeze-grip operation.

- B. All areas except as described below:
 - 1. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb (2.3-kg) nominal capacity, with mono ammonium phosphate dry chemical in enameled-steel container.
- C. Electrical Rooms and ACM Oil Rooms:
 - 1. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with mono ammonium phosphate-based dry chemical in enameled-steel container.
- D. Communication Equipment Rooms:
 - 1. Clean Agent portable fire extinguisher equal to Clean Guard Model F-13 as manufactured by Ansul Inc., UL-rated, 2-A:10-B:C, 5-lb in enameled-steel container.

2.04 BRACKETS

- A. Surface mounted portable fire extinguisher wall steel brackets; enamel or epoxy paint finish; sized to fit portable fire extinguisher supplied.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where cabinets will be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare recesses for cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights acceptable to authorities having jurisdiction.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed cabinets.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- D. Identification: Apply die-cut lettering at locations indicated.

3.05 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets and fire extinguishers are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet manufacturer.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.

3.06 INSPECTION

- A. Inspect and tag fire extinguishers as required by NFPA.

END OF SECTION

SECTION 26 00 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this and the other sections of Division 26.

1.02 REFERENCES

- A. All the following codes and requirements are incorporated into and made a part of the requirements of the Division 26 contract work.
 - 1. Latest current edition of:
 - a. The Florida Building Code.
 - b. National Electric Code.
 - c. NFPA, Life Safety Code.
 - d. ASME/ANSI A17.1.

1.03 SUMMARY

- A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements:
 - 1. Submittals.
 - 2. Coordination drawings.
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Electrical installations.
 - 7. Cutting and patching.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 26 Section 260500 "BASIC ELECTRICAL MATERIALS AND METHODS", for materials and methods common to the remainder of Division 26, plus general related specifications including:
 - a. Access to electrical installations.
 - b. Excavation for electrical installations within the building boundaries

and from building to utility connections.

1.04 SUBMITTALS

- A. General: Follow the procedures specified in Section "SUBMITTALS".
- B. Contractor shall provide a short circuit and protection coordination study performed by the equipment supplier. The study shall be based on equipment actually installed, on the drawings' provided design, and on actual field installation conditions and shall demonstrate that the electrical equipment proposed is adequate to provide properly coordinated and protected equipment.

1.05 COORDINATION DRAWINGS

- A. Prepare at shop drawing submittal stage, coordination drawings to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components (i.e. mechanical, plumbing, fire protection, structural, and architectural components). Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work.
- B. Drawings must be submitted in hard copy and in CAD format on disk.

1.06 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Section "PROJECT CLOSEOUT". In addition to the requirements, indicate installed conditions for:
 - 1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 - 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.07 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division specifications. In addition to the requirements specified to include the following information for equipment items:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature

- and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - a. Servicing instructions and lubrication charts and schedules.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.09 ELECTRICAL INSTALLATIONS

- A. The scope of work included under this Division shall include, but not be limited to, furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on accompanying plans and specified herein and briefly described as follows:
 1. Complete distribution system for normal and emergency lighting and power, wiring devices, equipment, equipment by others, controls, switchboards, panelboards, etc. as shown on the drawings and specified under this Division.
 2. Telephone distribution conduit system, empty conduit runs to various station and stub-out locations, and cable tray as shown on the drawings.
 3. Automatic fire alarm and detection system.
 4. Security alarm system.
 5. Complete electrical testing.
 6. Temporary services.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of

the actual equipment to be connected.

- B. Refer to equipment specifications in Divisions 02 through 26 for rough-in requirements.

3.02 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment.
- B. Coordinate electrical systems, equipment, and materials installation with other building components.
- C. Verify all dimensions by field measurements.
- D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
- E. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- F. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- G. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
- H. Coordinate connection of electrical systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- I. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect/Engineer.
- J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
- K. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- L. Install access panel or doors where units are concealed behind finished surfaces.

- M. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.03 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance to:
 - 1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - a. Uncover Work to provide for installation of ill-timed Work.
 - b. Remove and replace defective Work.
 - c. Remove and replace Work not conforming to requirements of the Contract Documents.
 - d. Remove samples of installed Work as specified for testing.
 - e. Install equipment and materials in existing structures.
 - f. Upon written instructions from the Architects/Engineers, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- B. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
- C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- D. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- E. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- F. Patch existing finished surfaces and building components using new materials matching existing materials and experienced installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- G. Patch finished surfaces and building components using new materials specified for the original installation and experienced installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to work of this section.
- B. Requirements specified in Division 26, Section 260000 "Basic Electrical Requirements" apply to this Section.

1.02 SUMMARY

- A. This Section includes limited scope general construction materials and methods for application with electrical installations as follows:
 - 1. Selective demolition including:
 - a. Non-destructive removal of materials and equipment for reuse or salvage as indicated.
 - b. Dismantling electrical materials and equipment made obsolete by these installations.
 - 2. Miscellaneous metals for support of electrical materials and equipment.
 - 3. Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.
 - 4. Access panels and doors in walls, ceilings, and floors for access to electrical materials and equipment.

1.03 SUBMITTALS

- A. General: Submit the following:
 - 1. Product data for the following products:
 - a. Access panels and doors.
 - b. Joint sealers.
- B. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.

1. Provide UL Label on each fire-rated access door.

1.04 PROJECT CONDITIONS

- A. Conditions Affecting Selective Demolition: The following project conditions apply:

1. Protect adjacent existing materials and utilities which are to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
 - a. Locate, identify and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

1.05 SEQUENCING SCHEDULING

- A. Coordinate the shut-off and disconnection of electrical service with the Miami-Dade Aviation Department and the utility company by providing written notification a minimum of 7 days in advance.
- B. Notify the Architect/Engineers at least 5 days prior to commencing demolition operations.

PART 2 - PRODUCTS

2.01 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A
36. B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout, recommended for interior and exterior applications.
- F. Fasteners: Zinc-coated, type, grade, and class as required.

2.02 JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
- B. Colors: As selected by the Architect/Engineer from manufacturer's standard colors.
- C. Elastomeric Joint Sealers: Provide the following types:
 - 1. One-part, non-acid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.
 - 2. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. One-Part, Non-acid-Curing, Silicone Sealant:
 - a. "Chem-Calk N-Cure 2000", Bostic Construction Products Div.
 - b. "Dow Corning 790", Dow Corning Corp.
 - c. "Silglaze N SCS 2501", General Electric Co.
 - d. "Silpruf SCS 2000", General Electric Co.
 - e. "864", Pecora Corp.
 - f. "Rhodorsil 5C", Rhone-Poulenc,
 - Inc. g. "Spectrum 1", Tremco, Inc.
 - h. "Spectrum 2", Tremco, Inc.
- E. Fire-Resistant Joint Sealers: Two-part, foamed-in-place, silicone sealant formulated for use in through- penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Dow Corning Fire Stop Foam", Dow Corning Corp.
 - b. "Pensil 851", General Electric Co.

2.03 ACCESS DOORS

- A. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.
- B. Frames: 16-gage steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling.
 - 1. For installation in masonry, concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.
 - 2. For gypsum wallboard or plaster: perforated flanges with wallboard bead.
 - 3. For full-bed plaster applications: galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- C. Flush Panel Doors: 14-gage sheet steel, with a minimum of concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.
 - 1. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.
- D. Locking Devices: Flush, screwdriver-operated cam locks.
- E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bar-Co., Inc.
 - 2. J.L. Industries.
 - 3. Karp Associates, Inc.
 - 4. Milcor Div. Inryco, Inc.
 - 5. Nystrom, Inc.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION FOR JOINT SEALERS

- A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

- B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

3.03 SELECTIVE DEMOLITION

- A. General: Demolish, remove, de-mount, and disconnect electrical materials and equipment indicated to be removed and not indicated to be salvaged or saved.
- B. Materials and Equipment To Be Salvaged: Remove, de-mount, and disconnect existing electrical materials and equipment indicated to be removed and salvaged, and deliver materials and equipment to the location designated for storage.
- C. Disposal and Cleanup: Remove from the site and legally dispose of demolished materials and equipment not indicated to be salvaged.
- D. Electrical Materials and Equipment: Demolish, remove, demount, and disconnect the following items:
 - 1. Inactive and obsolete raceway systems, controls, and fixtures.
 - a. Raceways embedded in floors, walls, and ceilings may remain if such materials do not interfere with new installations.
 - 2. Perform cutting and patching required for demolition in accordance with Section "Cutting and Patching".

3.04 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code".

3.05 APPLICATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
 - 1. Comply with recommendations of ASTM C 962 for use of elastomeric joint sealants.
 - 2. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air

pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

- B. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.06 INSTALLATION OF ACCESS DOORS

- A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.
- B. Adjust hardware and panels after installation for proper operation.

END OF SECTION

SECTION 26 05 19

WIRES AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements.

1.02 SUMMARY

- A. This Section includes wires, cables, and connectors for power, lighting, signal, control and related systems rated 600 volts and less.
- B. Related Sections: The following Sections contain requirements that relate to this section:
 - 1. Division 26 Section "Electrical Boxes and Fittings" for connectors for Terminating Cables in boxes and other electrical enclosures.

1.03 SUBMITTALS

- A. Product Data for electrical wires, cables and connectors.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with provisions of the following code: NFPA 70 "National Electrical Code", latest adopted edition.
- B. Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.
- C. UL Compliance: Provide components which are listed and labeled by UL.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wire and Cable:
 - a. American Insulated Wire Corp.
 - b. Brintec Corp.
 - c. Carol Cable Co. Inc.
 - d. Senator Wire and Cable
 - Co. e. Southwire Company.

2. Connectors for Wires and Cable Conductors:
 - a. AMP
 - b. 3M Company
 - c. O-Z/Gedney Co.
 - d. Square D Company.

2.02 WIRES AND CABLES

- A. General: Provide wire and cable suitable for the temperature, conditions and location where installed. All wire shall be UL labeled.

- B. Conductors: Provide solid conductors for power and lighting circuits No. 12 AWG and smaller. Provide stranded conductors for sizes No. 10 AWG and larger. Branch circuits shall be No. 12 AWG minimum.

- C. Conductor Material shall be copper for all to include:
 - 1) All wire and cable.
 - 2) All bussing in switchgear, switchboards and panelboards.
 - 3) All lugs and connectors.
 - a. Lugs must be copper (not aluminum or Cu/Al).
 - b. All compression lugs and connectors shall be installed per UL Article 486-A and terminated with combination dual rated compression tool.

- D. Insulation: Provide THHN/THWN insulation for all conductors. All insulation shall be rated for 600V.

- E. Color Coding for phase identification in accordance with Table 1 in Part 3 below.

- F. Cables: Provide cables in NEC approved locations and applications where indicated. Provide cable UL listed for particular application.

- G. Special wiring systems:
 1. Fire alarm wiring shall be type THHN/THWN, #14 AWG minimum, solid; or TFN, #14 AWG solid. Insulation shall be suitable for 600V.
 2. EMS wiring between DGP's and CPU shall be triax.

2.03 CONNECTORS FOR CONDUCTORS

- A. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

PART 3 - EXECUTION

3.01 WIRING METHOD

- A. Use the following wiring methods as indicated:
 - 1. Wire: Install all wire in raceway.
- B. All 120 volt circuits for lighting and receptacles exceeding 100 feet in length from the panelboard to the first outlet/light fixture shall be #10 AWG to the first outlet/light fixture and #12 AWG there on. All 277 volt lighting circuits exceeding 200 feet in length from the panelboard to the first light fixture shall be #10 AWG to the first light fixture outlet and #12 AWG there on.

3.02 INSTALLATION OF WIRES AND CABLES

- A. General: Install electrical cables, wires, and connectors in compliance with NEC. Power wiring of different voltages shall not be run in the same raceway, junction boxes or pull boxes.
- B. Coordinate cable installation with other Work. Control wiring shall not be run with power wiring in the same raceway, junction box or pullbox.
- C. Pull conductors simultaneously where more than one is being installed in same raceway.
Use
UL listed pulling compound or lubricant, where necessary.
- D. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.
- E. Conceal all cable in finished spaces.
- F. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.
- G. Keep conductor splices to minimum.

- H. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced. Splices shall be compression type with cold shrink wrap and tape, 3M, NSI or equivalent.
- I. Use splice and tap connectors which are compatible with conductor material.
- J. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Use cable ties to bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.
- K. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

3.03 FIELD QUALITY CONTROL

- A. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled.
- B. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.
- C. Subsequent to wire and cable hook-ups, energize circuits and demonstrate proper functioning.
Correct malfunctioning units, and retest to demonstrate compliance.

3.04 TABLE 1

A. Color Coding for Phase Identification:

- 1. Color code secondary service, feeder, and branch circuit conductors as follows:

Wire of size No. 6 and smaller shall be factory color coded. Wire sizes larger than No. 6 may be factory color coded or color coded with properly applied tape. Should tape be used, it shall cover not less than 6 inches of cable.

Power and lighting circuit wiring shall be color coded as follows:

<u>208y/120Volts</u>	<u>Phase</u>	<u>480y/277Volts</u>
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray w/White Tracer

Green

Ground

Green

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work of this section.

1.02 SUMMARY

- A. Extent of electrical grounding and bonding work is indicated by drawings and schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.
- B. Type of electrical grounding and bonding work specified in this section includes the following:
 - 1. Solidly grounded.
- C. Applications of electrical grounding and bonding work in this section includes the following:
 - 1. Electrical power systems.
 - 2. Grounding electrodes.
 - 3. Separately derived systems.
 - 4. Raceways.
 - 5. Service equipment.
 - 6. Enclosures.
 - 7. Equipment.
 - 8. Lighting standards.
- D. Refer to other Division-26 sections for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work; not work of this section.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's data on grounding and bonding products and associated accessories.
- B. Wiring Diagrams: Submit wiring diagrams for electrical grounding and bonding work which indicates layout of ground rings, location of system grounding electrode connections, routing of grounding electrode conductors, also include diagrams for circuits and equipment grounding connections.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including stranded cable, grounding electrodes and plate electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.
- C. Codes and Standards:
 - 1. Electrical Code Compliance: Comply with the latest adopted editions of applicable local electrical code requirements of the authority having jurisdiction, and NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.
 - 2. UL Compliance: Comply with applicable requirements of UL Standards No. 467, "Electrical Grounding and Bonding Equipment", and No. 869, "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL-listed and labeled for their intended usage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide grounding and bonding products of one of the following (for each type of product):
 - 1. Blackburn.
 - 2. Cadweld Div; Erico Products Inc.
 - 3. Joslyn Corporation.
 - 4. Thompson Lightning Protection, Inc.
 - 5. AC Lightning Protection.

2.02 GROUNDING AND BONDING

- A. Materials and Components:
 - 1. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding

electrodes and plate electrodes, surge arresters, and additional accessories needed for a complete installation. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.

2. Conductors: Provide "green" electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC 250-66, 250-122 for all feeders, subfeeders, and branch circuits.
3. Ground Electrodes: Steel with copper welded exterior, 3/4" diameter by 20 feet long.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS

- A. General: Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.
- B. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.
- C. Ground rods shall be accessible where possible, connected to the grounding electrode conductor with ground clamps. Ground rods may be driven in a concrete valve box flush with grade.
- D. Ground electrical service system neutral at service entrance equipment to grounding electrodes.
- E. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, plumbing systems, and the lightning protection system.
- F. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing.

- G. Connect grounding electrode conductors to 3/4 inch diameter, or greater, metallic cold water pipe using a suitably sized ground clamp.
- H. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- I. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.
- J. Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.
- K. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity.

3.03 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms, or less, by driving additional ground rods; then retest to demonstrate compliance.

END OF SECTION

SECTION 26 05 29

SUPPORTING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. "Basic Electrical Requirements".
 - 2. "Basic Electrical Materials and Methods".

1.02 SUMMARY

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.
 - 1. Refer to other Division 26 sections for additional specific support requirements that may be applicable to specific items.

1.03 SUBMITTALS

- A. Product data for each type of product specified.

1.04 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code", latest adopted edition.
- B. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Slotted Metal Angle and U-Channel Systems:
 - a. Allied Electrical.
 - b. B-Line Systems, Inc.

- c. Unistrut Diversified Products.
2. Conduit Sealing Bushings:
- a. O-Z/Gedney.
 - b. Red Seal Electric Corp.
 - c. Spring City Electrical Mfg. Co.

2.02 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

2.03 MANUFACTURED SUPPORT DEVICES

- A. Raceway Supports: Overhead raceways shall be supported from the structure above. Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and threaded hanger rods may be used.

- 1. Raceways shall not be supported from ceiling suspension wires.
- 2. Raceways shall not be supported from ductwork or piping.
- 3. Raceways shall not be suspended with hanger wires. Proper conduit hangers are required (i.e. threaded hanger rods).
- 4. Raceways shall be grouped and suspended on "trapeze"

- supports. B. Fasteners: Types, materials, and construction features as

follows:

- 1. Expansion Anchors: Carbon steel wedge or sleeve type.
 - 2. Toggle Bolts: All steel springhead type.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- E. U-Channel Systems: 16-gage steel channels, with 9/16- inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with

U-channel and are of the same manufacture.

2.04 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
 - a. 3-inch and smaller: 20-gage.
 - b. 4-inch to 6-inch: 16-gage.
 - c. over 6-inch: 14-gage.
 - 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
 - 1. Conform to manufacturer's recommendations for selection and installation of supports.
 - 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
 - 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
 - 5. Support individual horizontal raceways by separate pipe hangers. Spring steel

fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

6. Space supports for raceways in accordance with Table I of this section. Space supports for raceway types not covered by the above in accordance with NEC.
 7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- G. Sleeves: Install in walls and all other fire-rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL-listed firestopping sealant in gaps between sleeves and enclosed conduits and cables.
- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components.

TABLE I: SPACING FOR RACEWAY SUPPORTS

Raceway Size (Inches)	No. of Conductors in Run	Location	Maximum Spacing of Supports (Feet)	
			RMC & IMC*	EMT
HORIZONTAL RUNS				
3/4	1 or 2	Flat ceiling or wall.	5	5
3/4	1 or 2	Where it is difficult to provide supports, except at intervals fixed by the building construction.	7	7
3/4	3 or more	Any location.	7	7
1	3 or more	Any location.		
1 & larger	1 or 2	Flat ceiling or wall.	6	6
1 & larger	1 or 2	Where it is difficult to provide supports, except at intervals fixed by the building construction.	10	10
1 & larger	3 or more	Any location.	10	10
Any	....	Concealed.	10	10
VERTICAL RUNS				
3/4	....	Exposed.		7
1 - 1-1/4	....	Exposed.		8
1-1/2 and larger	....	Exposed.	10	10
Up to 2	....	Shaftway.	14	
2-1/2	....	Shaftway.	16	10
3 & larger	....	Shaftway.	20	10
Any	....	Concealed.	10	10

* Maximum spacings for IMC above apply to straight runs only. Otherwise the maximums for EMT apply.

Abbreviations: EMT Electrical metallic tubing.
 IMC Intermediate metallic conduit. RMC Rigid metallic conduit.

END OF SECTION

SECTION 26 05 33.13

RACEWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this Section:
 - 1. "Basic Electrical Requirements".
 - 2. "Basic Electrical Materials and Methods".

1.02 SUMMARY

- A. This Section includes raceways for electrical wiring. Types of raceways in this section include the following:
 - 1. Electrical metallic tubing (EMT).
 - 2. Flexible metal conduit.
 - 3. Intermediate metal conduit (IMC).
 - 4. Liquid-tight flexible conduit.
 - 5. Underground utilities duct.
 - 6. Galvanized rigid metal conduit.
- B. Related Sections: The following Division 26 Sections contain requirements that relate to this Section:
 - 1. "Wires and Cables" for other wiring methods.
 - 2. "Supporting Devices" for raceway supports.
 - 3. "Electrical Boxes and Fittings" for boxes used with conduit and tubing systems.

1.03 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code".
- B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
- C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

- A. Coordinate with other Work as necessary to interface installation of electrical raceways and components with other Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by the following:
 - 1. Conduit and Conduit Bodies:
 - a. Allied
 - b. Appleton Electric
 - Co. c. Carlon
 - d. Crouse-Hinds Division, Cooper Industries, Inc.
 - e. Killark Electric Mfg. Co.
 - f. Triangle
 - g. O-Z/Gedney
 - h. Wheatlan

2.02 METAL CONDUIT AND TUBING

- A. Galvanized rigid Steel Conduit: ANSI C80.1.
- B. Intermediate Steel Conduit: UL 1242.
- C. Electrical Metallic Tubing and Fittings: ANSI C80.3.
- D. Flexible Metal Conduit: UL 1, zinc-coated steel.
- F. Liquid-tight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.
- G. Rigid aluminum conduit, UL listed.

2.03 NONMETALLIC CONDUIT AND DUCTS

- A. Underground PVC Duct: NEMA type TC-6, EB-35/ASTM F512 for encased burial with a minimum of three (3) inches of concrete on all sides.
- B. Liquid-tight Flexible Nonmetallic Conduit and Fittings: UL 1660. Fittings shall be specifically approved for use with this raceway.
- C. Conduit, Tubing, and Duct Accessories: Types, sizes, and materials complying

with manufacturer's published product information. Mate and match accessories with raceway.

2.04 CONDUIT BODIES

- A. General: Types, shapes, and sizes as required to suit individual applications and NEC requirements. Provide matching gasketed covers secured with corrosion - resistant screws.
- B. Metallic Conduit and Tubing: Use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways. The use of set screw or indenter type fittings on metallic conduits is prohibited.
- C. Conduit Bodies: Use bodies with steel compression-type connectors for EMT. The use of die- cast or pot metal fittings and connectors is prohibited. Use threaded connectors for rigid and IMC conduit.

PART 3 - EXECUTION

3.01 WIRING METHOD

- A. Galvanized Rigid Conduit (GRC)
 - 1. Galvanized rigid conduit may be used for all applications. Except where indicated otherwise, galvanized rigid conduit must always be used in the following applications:
 - a) Underground with rust preventer compound.
 - b) Cast in floor slabs.
 - c) All exposed conduit up to 8'-0" above the floor.
 - d) In Baggage Make-Up areas, including areas above 8'-0", and overhead.
 - e) All conduits trade size 2" and above.
- B. Intermediate Metal Conduit (IMC)
 - 1. Intermediate metal conduit (IMC) may be used for the same applications as rigid galvanized, except:
 - a) IMC may not be used underground.
 - b) IMC may not be used in or below the ground floor.
- C. Electrical Metallic Tubing (EMT)
 - 1. EMT may be used for the following applications, unless indicated otherwise:

- a) Indoors in concealed areas (in partitions, above ceiling).
- b) Exposed in storage rooms and in mechanical and electrical rooms above 8'-0".
- c) Above 10'-0" in areas of exposed conduit where the conduit has physical protection due to construction configuration.

2. EMT may not be used in the following applications:

- a) Out-of-doors.
- b) Damp or moist locations.
- c) Exposed under exterior canopies or

overhangs. D. PVC Conduit

1. PVC conduit shall be permitted only in the following applications:

- a. Underground, when encased in a ductbank and with a minimum of three (3) inches of concrete on all sides. Use Type TC-6, EB-35/ASTM F512.
- b. For lightning protection conductors, when cast into concrete vertical building components, use Schedule 40 PVC.

E. Flexible Metal Conduit

- 1. Flexible metal conduit shall be used for all connections to equipment (transformers, air conditioning equipment, pumps, kitchen equipment, etc.) and lighting fixtures.
- 2. Liquid-tight type flexible metal conduit shall be used for all applications except that non-liquid-tight may be used for the following:
 - a) Indoor light fixtures.
 - b) Other similar indoor light-duty applications.
- 3. Exterior liquid-tight flex shall be ultra-violet resistant.

3.02 INSTALLATION

A. General: Install electrical raceways in accordance with manufacturer's written installation instructions, applicable requirements of NEC, and as follows:

- 1. Conceal Raceways unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install raceways level and square and at proper elevations.

2. Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.
3. Complete installation of electrical raceways before starting installation of conductors within raceways.
4. Provide supports for raceways as specified elsewhere in Division 26.
5. Prevent foreign matter from entering raceways by using temporary closure protection.
6. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
7. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
8. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate steel conduit and rigid steel conduit, use threaded rigid steel conduit fittings. Fittings for EMT shall be steel compression type only, no set screws or indenter types allowed. Fittings for aluminum conduits shall be threaded aluminum with inhibitors at all threads to avoid freezing.
9. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.
10. Raceway systems installed in or below the first floor slab, or located out-of-doors (including those below out-of-door canopies or overhangs) or otherwise located in wet or damp locations shall be completely watertight, including boxes and fittings.
11. Install exposed raceways parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical.
12. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same centerline so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases provide field bends for parallel raceways.
13. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide

electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.

14. Terminations: Terminate raceways with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
15. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
16. Install pull wires in empty raceways. Use Polyester line having not less than 200-lb tensile strength. Leave not less than 36 inches of slack at each end of the pull wire. Identify pull wires at both ends and securely caulk in place.
17. Telephone and Signal System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways 2-inch and smaller trade size in maximum lengths at 150 feet and with a maximum of two, 90-deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.
18. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
 - a. Where conduits enter or leave hazardous locations.
 - b. Where required by the NEC.
19. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this contract, install screwdriver-operated threaded flush plugs flush with floor.
20. Flexible Connections: Use short length (maximum of 6 ft.) of flexible conduit for recessed and semi-recessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement, for all motors and all other applications. Use liquid-tight flexible conduit in wet locations. Install separate ground conductor

across flexible connections. Maximum length of flexible and liquid-tight flexible conduit shall be 6 feet.

21. Minimum size of conduit to be used throughout project shall be 3/4" for entire length of runs. The use of 1/2" conduit is prohibited.
22. Provide expansion and deflection couplings as required for conduits passing thru expansion joints.
23. Provide smoke seals at the ends of all conduits which terminate in open bushed ends at the cable tray to prevent smoke infiltration into upper floors.

3.03 ADJUSTING AND CLEANING

- A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

END OF SECTION

SECTION 26 05 33.16

ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is a part of each Division-26 section making reference to electrical wiring boxes and fittings specified herein.

1.02 DESCRIPTION OF WORK

- A. Extent of electrical box and associated fitting work is indicated by drawings.
- B. Types of electrical boxes and fittings specified in this section include the following:
 - 1. Outlet boxes.
 - 2. Junction boxes.
 - 3. Pull boxes.
 - 4. Bushings.
 - 5. Locknuts.
 - 6. Knockout closures.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.
- C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
- D. UL Compliance: Comply with applicable requirements of UL pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical boxes and fittings.

- B. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
1. Adalet-PLM Div, Scott Fetzer Co.
 2. Appleton Electric; Emerson Electric Co.
 3. Bell Electric; Square D Company
 4. Eagle Electric Mfg Co., Inc.
 5. Midland-Ross Corp.
 6. OZ/Gedney; General Signal Co.
 7. Pass and Seymour, Inc.
 8. RACO Div; Harvey Hubbell Inc.
 9. Thomas & Betts Co.

PART 2 - PRODUCTS

2.01 FABRICATED MATERIALS

- A. Outlet Boxes: Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.
1. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.
- B. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.
1. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

- C. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.
- D. Junction and Pull Boxes: Provide galvanized after fabrication code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- E. Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron insulated conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

- A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- C. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture.
- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
- F. Avoid installing boxes back-to-back in walls. Provide not less than 6" (150 mm) separation.
- G. Position recessed outlet boxes accurately to allow for surface finish thickness.
- H. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.
- I. Provide electrical connections for installed boxes.
- J. Subsequent to installation of boxes, protect boxes from construction debris and

damage.

- K. Locate electrical boxes in coordination with architectural drawings. Architect/Engineer reserves the right to adjust the locations of boxes during rough-in at no additional cost to Owner.

3.02 GROUNDING

- A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. "Basic Electrical Requirements".
 - 2. "Basic Electrical Materials and Methods".

1.02 SUMMARY

- A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:
 - 1. Identification labeling for raceways, cables, and conductors.
 - 2. Warning and caution signs.
 - 3. Equipment labels and signs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 26 Section 260519 "Wires and Cables" for requirements for color coding conductors for phase identification.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Specification Sections.
- B. Product Data for each type of product specified.

1.04 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with the latest adopted edition of NFPA 70 "National Electrical Code".

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. American Labelmark Co.
2. National Band and Tag Co.
3. Panduit Corp.
4. Seton Name Plate Co.
5. Standard Signs, Inc.
6. W. H. Brady, Co.

2.02 ELECTRICAL IDENTIFICATION MATERIALS

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

B. Color-Coded Conduit Markers:

1. General: Provide manufacturer's standard pre-painted, flexible or semi-rigid, permanent, plastic-sheet conduit markers, extending 360 degrees around conduits; designed for attachment to conduit by adhesive, adhesive lap joint of marker, matching adhesive plastic tape at each end of marker, or pre-tensioned snap-on. Except as otherwise indicated, provide lettering which indicates voltage of conductor(s) in conduit. Provide 8" minimum length for 2" and smaller conduit, 12" length for larger conduit.
2. Colors: Unless otherwise indicated or required by governing regulations, provide white markers with black letters.

C. Color-Coded Plastic Tape:

1. General: Provide manufacturer's standard self-adhesive vinyl tape not less than 3 mils thick by 1-1/2" wide.
2. Colors: Unless otherwise indicated or required by governing regulations, provide orange tape.

D. Cable/Conductor Identification Bands:

1. General: Provide manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type, either pre-numbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identifications.

E. Plasticized Tags:

1. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention and operational tags, of plasticized card stock with matte finish suitable for writing, approximately 3-1/4" X 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording, e.g., DANGER, CAUTION, DO NOT OPERATE.
- F. Engraved Plastic-Laminate Nameplates:
1. General: Provide engraving stock melanine plastic laminate, engraved with engraver's standard letter style of wording, black face and white letters 1" x 3".
 2. Thickness: 1/6", except as otherwise indicated.
 3. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION A.

General Installation

Requirements:

1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NEC.
2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
3. Regulations: Comply with governing regulations, and requests of electrical

work. B. Conduit Identification:

1. General: Where electrical conduit is exposed in spaces apply color-coded identification on electrical conduit in manner similar to piping identification. Except as otherwise indicated, use white as coded-color for conduit.

C. Junction Pullbox Identification:

1. Junction boxes, pullboxes and their covers shall be distinctively painted to identify their service. (A convenient way to facilitate this is to spray-paint the boxes and covers in groups before installation).
2. Boxes shall be color coded as follows:

Red	Emergency Power System
Orange	Fire Alarm System
Purple	480/277V Power and Lighting System

Yellow	120/208V Power and Lighting System
White	Any other system, <u>with</u> system type (such as "Intercom" or
"Public	Address" marked on covers in
black. Blue	Security System
Green	CCTV Systems

D. Operational Identifications and Warnings:

1. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities
by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosure. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

E. Danger Signs:

1. General: In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of electrical work as constituting similar dangers for persons in or about project.
2. High Voltage: Install danger signs wherever it is possible, under any circumstance, for persons to come into contact with electrical power of voltages higher than 110-120 volts.
3. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.

F. Equipment/System Identification:

1. General: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1" x 3" sign, white lettering in black field. Attached with screws (not rivets). Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:

- a. Panelboards, electrical cabinets and enclosures, disconnect switches, starters and controllers.
 - b. Access panel/doors to electrical facilities
 - c. Transformers
 - d. Telephone equipment
 - e. Fire Alarm master station or control panel
2. Install signs at location indicated or, where not otherwise indicated, at location for best convenience or viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.
 3. Provide engraved plastic laminate signs as described in Item 1 above at all security doors as indicated in drawings. Identification numbers shall be provided by MDAD upon review of security scheme for facility. Secure all signs to door frames above door and mount where visibility is at an optimum.

END OF SECTION

SECTION 26 05 83

ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-26 section making reference to electrical connections for equipment specified herein.

1.02 DESCRIPTION OF WORK

- A. Extent of electrical connections for equipment is indicated by drawings and schedules.
Electrical connections are hereby defined to include electrical appurtenances, power and connections used for providing electrical power to equipment.
- B. Applications of electrical power connections specified in this section include the following:
 - 1. From electrical source to motor starters.
 - 2. From motor starters to motors.
 - 3. From motor starters to variable frequency drives to motors.
 - 4. To lighting fixtures.
 - 5. To converters, rectifiers, transformers, inverters, rheostats, relays, remote control units, and similar current adjustment features of equipment.
 - 6. To grounds including earthing connections.
 - 7. To master units of communication, signal, alarm, clock, and video systems.
 - 8. To electrically operated sensor faucets.
- C. Electrical connections for equipment are work of this section.
- D. Motor starters and controllers specified in applicable Division-26 sections are work of this section.
- E. Provide junction boxes and disconnect switches required for connecting motors and other electrical units of equipment. As specified in applicable Division-26 sections.
- F. Provide electrical identification for wire/cable conductors as specified in Division-26 section, "Electrical Identification".
- G. Provide raceways and wires/cables required for connecting motors and other electrical

units of equipment as specified in applicable Division-26 sections.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors and terminals, of types and ratings required, and ancillary connection materials, including electrical insulating tape, soldering fluxes, and cable ties, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firms with at least 3 years of successful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.
- C. NEC Compliance: Comply with applicable requirements of NEC as to type products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters, and disconnect switches.
- D. UL Compliance: Comply with UL Std 486A, "Wire Connectors and Soldering Lugs for Use With Copper Conductors" including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL-listed and -labeled.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of product):
 - 1. Burndy Corporation.
 - 2. Harvey Hubbell Inc.
 - 3. Square D Company.
 - 4. Thomas and Betts Corp.

2.02 MATERIALS AND COMPONENTS

- A. General: For each electrical connection required, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.
- B. Metal Conduit, Tubing and Fittings:
 - 1. General: Provide metal conduit, tubing and fittings of types, grades, sizes

and weights (wall thicknesses) indicated for each type service. Provide products complying with Division-16 basic electrical materials and methods section "Raceways", and in accordance with the following listing of metal conduit, tubing and fittings:

- a. Rigid steel conduit.
- b. Rigid metal conduit fittings.
- c. Electrical metallic tubing.
- d. Steel EMT fittings.
- e. Flexible steel metal conduit.
- f. Flexible steel metal conduit fittings.
- g. Liquid-tight flexible metal conduit.
- h. Liquid-tight flexible metal conduit fittings.

fittings. C. Wires, Cables, and Connectors:

- 1. General: Provide wires, cables, and connectors complying with Division-26 basic electrical materials and methods section "Wires and Cables".
- 2. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 20 deg. C (68 deg. F).
- 3. Connectors and Terminals: Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.
- 4. Electrical Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated.
- 5. Electrical solder and electrical soldering flux shall be permitted only for use on special systems as denoted in specific areas of Division 26 Specifications.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF ELECTRICAL COMPONENTS

- A. Install electrical connections as indicated; in accordance with equipment

manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.

- B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
- D. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.
- E. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- G. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.
- H. Provide flexible conduit for motor connections, and other electrical equipment connections, where subject to movement and vibration.
- I. Provide liquid-tight flexible conduit for connection of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:
 - 1. Exterior location.
 - 2. Moist or humid atmosphere where condensate can be expected to accumulate.
 - 3. Water spray.
 - 4. Dripping oil, grease, or water.

3.03 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION

SECTION 26 08 00

ELECTRICAL SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The purpose of this section is to specify Division 26 Commissioning Requirements.

1.02 SYSTEMS TO BE COMMISSIONED

- A. The following equipment/systems to be commissioned in this project.
 - 1. Switchgear, transformers and panelboards.
 - 2. Lighting systems.
 - 3. Lightning protection systems.
 - 4. Fire alarm/detection system (in conjunction with Fire Department).
 - 5. Emergency Power (generator, transfer switches and distribution system).

PART 2 – NOT USED

PART 3 - EXECUTION

3.01 FUNCTIONAL TESTS A.

Refer to Section 260802.

END OF SECTION

SECTION 26 08 02

ELECTRICAL SYSTEMS FUNCTIONAL TESTING REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section includes the testing/commissioning procedures for Electrical Systems.

PART 2 PRODUCTS

2.01 Not Used.

PART 3 EXECUTION

Complete all Functional Tests as listed below in accordance with 260800.

3.01 SUMMARY

- A. This Section defines responsibilities of the Contractor regarding Commissioning process and addresses validation of proper and thorough installation of electrical systems.
- B. Contractor shall oversee the Commissioning activities with the Contractor's Subcontractors and the Architect/Engineer (A/E).
- C. Contractor shall completely install, thoroughly inspect, start-up, test, adjust all systems and equipment. All activities shall be documented on specific, procedural forms developed for that purpose. Contractor shall notify A/E and Owner in writing that systems are complete and ready for verification.
- D. Written Certification: The Contractor shall certify that the installation, Start-up, and initial operation of the system or component is in accordance with the Contract Documents, and manufacturer's requirements. Any outstanding items or non-conformance shall be clearly indicated to the A/E and an action item shall have been initiated.

3.02 COMMISSIONING PROCEDURES A.

Service Switchgear

- 1. Provide the services of a factory-trained manufacturer's representative to assist the Contractor in the installation and Start-up service of the equipment for a period of three (3) working days in three (3) visits and to train Owner's personnel as specified.

2. Start-up checklists: Perform the following final checks before Start-up:
 - a. Inspect connections to main breakers.
 - b. Inspect grounding.
 - c. Inspect feeder connections to busways and cables.
 - d. Inspect installation of main, tie and feeder breaker elements.
 - e. Inspect control and alarm interconnections.
 - f. Check calibration/setting of trip devices using system coordination study.
 - g. Verify calibration/setting of digital metering.

3. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
 - a. Visually and mechanically inspect to include the following: anchoring, grounding, torque of feeder and incoming bus duct connections, feeder cable and integral main bus connections, switchgear section alignments, electrical clearances, mechanical operation of breaker/fuse drawout elements and operating mechanisms, manual trip function, main bus safety shutters, and installation verification using manufacturer's checklist.
 - b. Check current and potential instrument transformer ratios.
 - c. Conduct insulation resistance and over potential tests on each type of each breaker element contacts, switchgear control wiring, breaker element control wiring and each bus section.
 - d. Conduct resistance test through switchgear bus joints.
 - e. Conduct current test using primary or secondary current injection.
 - f. Conduct phasing test on triple-ended switchgear.
 - g. Conduct contact resistance test on each type breaker element.
 - h. Conduct ground resistance test.
 - i. Conduct operational/functional tests of protective relaying. Time-current tests shall be conducted and trip points shall be set per Architect/Engineer's direction.
 - j. Conduct operational/functional tests of digital metering.
 - k. Perform electrical and mechanical (key) interlock system operational tests on generator and service switchgear.

B. Distribution Transformers

1. Start-up Checks: Perform the following final checks before Start-up:

- a. Inspect wiring connections.
 - b. Insure taps are adjusted.
 - c. Inspect grounding.
2. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
 - a. Visually and mechanically inspect to include the following: mounting, grounding, electrical clearances, and K factor and/or isolating transformers are installed where required.
 - b. Perform insulation resistance, turns ratios, and polarity tests on each type/size of transformer.
- C. Distribution and Branch Circuit Panelboards
1. Start-up Checks: Perform the following final checks before Start-up:
 - a. Inspect wiring connections.
 2. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
 - a. Visually and mechanically inspect to include the following: mounting, separate ground and neutral connections per circuit, completed circuit directories, electrical clearances, KAIC ratings of panelboard and breakers.
 - b. Correct surge suppression devices installed.
 - c. Review current readings for each panelboard to ensure loads are balanced.
 - d. Conduct insulation resistance tests.
- D. Lighting Fixtures and Lighting Controls / 277 / 120V Lighting
1. Provide the services of a factory-trained manufacturer's representative to assist the Contractor in the installation and Start-up service of the lighting control system and train Owner's personnel as specified below. Representative will confirm the proper installation and operation of all system components.
 2. Start-up Checks: Perform the following final checks before Start-up
 - a. Ensure all labeling is affixed and accurate.
 - b. Verify quantity, type and location of fixtures.
 - c. Verify type and location of switches.
 - d. Ensure all terminations are tight.
 - e. Check sensor placement is adequate for required duty.
 - f. Ensure adequate access is provided to all panels and that documentation of that

- panel is provided in it.
 - g. Ensure all circuits for the loads are energized and ready for testing.
 - 3. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
 - a. Test, calibrate, and set all digital and analog sensing, and actuating devices.
 - 1) Calibrate each instrumentation device by making a comparison between the graphic display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +/-0.5 percent accurate, test equipment shall be +/-0.25 percent accurate over same range).
 - 2) Record the measured value and displayed value for each device.
 - 3) Check each digital control point by making a comparison between the control command at the control panel and the status of the controlled device.
 - 4) Check each digital input point by making a comparison of the state of the sensing device and the OI display.
 - b. Verify operation of lighting controls (dimming, photo-control, regular switching).
 - c. Check loads on all breakers to ensure that the breaker is properly sized.
 - d. Enter all schedules per occupant's direction.
 - e. For Operator Interfaces: Verify all elements on the graphics are functional and properly bound to physical devices and/or virtual points and that hot links or page jumps are functional and logical.
 - f. Output all specified reports for review and approval.
 - g. Verify the alarm printing and logging is functional and per requirements.
 - h. Validate all interfaces with other systems on a point by point basis.

E. Lightning Protection System:

- 1. Start-up Checks: Perform the following final checks before Start-up:
 - a. Inspect wiring connections.
- 2. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
 - a. Visually and mechanically inspect to include the following: air terminal mountings, bonding connections of roof mounted HVAC equipment, down leads routing/roof penetrations, and grounding.
 - b. Review UL test certification.

- c. Check for receipt of UL master label.

F. Fire Alarm Equipment / Fire Alarm and Detection System:

1. Provide the services of a qualified fire alarm specialist to supervise the installation, make adjustments, and perform tests on the fire alarm system and to train Owner's personnel.
2. Start-up Checks: Perform the following final checks before Startup.
 - a. Ensure all labeling is affixed and accurate.
 - b. Ensure all terminations are tight.
 - c. Ensure adequate access is provided to all panels and that documentation of that panel is provided in the panel.
 - d. Review that all fire alarm devices as shown on the construction Drawings and Shop Drawings are installed.
 - e. Review height and locations of pull stations and visual alarms to comply with ADA.
 - f. Review that smoke and duct detectors are installed according to NFPA.
 - g. Check that fire alarm system control panel is clear with no trouble or ground faults.
 - h. Sprinkler flow and tamper switches have been adjusted.
 - i. Check wire supervision on all devices.
3. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
 - a. Check location of all sensors and switches to ensure conformance with requirements.
 - b. Cause activation of all device, assure alarms are initiated and resulting response is per the requirements.
 - c. Verify interfaces with all other inter-related systems or equipment including building automation system (BAS), sound systems, security systems, HVAC systems, vertical delivery systems, etc. on a point by point basis for all points
 - d. Validate all output devices (speakers and strobes) meet the code criteria.
 - e. Activate high temperature detectors in the elevator machine room. Verify all sequences including elevator shunt off, elevator recall including alternate floors when main floor is in alarm.
 - f. Activate all sprinkler flow switches. Validate that appropriate zone enunciates and alarms sound.
 - g. Verify audio aspects of the system function as required. Verify paging messages can be heard throughout the building.
 - h. For annunciator panels, validate correct graphic and correct identification of all zones.
Test the action and interlocks of all override switches as appropriate

- i. For Operator Interfaces:
 - 1) Verify all elements on the graphics are functional and properly bound to physical devices and/or virtual points and that hot links or page jumps are functional and logical.
 - 2) Output all specified reports for review and approval.
 - 3) Verify the alarm printing and logging is functional and per requirements.
- j. Validate all interfaces with other systems on a point by point basis.

G. Automatic Transfer Switches:

- 1. Provide the services of a manufacturer certified specialist to supervise the installation, make adjustments, and perform tests on the automatic transfer switches and to train Owner's personnel.
- 2. Start-up Checks: Perform the following final checks before Start-up:
 - a. Visually inspect the systems.
 - b. Ensure the terminations are tight and all ancillary equipment completely installed.
 - c. Ensure all overloads are in place.
 - d. Measure contact resistance.
- 3. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
 - a. Energize Switch.
 - b. Check positive interlock between systems.
 - c. Set/Calibrate Voltage sensing relay, transfer time delays (in both directions), and synchronization relays.
 - d. Measure insulation resistance and resistance to ground.
 - e. Check manual bypass operation.

H. Emergency Power Engine Generators and Distribution Systems:

- 1. Provide the services of a manufacturer certified specialist to supervise the installation, make adjustments, and perform tests on the engine generators and emergency power switchgear and to train Owner's personnel.
- 2. Start-up Checks: Perform the following final checks before Start-up:
 - a. Visually inspect the systems.
 - b. Ensure the terminations are tight on power and control wiring.
 - c. Verify all ancillary equipment completely installed.
 - d. Ensure all overloads are in place.

- e. Verify that generator is set in place.
 - f. Verify fuel connections.
 - g. Verify radiator connections.
 - h. Verify battery connection.
 - i. Verify exhaust connections.
 - j. Verify block or oil heater connection.
 - k. Check and record engine oil level, radiator water level, and battery electrolyte level.
 - l. Piping System Tests: Complete system test in accordance with the respective section.
 - m. Inspect the installation and access/clearance for service and maintenance to ensure it meets the Project and manufacturer's requirements.
 - n. Check lubricating oil for lubricated-type equipment.
 - o. Check for proper seismic restraints.
 - p. Check that safety valves have correct setting; greater than compressor discharge pressure, but not greater than pressure rating of system components.
 - q. Check that all operating controls are set for initial safe operation.
3. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:
- a. Test generator at 50, 75, 100, 125 percent load capacity using load banks at 100 percent power factor.
 - b. Run load test at all loads except 125 percent for 30 minutes recording engine and alternator readings at the start, at 15 minutes and at 30 minutes. 125 percent load to be run for 15 minutes recording readings at the start and end of test.
 - c. Simulate operation of all generator safeties such as high oil pressure, low oil pressure, high temperature, over speed, etc. Observe function of safeties under actual malfunction situation.
 - d. Check for excessive vibration and noise.

3.03 ACCEPTANCE CRITERIA

Acceptance criteria for tests are indicated in the Specification Sections applicable to the systems being tested. Unless indicated otherwise, acceptance criteria will be specified with the individual system, equipment, component, or device.

FINAL SIGN-OFF

Contractors attest that the above items have been verified and meet the requirements of the Contract Documents except as noted on the attached Deficiency form.

General Contractor:	Print Name:	
	Signature:	

	Title:	
	Date:	
Electrical Subcontractor:	Print Name:	
	Signature:	
	Title:	
	Date:	

END OF SECTION 26 08 02

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.02 SUMMARY

- A. Extent of panelboard and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules, and as specified herein.
- B. Types of panelboards and enclosures required for the project include the following:
 - 1. Power-distribution panelboards.
 - 2. Lighting panelboards.
- C. Refer to other Division-26 sections for wires/cables, electrical boxes and fittings, and raceway work required in conjunction with installation of panelboards and enclosures.
- D. Wires/Cables, electrical boxes and fittings, and raceways required in conjunction with the installation of panelboards and enclosures are specified in other Division-26 sections.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's data on panelboards and enclosures.
- B. Wiring Diagrams: Submit wiring diagrams for panelboards showing connections to electrical power feeders and distribution branches.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to those required for this project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with the latest adopted edition of applicable local code requirements and NEC Article 384 as applicable to installation, and construction of electrical panelboards and enclosures.
2. UL Compliance: Comply with applicable requirements of UL 67, "Electric Panelboards", and UL's 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide panelboard units which are UL-listed and labeled.

1.05 SEQUENCING AND SCHEDULING

- A. Coordinate installation of panelboards and enclosures with installation of wires/cables, electrical boxes and fittings, and raceway work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):

1. Siemens
2. Square D
3. Cutler Hammer
4. GE.

Note: Basis of design is Siemens. All physical, electrical and operational characteristics must be matched and equaled if another manufacturer is used.

2.02 PANELBOARDS

- A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with the design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.
- B. Power Distribution Panelboards: Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug copper connectors. Select unit with feeders connecting at top of panel. Equip with copper bus bars with not less than 98-percent conductivity, and with

full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide molded-case main and branch circuit-breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

- C. Lighting Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types and arrangements shown; with anti-burn solderless pressure type lug connectors approved for use with copper conductors; construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, single-pole circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; and provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.
- D. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for recessed mounting. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.
- E. Molded-Case Circuit Breakers: Provide factory-assembled, electrically operated, molded-case circuit breakers of frame sizes, characteristics, and ratings including RMS symmetrical interrupting ratings indicated. Select breakers with permanent thermal and instantaneous magnetic trip, and ampere ratings as indicated. Construct with over-center, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position, and operating in an ambient temperature of 40 deg C. Provide breakers with mechanical screw type removable connector lugs, CU rated.
- F. Accessories: Provide panelboard accessories and devices including, but not necessarily limited to power link module, cartridge and plug time-delay type fuses, ground-fault protection units, etc., as recommended by panelboard manufacturer for ratings and applications indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which panelboards and enclosures are to be installed and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF PANELBOARDS

- A. Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B.
- C. Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.
- D. Provide properly wired electrical connections for panelboards within enclosures.
- E. Provide typewritten circuit directory card upon completion of installation work.

3.03 GROUNDING

- A. Provide equipment grounding connections for panelboard enclosures as indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

3.04 FIELD QUALITY CONTROL

- A. Prior to energization of electrical circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- C. Prior to energization, check panelboards for electrical continuity of circuits, and for short-circuits.

3.05 ADJUSTING AND CLEANING

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finishes.

3.06 DEMONSTRATION

- A. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles.
 - 2. Wall Plates.
 - 3. Snap Switches.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 26 Section "Circuit and Motor Disconnects" for devices other than snap switches and plug/receptacle sets used as disconnects for motors.
 - 2. Division 26 Section "Electrical Identification" for requirements for legends to be engraved on wall plates.

1.03 SUBMITTALS

- A. Product data for each type of product specified.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with provisions of the following codes.
 - 1. NFPA 70 "National Electrical Code", latest adopted edition.
 - 2. UL and NEMA Compliance: Provide wiring devices which are listed and labeled by UL and comply with applicable UL and NEMA standards.

1.05 SEQUENCE AND SCHEDULING

- A. Schedule installation of finish plates after the surface upon which they are installed

has received final finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Leviton.
 - 2. Hubbell Inc.
 - 3. Pass and Seymour Inc.

2.02 WIRING DEVICES

- A. General: Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Provide ivory color devices and wall plates except as otherwise indicated. Verify color selections with Architect/Engineer.
- B. Receptacles: Specification grade, back & side wired, as scheduled in Table 1 in Part 3 below. Comply with UL 498 and NEMA WD 1.
- C. Ground-Fault Interrupter (GFI) Receptacles: as indicated in Table 1 below; provide with integral ground-fault circuit interrupter, with integral heavy-duty NEMA 5-20R duplex receptacles. Provide unit designed for installation in a 2-3/4 inch deep outlet box without adapter, grounding type, Class A, Group 1, per UL Standard 94.3.
- D. Snap Switches: Specification grade rated 120/277V, 20 amp, quiet type AC switches as indicated in Table 2 below. Comply with UL 20 and NEMA WD1.
- E. Floor Service Outlets: modular, flush-floor service outlets and fittings of types and ratings indicated. Construct of stamped steel with a galvanized finish. Use design compatible with floor outlet wiring methods indicated. Provide 20-amperes, 125-volts, duplex receptacles. NEMA configuration 5-20R where indicated. Provide with 3/4 inch NPT, 1 inch long, locking nipple for installation where compatible with wiring method. Provide with flush mounted brass cover.

2.03 WIRING DEVICE ACCESSORIES

- A. Wall plates: single and combination, of types, sizes, and with ganging and cutouts as indicated. Provide plates which mate and match with wiring devices to which attached. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates. Provide wall plate color to match wiring devices except as

otherwise indicated. Provide plates possessing the following additional construction features:

1. Material and Finish: 0.04 inch thick, Type 302/304 satin finished stainless steel, in finished areas accessible to the public.
2. Material and Finish: stamped galvanized steel, with rounded corners in unfinished and service areas.
3. Material and Finish: plastic, smooth, with two (2) way reinforcing ribs in office type areas.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRING DEVICES AND ACCESSORIES

- A. Install wiring devices and accessories as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.
- C. Install wiring devices only in electrical boxes which are clean; free from building materials, dirt, and debris.
- D. Install galvanized steel wall plates in unfinished spaces.
- E. Install wiring devices after wiring work is completed.
- F. Install wall plates after painting work is completed.
- G. Install individual GFI devices in all locations less than 6'-0" away from water sources (i.e. sinks, hose bibbs, water fountains, etc.).
- H. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A. Use properly scaled torque indicating hand tool.

3.02 PROTECTION

- A. Protect installed components from damage. Replace damaged items prior to final acceptance.

3.03 FIELD QUALITY CONTROL

- A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.

TABLE 1
SPECIFICATION GRADE RECEPTACLES

DESIG- (1)	CURRENT AMPS	VOLTAGE	SINGLE/ DUPLICATE	NEMA RATING	UL	NOTES
-	20	125	DUPLEX	5-20R	HEAVY DUTY	
C	20	125	SINGLE	5-20R	HEAVY DUTY	(2)
WP	20	125	DUPLEX	5-20R	HEAVY DUTY	WEATHER- PROOF
GFI	20	125	DUPLEX	5-20R	HEAVY DUTY	INTEGRAL GFI

NOTES

- (1) Letter designations are used where symbols alone do not clearly designate on plans locations where specific receptacle types are used.
- (2) Item is a clock type outlet with device recessed below face of cover plate and with hook to hang clock.

TABLE 2
SPECIFICATION GRADE SNAP SWITCHES

DESIG- (1)	TYPICAL	LOAD	VOLTAGE (AC)	POLES	UL	NOTES
S	CONTROL LIGHTS	20A	120/277	1	HEAVY DUTY	
(1) S3	CONTROL LIGHTS	20A	120/277	3-way	HEAVY DUTY - SM	
	DISCONN. MOTOR	1HP	120/277	1	HEAVY DUTY	
(2) SD	DIMMER SWITCH	2000W	120	1	HEAVY DUTY	

NOTES

- (1) For snap switches, designation is the same as the symbol used on plans for the device. Type of switch as determined from plan context including type of device or circuit being controlled.
- (2) No overload element in switch.
- (3) Derate dimmer switch per manufacturer's recommendations where dimmers are ganged together.

General: Switches indicated at a common location shall be ganged together within one backbox under one continuous faceplate. Provide box barriers as required to separate different voltages.

END OF SECTION

SECTION 26 28 00

CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements

1.02 SUMMARY

- A. This Section includes circuit and motor disconnects.

1.03 SUBMITTALS

- A. Product data for each type of product specified.

1.04 QUALITY ASSURANCE

- A. Electrical Component Standards: Provide components complying with latest adopted edition of NFPA 70 "National Electrical Code" and which are listed and labeled by UL.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Siemens.

2.02 CIRCUIT AND MOTOR DISCONNECT SWITCHES

- A. General: Provide circuit and motor disconnect switches in types, sizes, duties, features, ratings, and enclosures as indicated. Provide NEMA 1 enclosure except for outdoor switches, and other indicated locations provide NEMA 3R enclosures with rain-tight hubs. For motor and motor starter disconnects, provide units with horsepower ratings suitable to the loads.
- B. All circuit and motor disconnects (fusible and non-fusible) shall be heavy duty, rated for 600V A.C.

- C. Fusible Switches: Heavy duty switches, with fuses of classes and current ratings indicated. Where current limiting fuses are indicated, provide switches with non-interchangeable feature suitable only for current limiting type fuses.
- D. Non-fusible Disconnects: Heavy duty switches of classes and current ratings as indicated.

2.03 ACCESSORIES

- A. Electrical Interlocks: Provide number and arrangement of interlock contacts in switches as required by specific equipment served.

PART 3 - EXECUTION

3.01 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT

- A. General: Provide circuit and motor disconnect switches as indicated and where required by the above Code. Comply with switch manufacturers' printed installation instructions.
- B. Disconnect switches shall be installed vertically with top not more than 6 feet above the floor, and shall be rigidly and securely attached to building and shall not depend upon conduit for support.
- C. Unitstrut: Mount disconnects on Unitstrut P-3000 mounting channels at top and bottom, secured similarly to wall.

3.02 FIELD QUALITY CONTROL

- A. Testing: Subsequent to completion of installation of electrical disconnect switches, energize circuits and demonstrate capability and compliance with requirements. Except as otherwise indicated, do not test switches by operating them under load. However, demonstrate switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure for inspection of interior, mechanical and electrical connections, fuse installation, and for verification of type and rating of fuses installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to the work of this section.
- B. Division-26 Basic Electrical Materials and Methods sections apply to work of this section.

1.02 SUMMARY

- A. Extent of fuse work required by this section is indicated by drawings, and by requirements of this section.

1.03 SYSTEM DESCRIPTION

- A. Types of fuses specified in this section include the following:
 - 1. Class RK1 time-delay.
 - 2. Class RK 5 time-delay.
 - 3. Class L time-delay.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data on fuses, including specifications, electrical characteristics, installation instructions, furnished specialties and accessories. In addition, include voltages and current ratings, interrupting ratings, current limitation ratings, time-current trip characteristic curves, and mounting requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fuses of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. UL Compliance and Labeling: Comply with applicable provisions of UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide overcurrent protective devices which are UL-listed and labeled.
 - 2. NEC Compliance: Comply with NEC as applicable to construction and installation of fuseable devices.

1.06 MAINTENANCE

A. Extra Materials:

1. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one set of 3 of each kind.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide fuses of one of the following:

1. Littlefuse.
2. Bussmann Div; Cooper Industries.

2.02 FUSES

- A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time-current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and constructed in accordance with published product information, and with industry standards and configurations.
- B. All power fuses shall be of the indicator type which incorporate integral window openings to immediately determine the fuse status.
- C. Class RK1 Time-Delay Fuses: Provide UL Class RK1 time- delay fuses rated 600-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting motors and circuit-breakers.
- D. Class RK5 Time-Delay Fuses: Provide UL Class RK5 time- delay fuses rated 600-volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting motors.
- E. Class L Time-Delay Fuses: Provide UL Class L time-delay fuses rated 600 volts, 60 Hz, with 200,000 RMS symmetrical interrupting current rating for protecting main feeders.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which fuses are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed

with the work until satisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF FUSES

- A. Install fuses as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC, and NEMA standards for installation of fuses.
- B. Coordinate with other work, including electrical wiring, as necessary, to interface installation of fuses with other work.
- C. Install fuses in fused switches, if any.

3.03 FIELD QUALITY CONTROL

- A. Prior to energization of fuseable devices, test devices for continuity of circuitry and for short-circuits. Replace malfunctioning units with new units, and then demonstrate compliance with requirements.

END OF SECTION

SECTION 26 29 13

MOTOR STARTERS/CONTROLLERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.02 SUMMARY

- A. Extent of motor starter/controller work is indicated by drawings and schedules.
- B. Types of motor starters/controllers specified in this section include the following:
 - 1. Combination.
 - 2. Fractional HP manual.
 - 3. Solid-state reduced voltage.
- C. Work of this section includes wires/cables, raceways, electrical boxes and fittings, as specified in Division-26 Basic Electrical Materials and Methods sections, and used in conjunction with motor controllers.
- D. Refer to applicable Division-26 Basic Electrical Materials and Methods sections for wires/cables, electrical raceways, and boxes and fittings required in connection with motor controllers.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's data and installation instructions on motor starters/controllers.
- B. Shop Drawings: Submit shop drawings of motor starters/controllers showing accurately scaled equipment locations and spatial relationships to associated motors and equipment.
- C. Wiring Diagrams: Submit power and control wiring diagrams for motor starters/controllers showing connections to electrical power panels, feeders, and equipment. Differentiate between portions of wiring which are manufacturer-installed and portions which are field- installed.

1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of motor controllers of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 5 years of successful installation experience with projects utilizing motor controller work similar to that required for this project.
- C. Codes and Standards:
 - 1. Electrical Code Compliance: Comply with latest adopted editions of applicable local electrical code requirements of the authority having jurisdiction and NEC Articles 220, 250, and 430, as applicable to installation, and construction of motor controllers.
 - 2. NFPA Compliance: Comply with applicable requirements of NFPA 70E, "Standard for Electrical Safety Requirements for Employee Workplaces."
 - 3. UL Compliance: Comply with applicable requirements of UL 486A and B, and UL 508, pertaining to installation of motor controllers. Provide controllers and components which are UL-listed and labeled.
 - 4. IEEE Compliance: Comply with recommended practices contained in IEEE Standard 241, "Recommended Practice for Electric Power Systems in Commercial Buildings," pertaining to motor controllers.
 - 5. NEMA Compliance: Comply with applicable requirements of NEMA Standard ICS 2, "Industrial Control Devices, Controllers and Assemblies", and Pub No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)", pertaining to motor controllers and enclosures.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver motor starters/controllers and components properly packaged in factory-fabricated type containers.
- B. Store motor starters/controllers and components in original packaging and in a clean dry space; protect from weather and construction traffic.
- C. Handle motor starters/controllers and components carefully to avoid breakages, impacts, denting and scoring finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.

1.06 SEQUENCING AND SCHEDULING

- A. Coordinate with other electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of motor starters/controllers with other work.
- B. Sequence motor starter/controller installation work with other work to minimize possibility

of damage and soiling during remainder of construction period.

1.07 MAINTENANCE

- A. Maintenance Data: Submit maintenance data and parts list for each motor starter/controller and component; including "trouble shooting" maintenance guide.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide motor controllers of one of the following (for each type and rating of motor starter/controller):

1. Siemens.

2.02 MOTOR STARTERS/CONTROLLERS

- A. Provide motor starters/controllers and ancillary components which comply with manufacturer's standard materials, design and construction in accordance with published product information, for all required equipment to provide a complete working installation.
- B. Reversing Drum Switches: Provide reversing-drum switches capable of starting and reversing squirrel cage, and single-phase motors which are designed for reversing service, and direct-current shunt and compound wound motors, of types, sizes, ratings, and NEMA size drums indicated. Equip with non-spring return (non-self centering) construction, and with type interlock which provides low-voltage protection, and requires that drum return to OFF position after voltage failures. Equip switches with ball lever operating handles, and with NEMA Type 1 enclosure; coat with manufacturer's standard color finish.
- C. Fractional HP Manual Starters/Controllers: Provide sing-phase fractional HP manual motor controllers, of sizes and ratings indicated. Equip with manually operated quick-make, quick-break toggle mechanisms; and with one-piece melting alloy type thermal units. Controller to become inoperative when thermal unit is removed. Provide controllers with double break silver alloy contacts, visible from both sides of controller; green pilot lights, and switch capable of being padlocked-OFF. Enclose controller unit in NEMA Type 1 general purpose enclosure suitable for flush mounting; coat with manufacturer's standard color finish.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which motor starters/ controllers are to be installed,

and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF MOTOR STARTERS/CONTROLLERS

- A. Install motor starters/controllers required, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, UL and NEMA standards, to insure that products fulfill requirements.
- B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

3.03 FIELD QUALITY CONTROL

- A. Prior to energization of motor controller equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- B. Prior to energization, check circuitry for electrical continuity, and for short-circuits.
- C. Ensure that direction of rotation of each motor fulfills requirements.

3.04 GROUNDING

- A. Provide equipment grounding connections for motor controller equipment as indicated.
Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

3.05 ADJUSTING AND CLEANING

- A. Adjust operating mechanisms, where necessary, for free mechanical movement.
- B. Touch-up scratched or marred enclosure surfaces to match original finishes.

3.06 DEMONSTRATION

- A. Upon completion of installation of motor controller equipment and electrical

circuitry, energize controller circuitry and demonstrate functioning of equipment in accordance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

END OF SECTION

SECTION 26 41 00

LIGHTNING PROTECTION SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements.
 - 2. Basic Electrical Materials and Methods.

1.02 SUMMARY

- A. This Section includes lightning protection systems for buildings and associated structures and includes requirements for lightning protection systems components including, but not limited to, the following:
 - 1. Air terminals.
 - 2. Bonding plates.
 - 3. Conductors.
 - 4. Connectors.
 - 5. Fasteners
 - 6. Grounding plates.
 - 7. Grounding rods.
 - 8. Rod clamps.
 - 9. Splicers.
- B. Raceways used for lightning protection system conductors are specified in Division 26 Section "Raceways".

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Specification Sections.
- B. Product data for each type of product specified, including roof adhesive where used.
- C. Shop drawings detailing lightning protection system including, but not limited to, air terminal locations, conductor routing, connections and grounding.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer to install lightning protection system. Refer to section "Definitions and Standards" for definition of experienced Installer. Upon request, submit evidence of such qualifications to the Architect.
- B. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code", 2014 Edition.
- C. LPI Compliance: Comply with requirements of Lightning Protection Institute (LPI) Standards 175, 176, and 177, pertaining to lightning protection system material, components, installation and quality assurance procedures.
- D. ANSI Compliance: Comply with applicable requirements of ANSI Standard C2.
- E. Comply with the requirements of NFPA 780, "Lightning Protection Code, 2014 Edition.
- F. UL 96A Compliance: Comply with applicable requirements of UL 96A.

1.05 SEQUENCING AND SCHEDULING

- A. Coordinate installation of lightning protect system with the installation of other building systems and components, including electrical wiring, supporting structures and building materials, and metal components requiring interface with lightning protection systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A-C Lightning Security Inc.
 - 2. Approved Lightning Protection Co., Inc.
 - 3. Thompson Lightning Protection, Inc.

2.02 LIGHTNING PROTECTION SYSTEM COMPONENTS

- A. Provide lightning protection system materials and components that comply with NFPA 780 – Latest Adopted Edition and manufacturer's standard design, in accordance with published product information. Provide air terminals, bonding plates, conductors, connectors, conductor straps, fasteners, grounding plates, grounding rods, rod clamps, splicers and other components required for a complete system that meets LPI-175.

- B. Provide lightning protection system and components required to obtain a UL Master Label Certificate at conclusion of installation. All costs for said certification and corresponding process to obtain said master label shall be included.
- C. Type of Metal for air terminals and cables: copper with solid copper 1/2" diameter air terminals.
- D. Ground rods: 3/4-inch minimum diameter by 20-feet long, copper clad steel with minimum 27 percent of the rod weight in the copper cladding.

PART 3 - EXECUTION

3.01 INSTALLATION OF LIGHTNING PROTECTION SYSTEMS

- A. Install lightning protection systems as indicated, in accordance with equipment manufacturer's written instructions, and in compliance with applicable installation standards specified above.
- B. Install conductors with direct paths from air terminals to ground connections avoiding sharp bends and narrow loops. Where indicated, run conductors in non-metallic raceway, Schedule 20 minimum, and in PVC U-guards surface mounted on structure.
- C. Conceal wiring from normal view from all exterior locations at grade within 200-feet of building.
- D. Splices and Clamps: Use approved accessible clamped connections for all conductor splices and all connections between conductors and other components.

3.02 CORROSION PROTECTION

- A. Use no combination of materials that may form an electrolytic couple of such nature that corrosion is accelerated in the presence of moisture, unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist that would cause deterioration or corrosion of conductors, use conductors with suitable protective coatings.

3.03 GROUNDING AND BONDING

- A. Provide equipment grounding and bonding connections sufficiently tight to assure permanent and effective grounds and bonds.
- B. Lightning protection system shall be bonded to the main electrical service entrance

ground.

- C. Augment grounding as required to achieve 5 ohms or less of resistance to ground at all earthing points.

3.04 FIELD QUALITY CONTROL

- A. Perform inspections of the lightning protection system installation in accordance with LPI-177, "Inspection Guide for LPI Certified Systems." Provide Architect/ Engineer with one copy of LPI-177 and retain one copy at the project site throughout construction for reference.
- B. Document the inspections on LPI forms LPI-C1-02 and LPI Form 1-R88. Provide one copy of each completed form to the Architect/Engineer.
- C. Provide advance notice of at least 24 hours to the Architect/Engineer before concealing lightning protection system work.

END OF SECTION

SECTION 26 43 00

SURGE SUPPRESSION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this section:
 - 1. Basic Electrical Requirements.

1.02 SUMMARY

- A. These specifications describe the electrical and mechanical requirements for a high energy transient voltage surge suppression system (TVSS). The specified system shall provide effective high energy surge current diversion and be suitable for application in ANSI/IEEE C62.41 Category A, B, and C environments. The system shall be connected in parallel with the protected system; no series-connected elements shall be used.

1.03 STANDARDS

- A. The specified system shall be designed, manufactured, tested and installed in compliance with:
 - 1. American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.1, C62.41 and C62.45).
 - 2. Canadian Standards Association (CSA).
 - 2. Federal Information Processing Standards Publication 94 (FIPS PUB94).
 - 3. National Electrical Manufacturer Association (NEMA).
 - 4. National Fire Protection Association (NFPA 70, 75 and 780).
 - 5. Underwriters Laboratories (UL 1449).
- B. The system shall be UL listed as a complete system under UL 1449 Standard for Transient Voltage Surge Suppressors.

1.04 SYSTEM DESCRIPTION

- A. Environmental Requirements:
 - 1. Storage Temperature: Range shall be -55 to +85 C (-67 to +185 F).
 - 2. Operating Temperature: Range shall be -40 to +50 C (-40 to 122 F).

3. Relative Humidity: Operation shall be reliable in an environment with 0% to 95% non-condensing relative humidity.
4. Audible Noise: The audible noise level of the specified system shall be less than 40 dBA at 5 feet (1.5m).

B. Electrical Requirements:

1. System Operation Voltage: The nominal system operating voltages shall be:
 - a. 120/208 volt, three phase wye, 4 wire plus ground.
 - b. 277/480 volt, three phase wye, 4 wire plus ground.
2. Maximum Continuous Operating Voltage: The transient voltage suppressor's maximum continuous operating voltage shall be greater than 115% of the nominal system operating voltage to ensure the ability of the system to withstand temporary overvoltage conditions.
3. Operating Frequency: The operating frequency range of the system shall be at least 47 to 63 Hertz.
4. Protection Modes: Transient voltage suppression shall be provided for protection against line-to-neutral, line-to-ground, and neutral-to-ground disturbances.

The maximum surge current capacity of the specified system shall be at least 240 kAmps per phase based on the standard 8 x 20 microsecond current waveform.

5. Performance Ratings: The system performance ratings shall be based on the UL 1449 listing ratings for IEEE C62.41 Category B equipment. The maximum UL 1449 voltage clamping ratings for each of the specified protection modes shall be:
 - a. 400 volts for 120/208 volt systems.
 - b. 800 volts for 277/480 volt systems.

1.05 DOCUMENTATION

- A. Equipment Manual: The manufacturer shall furnish an installation manual with installation, start-up, and operating instructions for the specified system.
- B. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, component and connection locations, mounting provisions, connection details, and wiring diagram.
- C. UL 1449 Ratings: Documentation of specified system's UL 1449 listing and clamping voltage ratings shall be included as required product data submittal information.
- D. Spare Parts: A list of recommended spare parts shall be supplied at the customer's request.

1.06 WARRANTY

- A. The manufacturer shall provide a full five-year warranty from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL listing requirements, and any applicable national or local electrical codes.

1.07 QUALITY ASSURANCE

- A. The specified system shall be thoroughly factory-tested before shipment. Testing of each system shall include but shall not be limited to quality control checks, "Hi-Pot" tests at two times rated voltage plus 1000 volts per UL requirements, IEEE C62.41 Category B surge tests, UL ground leakage tests, and operational and calibration tests.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Current Technology.
 - 2. Advanced Protection Technologies, "Transient Eliminator" XLHP Series.
 - 3. Transtector

2.02 COMPONENTS

- A. The system shall be constructed using surge current diversion modules, each rated for at least 80 kAmps of surge current capacity based on the standard 8 x 20 microsecond waveform. Further, each module shall be capable of withstanding over 1000 pulses of the IEEE C62.41 Category C3 surge current without waveform degradation of clamping voltage. The module shall consist of multiple gap-less metal oxide varistors, with each MOV individually fused. The modules shall be designed and constructed in a manner which ensures reasonable MOV surge current sharing. No gas tubes or silicon avalanche diodes shall be used. The status of each varistor shall be monitored and a green LED shall be illuminated if the module is in full working order. When module performance is degraded, such as if one or more fuses or varistors have failed, the LED shall indicate a failed module.

2.03 CONNECTIONS

- A. Terminal shall be provided for all of the necessary power and ground connections. The terminals shall accommodate wire sizes of #14 to #2/0 AWG for two conductors per required connection, thereby allowing a Kelvin connection of the TVSS which minimizes the actual

clamped voltage at the protected circuit.

2.04 INTERNAL CONNECTIONS

- A. All surge current diversion module intra-unit connections shall be by way of low impedance plated bus bars. No small gauge round wire or plug-in connections shall be used as the surge current carrying conductor. Surge current diversion modules shall use bolted connections to the plated bus bars for reliable low impedance connections. All module mounting hardware and power wiring shall be captive or remain in place when a module is removed or replaced.

2.05 ENCLOSURE

- A. The specified system shall be provided in a heavy duty NEMA 12 dusttight, driptight enclosure with no ventilation openings. The cover of the enclosure shall be hinged on the left side and require a tool for access to internal components. A drawing pocket shall be provided inside the door for storage of unit drawings and installation/ operation manual. Indication of surge current module status shall be visible without opening the door. Enclosure maximum dimensions shall be 24 inches wide, 30 inches high, and 7 inches deep.

2.06 ACCESSORIES

- A. Unit Status Indicators. Red and green solid state indicators shall be provided on the hinged front cover to redundantly indicate unit module status. The absence of the green light and the presence of the red light shall reliably indicate that one or more surge current diversion modules has failed and that service is needed to restore full operation. Additionally, a Form C (one N.O. and one N.C.) summary alarm contact rated for at least 120 VAC and 1 Ampere shall be provided for remote annunciation of unit status. The summary alarm contact shall change state if any one or more of the surge current diversion modules has failed.
- B. Audible Alarm. The specified system shall be equipped with an audible alarm which shall be activated when any one or more of the surge current diversion modules has failed. In conjunction with the audible alarm, an alarm on/off switch shall be provided to silence the alarm and an alarm push-to-test switch shall be provided to test the alarm function. Both switches and the audible alarm shall be located on the unit's hinged front cover.
- C. Service Disconnect Switch. Each "TVSS" unit shall be provided with an integral disconnect switch. The switch shall disconnect all ungrounded circuit conductors from the high energy surge current diversion modules. The switch shall be rated for 600 VAC and 100 Amps continuous. Wiring terminations shall be provided for at least #2/OAWG.
- D. Provide at each panelboard where TVSS units are required, a dedicated 3 pole, 50 amp, circuit breaker to service the TVSS unit. Circuit breaker shall be located in available space on

the panelboard shall be of same manufacturer and AIC rating of the panel.

- E. Surge Counter: Each "TVSS" unit shall be provided with a surge counter to monitor the occurrence of transients entering the facility.
- F. Filter capacitors for EMI/RFI noise reduction.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

3.02 INSTALLATION OF ELECTRICAL COMPONENTS

- A. Install electrical connections as indicated and required; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
- D. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.
- E. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- G. Tighten connectors and terminals, including screws and bolts, in accordance with

equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.

3.03 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION

SECTION 27 01 00

GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Specification 27 01 00 contains the General Requirements for Communications Systems applicable to all technical systems specifications listed in Paragraph 1. 3 of this specification section shall apply to all referenced documents.
- B. Drawings and general provisions of the Contract, including Contractual Conditions and Division 00 and Division 01 specifications sections apply to this section.
- C. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- D. Contractor shall provide all labor, materials, tools, plant, transportation, storage costs, training, equipment, insurance, temporary protection, permits, inspections, taxes and all necessary and related items required to provide complete and operational systems shown and described in the Specifications.
- E. The Contractor is responsible for providing and coordinating final equipment arrangements, locations, phased activities and construction methods that minimize disruption to operations and provide complete and operational systems.
- F. The Contractor shall coordinate interfaces to existing systems that are being extended in the Project in order to minimize disruption to the existing systems operations. Any systems outages shall be approved in advance and scheduled with MIA (refer to Section 27 05 05 – Selective Demolition Telecommunication Systems).
- G. The Contractor shall coordinate specialty electronic, ACAMS, Information Technology (IT) data networks, common use and flight information systems and displays, CCTV, public address and any other IT infrastructure systems.
- H. All Specifications listed in Paragraph 1.3 of this specification shall be used as functional performance-based specifications. The Contractor shall be responsible for completing and coordinating requirements necessary to design, furnish and install fully engineered and functional systems. These requirements include any site analysis, furthering of design documents, determination of quantities of equipment, verification of existing conditions and external service providers, and the like. It shall be the responsibility of the Contractor to provide any additional equipment, software, arrangements or infrastructure necessary to complete the system commissioning.

1.02 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. Specific reference in Specifications to codes, rules regulations, standards, manufacturer's instructions or requirements of regulatory agencies shall mean the latest printed edition of each in effect at date of Contract unless the Document is shown dated.
- C. Comply with all local codes and requirements of Authorities Having Jurisdiction (AHJ).
- D. Reference to General Conditions
 - 1. The Owner's General Conditions shall be considered as forming an integral part of the Specification and shall be carefully examined before proposals for any work are submitted. Unless this section contains statements which are more definitive or more restrictive than those contained in the Owner's General Conditions, this Specification shall not be interpreted as waiving or overruling any requirements expressed in the General Conditions.
- E. Publication References. Applicable portions of the following codes, standards, regulations and recommendations shall be observed in the design and implementation of the converged network system, equipment and associated technologies:
 - 1. ANSI: American National Standards Institute including:
 - a. ANSI-C2 (2007);
 - b. ANSI/TIA/EIA-526-7 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant (Method A)
 - c. ANSI/TIA/EIA-526-14A – Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
 - d. ANSI/TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises
 - e. ANSI/TIA-568-C.1 Commercial Building Telecommunications Cabling Standard
 - f. ANSI/TIA-568-C.2 Balanced Twisted-Pair Telecommunication Cabling and Components Standard
 - g. ANSI/TIA-568-C.3 Optical Fiber Cabling Components Standard
 - h. ANSI/TIA/EIA-569-A
 - i. ANSI/TIA/EIA-569-A-1 to A-7
 - j. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
 - k. ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - l. ANSI/TIA/EIA Joint Standard – 607-A Commercial Building Grounding and Bonding Requirements for Telecommunications
 - m. ANSI/TIA/EIA-758-A – Customer-Owned Outside Plant Telecommunications Cabling Standard

- n. ANSI/TIA-758-1 – Addendum No. 1 to Customer-Owned Outside Plant Telecommunications Cabling Standard
 - o. ANSI/TIA/EIA/IS-811 Telephone Terminal Equipment, Performance and Interoperability for VoIP Feature Telephones.
 - p. ANSI/TIA/EIA-854 Full Duplex Ethernet Specification for 1000Mbps Operating Over Category 6 Balanced Twisted Pair Cabling
 - q. ANSI/TIA/EIA-942 Data Center Standards
2. ASTM: American Society for Testing Materials
 3. Building Industry Consulting Service International (BICSI).
 4. CFR: Code of Federal Regulations; CFR 47 Part 15; Radio Frequency Devices
 5. Federal Aviation Administration (FAA)
 6. Federal Communications Commission (FCC) regulations and standards.
 7. ICEA: Insulated Cable Engineers Association S-84-608-1994 Telecommunications Cable, Filled, Polyolefin Insulated Copper Conductor
 8. IEC 603-7
 - a. NTPv2 (RFC 1119), NTPv3 (RFC 1305)
 - b. SNTP (RFC 1361), Time protocol (RFC 868)
 9. Institute of Electrical & Electronics Engineers (IEEE).
 - a. 142-1991 Recommended Practice for Grounding of Industrial and Commercial Power Systems
 - b. 1100-1999 Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems
 - c. C62.41 Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
 - d. 802.1 LAN/MAN Bridging and Management
 - e. 802.3 CSMA/CD Access Methods (Ethernet)
 - f. 802.3ae 10 Gigabit Specification
 - g. 802.3z 1000 Base-S specification
 - h. 802.3ab 1000 Base-T specification
 - i. 802.3af/at Power over Ethernet
 - j. 802.3u 100 Base-T specification
 - k. 802.1Q VLAN
 - l. 802.1P Prioritization
 - m. 802.11 a/b/g/n CSMA/CA Access Methods (Wireless LANs)
 10. International Air Transport Association (IATA)
 - a. IATA PDF417 2D Bar Code – Latest Standards
 - b. IATA RP 740, 740a; BTP related resolutions.
 - c. IATA CUSS Standard RP 1706c.
 - d. IATA CUPPS – RP 1797 latest version.

11. International Telecommunications Union–Telecommunications (ITU-T)
 - a. ITU-T FG IPTV.
12. IEC 603-7
13. IETF: Internet Engineering Task Force
 - a. NTPv2 (RFC 1119), NTPv3 (RFC 1305)
 - b. SNTP (RFC 1361), Time protocol (RFC 868)
14. IBC: International Building Code 2006
15. ISO: International Organization for Standardization including:
 - a. International Standards Organization/International Electromechanical Commission (ISO/IEC) DIS11801, January 6, 1994;
 - b. ISO 9001; Quality Assurance in Design/Development, Production, Installations and Servicing;
 - c. ISO 9003; Quality Assurance in Final Inspection and Test;
 - d. ISO 9004; Quality Management and Quality System Elements Guidelines;
 - e. ISO/IEC JTC 1/SC 25/WG 3 N655 (Nov. 2001)
 - f. Class D ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer;
 - g. Premises, 2002;
 - h. Class E ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer Premises;
 - i. Class EA Amendment 1 to ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer Premises, pending publication; Class F ISO/IEC 11801, 2nd Ed., Information Technology – Generic Cabling for Customer Premises, 2002;
 - j. Class FA Amendment 1 to ISO/IEC 11801, 2nd Ed.
 - k. ISO 9003 – Model for Quality Assurance in Final Inspection and Test
 - l. ISO 10012-1 – Quality Assurance Requirements for Measuring Equipment.
 - m. ISO 18000-6C EPC Gen2 UHF RFID Tags
16. Local/National Electrical codes.
17. Local/National Health & Safety codes.
18. Local/National radio frequency regulations.
19. Local and national regulations and codes in effect as of date of purchase.
20. Motorola R56, “Standards for Communications Sites”.
21. NEC: National Electrical Code – Articles 770 and 800
22. NEMA: National Electrical Manufacturers Association (NEMA)
23. NFPA: National Fire Protection Association
 - a. NFPA-70 (2008)
 - b. NFPA-72 (2010)
 - c. NFPA 101 (2009 ed.)

- d. NFPA 780 (2008)
 - e. NFPA 5000 (2006 ed.)
24. NESC: National Electrical Safety Code
 25. OSHA: Occupational Safety and Health Agency
 26. UL: Underwriters Laboratories;
 - a. UL 83 Thermoplastic Insulated Wire and Cables
 - b. UL 96 Lightning Protection Components
 - c. UL96A Installation Requirements for Lightning Protection Systems
 - d. UL 467 Grounding and Bonding Equipment
 - e. UL 497 Protectors for Paired-Conductor Communication Circuits
 27. Wireless Communications Principles and Practice second edition, Theodore S. Rappaport.
- F. Design and Install cabling in accordance with the most recent edition of Building Industry Consulting Services International (BICSI®) publications:
1. BICSI – Telecommunications Distribution Methods Manual (TDMM)
 2. BICSI – Information Technology Systems Installation Methods Manual (ITSIMM)
 3. BICSI – Network Design Reference Manual
 4. BICSI – Outside Plant Design reference Manual
 5. BICSI – Wireless Design Reference Manual
 6. BICSI – Electronic Safety and Security Design Reference Manual
- G. American Airlines Standards
1. MIA design guidelines if any recent revision at start of work.
- H. Conflicts: Where the requirements of the specifications conflict with other documents the following shall apply:
1. Between Plans and Specifications, between different specifications, or between different plans: Comply with the one establishing the more stringent requirement.
 2. Between referenced requirements or between industry standards: Comply with the one establishing the more stringent requirements.
 3. Between referenced requirements and Contract documents: Comply with the one establishing the more stringent requirements.

1.03 RELATED SECTIONS

- A. Specification 27 04 00 Common Work Results for Communications.
- B. Specification 27 05 00 Communication Pathways.
- C. Specification 27 05 05 Selective Demolition for Communications.

- D. Specification 27 05 26 Grounding and Bonding for Communications Systems.
- E. Specification 27 05 53 Identification for Communications Systems.
- F. Specification 27 11 00 Communications Equipment Room Fittings.
- G. Specification 27 13 00 Communications Backbone Cabling.
- H. Specification 27 15 00 Communications Horizontal Cabling.
- I. Specification 27 42 16 Electronic Visual Information Display System.
- J. Specification 27 42 20 Common Use System.
- K. Specification 27 51 16 Public Address System.
- L. Specification Section 28 05 00 "General Requirements for Security systems".
- M. Specification Section 28 13 00 "Access Control and Monitoring System".
- N. Specification Section 28 23 00 "Video Surveillance System".

1.04 SCOPE OF WORK

- A. General: See related section in each Specification listed under Paragraph 1.4.
- B. Systems Manager: This project requires the Contractor to provide a low voltage "Systems Manager" who will be the primary point of contact for coordination of passive and active communication functionality throughout the project phasing and commissioning. The Systems Manager shall be certified as and RCDD or similar with extensive experience in networking and communication systems. Systems Manager tasks shall include but not be limited to:
 1. Phasing documentation of existing Communication infrastructure
 2. Coordination with A/E & MIA for communication systems phasing and migration (existing, temporary and final) , including passive and active port assignments, workstation & VoIP phone outlets, service provider circuits, and documentation of all operational circuits throughout the project.
 3. Coordination with A/E & MIA for communication systems phasing and migration (existing, temporary and final) , including passive and active port assignments communication terminations, paging system, EVIDS system, BMS (BAS) systems & VoIP phone outlets, service provider circuits, and documentation of all operational circuits throughout the project. This task will include development and follow through with MDAD for to provide labeling, outlet and port ID's, IP addresses and activation of equipment planned to interface MDAD network.

4. MPOE cutover management: Provide cutover scheme for all active circuits and maintain documentation of all known circuits and provide complete physical and active circuit cutover management to provide no negative down time.
5. Develop and maintain Horizontal and Backbone cabling schedules bases upon project design schedules and updated to reflect final acceptance data. Submit to A/E and MDAD as part of closeout.

1.05 QUALIFICATIONS

A. Project Qualifications

1. The Contractor must currently be and have been in the business of selling, installing, and maintaining similar systems at airports for a minimum of five (5) years. The Contractor must have been actively engaged in designing, installing, maintaining and operating similar systems and services as outlined in this document.
2. The Contractor must have a minimum of three (3) customer sites that are actively using the same or similar solutions, and each of those solutions must be currently in operation, and have been in operation for at least the preceding twelve (12) months.
3. The Contractor is required to submit information regarding a minimum of three (3) reference sites that are actively using the same or similar systems. The sites should be similar in terms of number of equipment, devices throughput, and network operations. This reference information shall include the contact name, address, telephone number, and date of original installation for each reference site listed. Additionally, for each reference site detail the features that make it a qualified site (e.g., final system acceptance date, number of devices, etc.).
4. General Certification: The Contractor shall be capable of installing, maintaining, and troubleshooting audio systems. The minimum requirement is one (1) project dedicated staff holding a Certified Technology Specialist, Installation (CTS-I), or other equivalent ISO/IEC/ANSI certified audio credential.
5. Code Certification: The Contractor shall be certified to install and maintain voice evacuation systems that are NFPA 72 certified.
6. Code Certification: The Contractor shall have a working knowledge of the systems specified herein.
7. The Contractor shall have a fully staffed service department capable of responding to system needs as specified. The minimum requirement is a fully staffed service department within 60 miles of the project site.

B. Organization Qualifications

1. The Contractor shall provide a complete description of organizations and/or firms involved including:
 - a. Involvement of Sub-Contractors or product vendors
 - b. The name of the Team Leader responsible for the project coordination, development and ongoing Implementation

- c. Detailed description of the team and organization chart noting its structure
 - d. Résumés for key personnel.
 - e. Specific role definition including provision for leadership, technical control, teamwork, partnering, coordination and communication
 - f. Percentage of time committed for the project by each key personnel
 - g. Mobilization plans for the different phases of the project
 - h. Listing of all current projects where there is an overlap or potential for overlap of manpower resources. For these projects provide a detailed description of the role, committed level of effort, schedule and completion date for each key individual of the proposed team.
- C. Unless accepted otherwise by the Engineer, use manufacturers and installers that employ a Quality Management System complying with the program described in ISO 9001-2000, or similar system.

1.06 SUBMITTALS

A. Proposal Submittals:

1. In addition to all required proposal submittals listed in the appropriate Division, the Contractor shall provide the following submittals:
 - a. Design Approach: In designing the systems, it is desired to standardize hardware, operating systems, etc. in order to facilitate long-term maintenance of the systems. However, the Contractor may propose an alternative solution to any of the design requirements. These alternatives shall be clearly delineated and shall be bid as options, in addition to the base design. Preference shall be given to vendor solutions which best integrate into the overall system design.
 - b. References: The Contractor is required to submit data sheets for same or similar implementations as specified in the "Qualifications" article of this specification.
 - c. Qualifications: The Contractor shall supply qualification data sheets for firms and persons as specified in the "Qualifications" article of this specification to demonstrate their capabilities and experience.

B. Contract Submittals:

1. Work Plan and Schedule: The Contractor shall supply a schedule of proposed installation and implementation, including dates and milestones within 30 days of contract award. Updates shall be submitted monthly.
2. Proposed product data sheets: The Contractor shall submit catalogue cut-sheets that include manufacturer, trade name, listings, and complete model number for each product specified. Model number shall be handwritten and/or highlighted to indicate exact selection. Identify applicable specification section reference for each product. Product data sheets shall be bound in a three ring binder and shall include a product index listing the model number and description of product.

3. Shop Drawings: The Contractor shall submit floor plans scaled not smaller than 1/8"=1' and shall include a bar scale on the respective sheets. The shop drawing package shall include:
 - a. Floor plans to scale
 - b. Riser diagrams showing all panels, devices, interconnections with other systems, and interconnections between components.
 - c. Input/Output matrix showing sequence of operation between actions.
 - d. Battery calculations.
 - e. Voltage calculations for speakers.
 - f. Layouts for TR's /MPOE equipment and cabinet elevations with details
 - g. Coordination of Data Outlets within millwork typical for each type of EVIDS display, Ticket counters, Self Service kiosks, ATM's, Payphones, ephones, Gate podiums and holdroom service desks
4. Samples: Submit one sample of the product components and if required a complete assembly.
5. Other Drawings: The Contractor shall review other discipline drawings and confirm that all are acceptable. If unacceptable, it is the responsibility of the Contractor to submit written comments, including revised drawings markups (if required) to ensure the adequacy of all other work applicable to the Contractor's system.
6. System Block Diagram: The Contractor shall supply a block diagram that depicts the final system design, including riser diagrams, logical flow, and single line diagrams.
7. Configuration: Submit complete lists of all proposed configuration setups, business rules, process flows, and processes implemented in the system. Lists must be submitted weekly during the project and thirty (30) days prior to any formal testing.
8. Parts Lists: The Contractor shall supply complete Systems parts lists and breakdowns that identify each component (to the lowest repairable unit) as well as ordering information for these parts shall be provided. The characteristics of each component shall also be shown, where applicable, to aid in obtaining substitute parts. Schematics and parts layout drawings to the component level are to be provided when available. The Contractor shall supply a complete list and cross-reference of all supplied documents (i.e., name, brief description, and document number).
9. Test Plans, Test Procedures and Test Reports: Indicate testing methods, devices, and procedures. Progress payments shall depend on the successful completion of testing and documentation. Provide the test plan at least forty five (45) days prior to the scheduled start of the first test. The test plan shall detail the objectives of all tests and samples of all proposed test forms.
10. Test Results: The Contractor shall supply report of test results in accordance with test procedures specified herein.
11. Manufacturers' system manuals for each system/component provided under the referenced specification Section, including:
 - a. Design and Installation.
 - b. Operation/System Administration.
 - c. Maintenance and Service.

- d. End-user.
 - 12. Training Plan: Indicate proposed training methods as specified in the "Training" section of this specification.
 - 13. Progress Schedule – The Contractor shall submit to Owner estimated construction progress schedules for the Work.
 - 14. Compliance Matrix: The Contractor shall submit a compliance matrix that summarizes compliance or non-compliance with each specification component.
- C. Systems Manager Coordination Schedules and related documents for Passive and Active network and service circuits including;
- 1. Schedule for cutover and activation of cable plant throughout phasing
 - 2. Network switch port assignments
 - 3. Outlet & patch port ID's
 - 4. IP addresses assignments systems
 - 5. Patch panel and switch port ID's systems
 - 6. Service provider circuit punch down and port identities
 - 7. Updated outlets schedules and related documents.
 - 8. Fiber and copper cutover assignments
- D. Supply all documents necessary to enable users to operate all systems and to change feature assignments and software parameters without assistance from the Contractor. This includes a complete listing of all software parameters of the system.
- E. Record Drawings: Furnish hardcopy and electronic drawings, in AutoCAD latest format, of completed work including labeling, where applicable.

1.07 INTELLECTUAL PROPERTY

- A. Software: All furnished software shall be Common-off-the-shelf (COTS) and shall be delivered with standard documentation and shall be registered in the name of the Owner.
- 1. A backup copy of the configured system software shall be provided on DVD/CD-ROM media. All original distribution software shall be delivered with an installable backup.
 - 2. All required software licenses shall be identified and supplied by the Contractor with the exception of software licenses provided by the Owner. All software licenses shall be sized to accommodate the number of seats/users expected for use of the project systems.
 - 3. Commercial software packages shall have all registration and licensing documentation filed indicating the Owner as the owner of the software. The price of an ongoing service contract shall be separately identified, and shall include a per year price for continuing the contract.
- B. Patents: Should patented articles, methods, materials apparatus, etc., be used in this work, the Contractor shall acquire the right to use same. The Contractor shall hold the Owner harmless

for any delay, action, suit, or cost growing out of the patent rights for all devices or software used on this Project.

- C. Copyrights: Should copyrighted software be used in this work, the Contractor shall acquire the right to use same. The Contractor shall hold the Owner harmless for any delay, action, suit, or cost growing out of the copyrights for any software on this Project.

1.08 WARRANTY

A. General:

- 1. The Contractor shall warrant complete installation of the equipment, system, and software to be free from defects in materials and workmanship for a period of no less than twenty-four (24) months, starting with the date of Substantial Completion. As an option, the Contractor shall supply pricing for an extended Warranty of the system. This option shall be renewable on a yearly basis, and pricing shall be supplied for a minimum of five (5) years from the expiration of the initial Warranty.

B. Hardware Warranty:

- 1. The Contractor shall warrant that the proposed hardware equipment will conform to its description and any applicable specifications, and shall be of good quality for the known purpose for which it is intended. This Warranty shall be in addition to any standard Warranty or service guarantee given by the Contractor to the Owner.
- 2. The Warranty shall allow for replacement or repair of failed systems, equipment and components.
- 3. The hardware warranty can be supplied by a service contract. If a service contract is used to provide warranty, the price of the contract shall be separately identified, and shall include a per year price for continuing the contract.
- 4. All hardware installed without an on-site spare shall have a twenty-four (24) hour repair/replacement Warranty from the time the Contractor is notified of the hardware failure.

C. Software Warranty:

- 1. The warranty shall allow for replacement or repair of failed components. All software necessary to compile, modify, and maintain software supplied for this specification shall be included in this warranty.
- 2. The software warranty can be supplied by a service contract. If a service contract is used to provide warranty, the price of the contract shall be separately identified, and shall include a per year price for continuing the contract.
- 3. The warranties shall include the price of all software upgrades and computer operating system upgrades during the warranty period. If a new version of the system software becomes available during the warranty period, it shall be upgraded as part of the warranty.

1.09 QUALITY ASSURANCE

- A. General: In addition to the general requirements, the Contractor must have been in the business of selling and installing similar systems for a minimum of five (5) years. The Contractor shall have been actively engaged in installing, maintaining and operating similar systems and services as outlined in the Related Sections portion of this document. The Contractor shall include eighty (80) hours of on-site assistance (excluding travel time) to be used after the final acceptance of the system. This assistance time is in addition to Warranty services and shall be performed on an on-call basis at the Owner's request.
1. Unless accepted otherwise by the Engineer, use manufacturers and installers that employ a Quality Management System complying with the program described in ISO 9001-2000, or similar system.
 2. The Contractor shall upgrade each software package and firmware (where applicable) used in the system to the latest version by the end of the Warranty period.
 3. The Contractor shall offer an "Optional One (1) Year Extended Warranty" package renewable for up to five (5) years to the Owner. The Owner shall inform the Contractor of the acceptance or rejection of the first year of the package at the time of final acceptance.
 - a. Installation personnel shall meet manufacturer's training and education requirements for implementation of extended warranty program.
- B. NEC Compliance: Comply with NEC as applicable to construction and installation of all system components and accessories including fire rating to all cables and enclosures as applicable.
- C. UL Compliance and Labeling: Provide system components, which are UL-listed and labeled.
- D. Equipment and materials supplied shall be a standard product of manufacturers regularly engaged in the manufacture and installation of that type of equipment and shall be the manufacturer's latest standard design. Items of the same classification shall be by the same manufacturer and shall be the same series and model. This requirement includes equipment, modules, assemblies, parts, and components. Electrically powered equipment shall be UL approved. Electronic equipment shall meet the requirements of CFR 47 Part 15.
- E. All technicians providing final wire terminations, configurations, and programming on major components shall be manufacturer certified and trained on products being installed under this project.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver system components properly packaged in factory-fabricated containers. Enclose an operating impact sensor in each container that is holding sensitive electronic equipment. The impact sensor shall be capable of recording a 5G rating.

- B. Handling: Handle equipment and components carefully to avoid breakage, impact, denting and scoring finishes. Do not install damaged equipment. Replace and return damaged units to equipment manufacturer.
- C. Equipment delivered to the job site shall be opened and inspected immediately upon arriving and compared to the approved Shop Drawing submittal and checked for defects. If the equipment is not correct, the equipment shall be returned to the manufacturer immediately and a new order for the approved equipment shall be placed at no cost to the Owner.
- D. Equipment and components shall be protected from the prolonged exposure, weather, humidity, temperature variations, dirt, dust, or other contaminants. Equipment damaged prior to system acceptance shall be replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL:

SEE RELATED SECTION IN EACH SPECIFICATION LISTED UNDER SECTION 1.3 FOR PRODUCT REQUIREMENTS.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The Owner assumes no responsibility or liability for transportation from country of origin, storage fees, drayage, import taxes, duty taxes, or other costs associated with the delivery and storage of system components.
- B. The Contractor shall be responsible for any and all loss or damage in the shipment and delivery of all material until transfer of title to the Owner
- C. The Contractor shall store products in accordance with manufacturer's instructions, within Contractor's staging area and with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- D. The Contractor shall provide coverings to protect products from damage from traffic and construction operations, remove when no longer needed.
- E. The Contractor shall ensure that all work performed under these Specifications is in accordance with the requirements and standards defined and referenced in these Specifications. Any work performed in deviation of these Specifications, any of the referenced material, or any applicable

standards or requirements, shall immediately be corrected by the Contractor without additional charges, regardless of the stage of completion. The Contractor shall record all inspection observations. As a minimum, the record shall include the name(s) of personnel conducting the inspection, a brief description of the inspection and the observations. These records shall be available for the Owner to review at any time. Also, these records shall be delivered to the Owner before final acceptance.

- F. Installation Inspections: Installation inspections shall be undertaken through the performance of pre-installation, in-progress, and final inspections as follows:
1. Pre-Installation Inspection: The Contractor shall make an inspection of all equipment and material to be used prior to installation. All items shall be verified for compliance with the requirements of these Specifications and all other applicable standards. All equipment, cable, and associated hardware identified for installation shall be inspected for damage and completeness utilizing standard practices to determine integrity and acceptability.
 2. In-Progress Inspection: At the Owner's discretion, the Contractor shall perform in-progress inspections that shall include visual inspections of equipment, wiring practices, cabling, placement of equipment, marking of cables and adherence to safety procedures. In addition, the Owner, or his representative, may conduct additional inspections any time.
 3. Final Inspection: The Contractor shall conduct a final inspection that encompasses all portions of the installation. This inspection shall be performed to ensure that all aspects of the installation have been performed in accordance with these Specifications, standard industry practices and the publications referenced herein. All non-compliance items shall be noted by the Contractor during this inspection. The Owner shall witness this inspection.
 4. Corrective Action and Verification Inspection: The Contractor shall perform all corrective actions to ensure that all non-compliance items identified during the final inspection have been corrected.

3.02 INSTALLATION

- A. Standards: All installation activities shall be performed in a neat and professional manner in accordance with all applicable local and national codes. Additionally, the Contractor and all subsequent Sub-Contractors employed to satisfy the requirements of these specifications shall obtain, or satisfy, the following prior to installation:
1. All licenses and permits
 2. All insurance and bonding as required
 3. All other standards or requirements specified in this document
- B. The Contractor shall install and inspect all hardware required in this specification in accordance with the manufacturer's installation instructions.
- C. The Contractor shall adhere to the following during installation of the system:

1. Underwriter's Laboratories (UL) listing for restricted access installations in business and customer premises applications. This listing is required by the National Electric Code for customer premise installations.
 2. Fire resistance requirements specified by Underwriter's Laboratories in UL 1459, 2nd edition.
- D. Where undefined by codes and standards, the Contractor shall apply a safety factor of at least [two (2)] times the rated load to all fastenings and supports of system components.
- E. The Contractor shall install all system components including furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and shall furnish all cables, connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- F. Rack Mounted Equipment:
1. As a general practice, the Contractor shall run power cables, control cables, and high level cables on the left side of an equipment rack as viewed from the rear.
 2. The Contractor shall run other cables on the right side of an equipment rack, as viewed from the rear.
 3. For equipment mounted in drawers or on slides, provide the rack accessories as well as interconnecting cables with a service loop of not less than three feet and ensure that the cable is long enough to allow full extension of drawer or slide.
- G. Contractor shall install all custom and packaged software in the development and production environments'.
- H. Contractor shall provide a migration plan for all new and updated software to be migrated from within the development environment to the production environment.
- I. Final hardware selected and installation of hardware shall be submitted for review by the Engineer. Additionally, the Contractor shall review the cabinets and equipment room to ensure ventilation requirements are met or recommend modifications.
- J. Contractor shall install and configure all software required in this Specification in accordance with the software manufacturer's installation instructions. Apply the latest patches and security updates. Register the application with the manufacturer to the Owner.
- K. The contractor shall facilitate, configure, document and test all network connections required by other systems or other facilities not in contract that require access to the network specified herein.
- L. Contractor shall place materials only in those locations that have been previously authorized. Any other locations shall be authorized, in writing, by the Engineer.

- M. Contractor shall provide all tools, applications and test equipment required to install, verify, and test the installation and to determine that it meets the specifications. The Contractor shall furnish all necessary materials required to implement and to achieve the required work performance.

3.03 DOCUMENTATION

- A. This Section requires complete documentation of all systems for the purpose of system operation and maintenance during and after the Warranty period. It is intended that the operation and maintenance manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification, and repair of defective parts. All documentation, as described here-in shall comply with NFPA 72 and shall be submitted to the Owner for approval thirty (30) days prior to final submission.
- B. Provide documentation for all provided cables, equipment, telecom infrastructure and systems into the existing Airport Computerized Maintenance Management System (CMMS) database per Section 27 05 53
- C. Scope: The Contractor shall provide the Owner with Operation and Maintenance Manuals and other documentation on all installed systems. These manuals shall include basic wiring diagrams, schematics, and functional details such that any component, wire, or piece of equipment in the system may be easily identified by going to the actual equipment and making reference to this manual. It is required that everything in the system be neatly labeled and easily identifiable. Every terminal, wire, component, or piece of equipment, and other such items shall have a number or letter designation. All of these identification characteristics shall be included in the maintenance and operation manuals.
- D. The maintenance manual requirement of this Section is in addition to Shop Drawing requirements. Maintenance manuals and Drawing sets shall be compiled after system fabrication and testing, and shall incorporate any changes made after Shop Drawing submittal. The maintenance manuals and drawing books shall be permanently bound in hard plastic covers.
- E. Maintenance Manuals, Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. The maintenance manuals shall contain specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification. All references to equipment not supplied on this Project shall be crossed out.
- F. Drawing Books: All Drawings developed specifically for this Project shall be created at 30" x 42" and bound. The Drawings provided shall be easily readable after printing, even if this requires breaking large Drawings into several parts. Text shall be no smaller than 3/32". The drawing book documents shall be produced with current version of AutoCAD and the electronic files shall be provided to the Owner at the completion of the Project on DVD/CD-ROM. Provide component identification and cross reference on the Drawings to allow the maintenance

department to understand the function of each item (the block diagram), find the room where the device is mounted (Contract Document plans), find its location in a rack (Arrangement Drawings), find how it is wired (wiring diagrams), and its detailed Specifications (vendor data sheets), and how to repair it (spare part lists). Include the following drawings as a minimum:

1. System Block Diagram: Drawings shall depict the final System overview, including equipment types, location, and any special information.
2. System Riser Diagram(s): Drawings shall show all System components, wire numbers, color codes, pin numbers, component locations and connections, depicting the "as-built", final configuration.
3. Rack Elevation and Wiring Diagram(s): Elevation diagrams shall depict the front views of the equipment racks identifying all equipment installed within. Complete wiring diagrams of the racks shall also be included.
4. Floor plans of the communications rooms showing the location of all equipment affected as a part of this contract within the communications rooms.
5. Elevation drawings of all wall mounted equipment showing the location of each component on the wall. Components on the walls shall be identified as in the functional block diagrams.
6. Wiring Diagrams: Provide wiring diagrams showing all field installed interconnecting wiring. Wire identification on the diagrams shall agree with the wire markers installed on the equipment.
7. System Administrator Documentation: The Contractor shall supply three (3) hardcopies of administrator documentation and [three (3)] copies of the documentation in PDF format on CD-ROM that detail the operation of the system. This documentation shall provide complete information on the configuration, business rules, operation, maintenance, and trouble-shooting of the system.
8. Refer to Section 1.6. C of this specification for additional requirements for Systems Manager Documentation.

- G. Warranty: The Contractor shall supply all warranties as required in the "Warranty" article of this specification.

3.04 GENERAL TESTING REQUIREMENTS

- A. Phases of Testing:

1. On-site Testing
2. Integration Testing
3. Endurance Testing

- B. Project Testing: The system installation shall not be considered complete until On-Site Testing is completed. The purpose is to test the complete system and demonstrate that all specified features and performance criteria are met. All requirements of the specification shall be tested, including:

1. Functionality, including reporting and response
 2. System capacity
 3. Hardware and software interaction
 4. Failure Recovery
 5. Report generation
- C. Test Plan/Procedure: Contractor shall provide six (6) copies of the proposed test plan/procedures for each testing phase for the review of the Engineer. The test plan for each phase of testing shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. The submission of Test Plans shall adhere to the following:
1. A draft test plan shall be presented to the Engineer at least forty-five (45) days prior to the scheduled start of each test
 2. A workshop for reviewing comments shall be conducted with the Engineer at least thirty (30) days prior to the scheduled start of each test
 3. A final test plan shall be submitted to the Engineer at least fourteen (14) days prior to the scheduled start of each test
- D. Test plans shall contain at a minimum:
1. Functional procedures including use of any test or sample data
 2. Test equipment is to be identified by manufacturer and model including LAN analyzers and packet sniffers
 3. Interconnection of test equipment and steps of operation shall be defined
 4. Expected results required to comply with specifications
 5. Traceability matrix referencing Specification requirements with specific test procedures
 6. Record of test results with witness initials or signature and date performed
 7. Pass or fail evaluation with comments
- E. The test procedures shall provide conformity to all Specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.
- F. All Test plans must be reviewed by the Engineer. To successfully complete a test, the test document must be signed and dated by both the Contractor and the Engineer.
- G. The Engineer will review, witness and validate the execution of all formal test procedures prepared by the Contractor and deliverable under the contract to assure the tests cover all requirements and that there is a conformity between the conducted test, the test results and Specification requirements.
- H. Documentation verification both interconnects and operationally, shall be part of the test. Where documentation is not in accordance with the installed system interconnect and operating procedures, the system shall not be considered accepted until the system and documentation correlate.

- I. The Contractor shall provide the Owner or Owner representative the opportunity(s) to participate in any or all of tests.
- J. Test Reports: The Contractor shall prepare, for each test, a test report document that shall certify successful completion of that test. Six (6) copies of the test report shall be submitted to the Owner representative for review and acceptance within seven (7) days following each test. The test report shall contain, at a minimum:
 - 1. Commentary on test results
 - 2. A listing and discussion of all discrepancies between expected and actual results and of all failures encountered during the test and their resolution
 - 3. Complete copy of test procedures and test data sheets with annotations showing dates, times, initials, and any other annotations entered during execution of the test
 - 4. Signatures of persons who performed and witnessed the test
- K. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to Owner. The problems identified in each phase shall be corrected and the percentage of the entire system re-tested determined by the Engineer before any subsequent testing phase is performed.
- L. Adjustment, Correction, and Maintenance
 - 1. Adjustment and Correction: Make adjustments and corrections to system only after obtaining written approval of the Engineer
 - 2. Maintenance: Perform required maintenance on systems including provision of replacement parts
- M. Final Inspection and Acceptance
 - 1. After onsite Testing is complete, review tabulated records with the Engineer
 - 2. Contractor will not be responsible for failures caused by:
 - a. Outage of main power in excess of backup power capability provided that automatic initiation of all backup sources was accomplished and automatic shutdowns and restarts of systems performed as specified
 - b. Failure of any owner furnished power, communications, and control circuits provided failure not due to Contractor furnished equipment, installation, or software
 - c. Failure of existing Owner equipment provided failure not due to Contractor furnished equipment, installation, or software
 - 3. When performance of system does not fall within the above parameters, determine cause of deficiencies, correct, and retest
 - 4. When requested by the Engineer, extend monitoring period for a time as designated by the Engineer
 - 5. Period shall not exceed 60 days exclusive of retesting periods

6. Submit final report of onsite Testing containing all recorded data

3.05 MAINTENANCE AND SUPPORT

A. General

1. The Contractor shall provide maintenance and support of all components associated with this system at no additional charge during the warranty period. This extends to systems requiring vendor pre-purchased maintenance agreements.
2. The Contractor shall supply a list of special tools, test equipment, and outside inventory required for this Project. The Contractor may recommend specific items to facilitate long-term support of the system as an option
3. All lead technicians performing installation and maintenance shall have a minimum of two (2) years experience on the proposed system and be manufacturer certified on all hardware/software applications. All maintenance technicians shall be provisioned to attend a one (1) week manufacturer training class each year. Pre-assigned backup technicians shall be available to backfill for onsite technicians who are on vacation, in training or who are out sick
4. The Contractor shall provide twenty-four (24) hours/seven (7) days a week telephone support as a minimum maintenance and support agreement. Additionally, the Contractor shall specify a maximum amount of time to get the system up and operational in the event of a system failure. This time period shall be subject to Owner's approval

B. Hardware and Software Support

1. Hardware and Software support shall be supplied by the Contractor directly or by a Sub-Contractor reviewed by the Owner. Support shall cover all equipment and systems referenced in this Specification
2. The Contractor shall assume full responsibility for the performance of all equipment supplied by the Owner, provided that such equipment meets the specifications set forth by the Contractor
3. All software shall be delivered with an installable backup

- C. Pricing after Warranty Period: Cost of maintenance and support on a yearly basis after the Warranty period has expired, shall be included as an option to be exercised by the Owner or his designated representative. Contractor shall clearly state in the bid the annual cost and availability of the following services that the Owner may wish to use or to continue after the initial Warranty period has expired (Costs shall be given for a three (3) years with additional two (2) years to be renewed on an annual basis):

D. Definitions

1. Preventive and Routine Maintenance: Preventive and routine maintenance services shall be provided in accordance with the provisions of the maintenance manual for each component. Preventative maintenance services shall include inspection, test, necessary

adjustment, lubrication, parts cleaning, and upgrades. Routine maintenance services shall include scheduled overhauls as recommended by the equipment manufacturer

2. Emergency Failure: A system failure is considered an emergency if any of the key components are inoperative to the extent the system cannot function in a normal manner. Emergency services shall include inspections and necessary tests to determine the causes of equipment or software malfunction or failure. The emergency services shall include furnishing and installing components, parts, or software changes required to replace malfunctioning system elements. The Contractor shall provide telephone support twenty-four (24) hours a day, seven (7) days a week. The Contractor shall provide support on-site within eight (8) hours of request.
3. Support: Support shall be supplied by the Contractor directly or by a sub-Contractor reviewed by the Owner. Support shall cover all equipment referenced in this specification

3.06 CLEANING

- A. Upon completion of system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.
- B. Communications Rooms will be active during the project. Contractor shall keep Communications Rooms free of debris and dust; and shall not place equipment that prevents others from working in the rooms.

3.07 TRAINING

- A. The User Training shall include on-the-job-training of at least two (2) weeks. The training shall be conducted on site at the airport.
- B. The System Administrators Training shall include on-the-job training. Six (6) weeks of on-the-job training shall be provided. This training shall be conducted on site at the airport.
- C. The Contractor shall provide the Owner specified trainees with detailed As-built information by the Contractor Lead Network Engineer. The training shall provide the system Administrators with a working knowledge of the system design and layout, and shall provide troubleshooting methods and techniques. In addition, the training shall cover testing, maintenance, and repair procedures for all equipment and applications, which are provided under this Specification.
- D. Course materials shall be delivered to the Owner. Final delivery of the course materials shall include a master hard copy of all materials and an electronic copy in a format reviewed in advance by the Owner. The Contractor shall supply a videotape of each training course.
- E. All training shall be completed a minimum of two weeks prior to the system becoming operational and utilized by the Owner. Training schedule subject to the Owner's review.

3.08 ACCEPTANCE

- A. The Contractor shall not apply power to the system until after:
 - 1. System and components have been installed and inspected in accordance with the manufacturer's installation instructions
 - 2. A visual inspection of the system components has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections
 - 3. System wiring has been tested and verified as correctly connected as indicated
 - 4. All system grounding and transient protection systems have been verified as properly installed and connected, as indicated
 - 5. Power supplies to be connected to the system and equipment have been verified as the correct voltage, phasing, and frequency as indicated

- B. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage as a result of Contractor work/equipment.

- C. Acceptance will be withheld until the following have been completed successfully:
 - 1. Acceptance of all submittals
 - 2. Successful testing and delivery of approved test results
 - 3. Completed Training as per the specifications as well as successful demonstration of the operation of the entire system
 - 4. Final cleanup of the system and work areas
 - 5. Delivery of all documentation including accepted As-built documentation.

END OF SECTION

SECTION 270526

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section 27 01 00 contains the technical specifications for Grounding and Bonding for Communication Systems for CBIS/CBRA Building at the Miami International Airport (MIA).
- B. Drawings and general provisions of the Contract, including Contractual Conditions and Division 00 and Division 01 specifications sections apply to this section.
- C. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- D. This Section includes grounding and bonding products and installation methods for communications systems.
- E. Performance Requirements: Grounding and Bonding system shall comply with all referenced codes and standards
 - 1. The Grounding and Bonding system shall:
 - a. Maintain zero volts to all equipment enclosures during normal operation.
 - b. Provide an intentional fault current path.
 - c. Provide a zero voltage reference for end use power supplies.
 - 2. Grounding and Bonding for Communication Systems shall function in concert with the provided cabling topology, pathways, administrative labeling, outside plant, and comply with all referenced codes and standards.

1.02 REFERENCES

- A. See Section 27 01 00, Paragraph 1.2
- B. BICSI Information Transport Systems installation Methods Manual (ITSIMM)
- C. BICSI Telecommunications Methods Manual (TDDM).
- D. National Electric Safety Code (NEC).
- E. NFPA-70 National Electric Code (NEC) (2011).

- F. NFPA 780 Lightning Protection.
- G. TIA J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
- H. Bonding and Grounding shall follow and be compliant with applicable portions of the MIA Standards of Practice (latest Revision)

1.03 RELATED SECTIONS

- A. See Section 27 01 00, Paragraph 1.3.

1.04 SCOPE OF WORK

- A. See Section 27 01 00, Paragraph 1.4
- B. Contractor shall provide a complete telecommunications grounding and bonding system solution with all necessary components in accordance with the related Specifications, Drawings, Manufacturer's recommendations and requirements, including:
 - 1. Telecommunication grounding busbars.
 - 2. Telecommunications ground bond wire.
 - 3. Ground bond connection to electrical panel ground bus.
 - 4. Ground bond connectors.
 - 5. Grounding of Telecommunication Cabinets, Conduits and Cable Tray
 - 6. Project Management, including coordination and planning.
 - 7. Installation, terminations, exothermic welds, and labeling.
 - 8. Testing.
 - 9. All other work, equipment and accessories required to provide a complete and fully operational system.
- C. Scope exclusions:
 - 1. Building Lightning Protection system tie-in.
 - 2. Communication site and tower grounding.
- D. Acronyms and Definitions
 - 1. ASTM ASTM International.
 - 2. AWG American Wire Gauge.
 - 3. BCT Bonding Conductor for Telecommunications.
 - 4. GE Grounding Equalizer.
 - 5. NEC National Electric Code.
 - 6. RBC Rack Bonding Conductor.
 - 7. RGB Rack Grounding Busbar.

8. SRG Signal Reference Grid.
9. TBB Telecommunications Bonding Backbone conductor.
10. TEBC Telecommunications Equipment Bonding Conductor.
11. TGB Telecommunications Grounding Busbar.
12. TMGB Telecommunications Main Grounding Busbar.
13. UBC Unit bonding Conductor.
14. UL Underwriters Laboratories.

1.05 QUALIFICATIONS

- A. See Section 27 01 00, Paragraph 1.5.A.
- B. Project Qualifications:
 1. Successful installation completion of at least three similar and comparable Telecommunications Grounding and Bonding Systems as indicated for this project, within the most recent three year period.

1.06 SUBMITTALS

- A. See Section 27 01 00, Paragraph 1.6.
- B. Each product submittal shall include a summary listing each manufacturer, model, part number and cut sheet reference page(s).
- C. Customer Acceptance Plan
 1. The Contractor shall coordinate with the <OWNER> to provide a Customer Acceptance Plan for overall compliance with this Specification Section 27 05 26.
 2. The Customer Acceptance Plan shall include verification of satisfactory completion of the following:
 - a. Inspection.
 - b. Testing.
 - c. Labeling.
 - d. Documentation.

1.07 INTELLECTUAL PROPERTY

- A. See Section 27 01 00, Paragraph 1.7.

1.08 WARRANTY

- A. See Section 27 01 00, Paragraph 1.8.

1.09 QUALITY ASSURANCE

- A. See Section 27 01 00, Paragraph 1.9.

1.10 DELIVERY STORAGE AND HANDLING

- A. See Section 27 01 00, Paragraph 1.10.

1.11 RADIO/TELEVISION INTERFERENCE

- A. See Section 27 01 00, Paragraph 1.11.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers shall meet all specifications requirements and shall be approved by the Engineer. Manufacturers that may be incorporated in the work, include, but are not limited to the following:

1. Cable Manufacturers
 - a. Houston Wire and Cable Company
 - b. Okonite Company
 - c. General Cable
 - d. Pirelli Cable Corporation
 - e. Triangle Wire and Cable, Inc
 - f. Approved Equivalent
2. Ground Rod and Connector Manufacturers
 - a. Copperweld
 - b. Thomas & Betts
 - c. Blackburn
 - d. Approved Equivalent
3. Exothermic Connector Manufacturers

- a. Erico Products (Cadweld)
 - b. Continental Industries (thermOweld)
 - c. Approved Equivalent
4. Grounding Connector Manufacturers
- a. Thomas & Betts
 - b. FCI Burndy Electrical
 - c. O-Z/Gedney
 - d. Approved Equivalent

2.02 MATERIALS

A. General Requirements

- 1. All grounding and bonding components including conductor wire, busbars, ground rods and conduit shall be UL listed. Connectors shall be UL listed for the application.

B. Grounding and Bonding Conductors

- 1. Grounding and bonding conductors shall be green insulated copper American Wire Gauge (AWG) wire following ASTM-B3, ASTM-B8 and ASTM-B33.
- 2. Grounding and bonding conductors installed in plenums or air-handling spaces shall meet UL 910 and shall be marked CMP (communications multipurpose plenum) in accordance with the NEC.
- 3. Grounding and bonding conductors installed in non-plenum riser-rated spaces shall meet UL 1666 and be marked CMR (communications multipurpose riser) in accordance with the NEC.
- 4. Minimum acceptable ground wire size shall be No. 6 AWG.

C. Grounding and Bonding Connectors

- 1. Grounding and bonding connectors shall be a copper alloy two-hole compression lug type at all connecting ends.
- 2. Mechanical reversible compression connectors are acceptable only for connection to conduit or equipment where irreversible compression connectors or exothermic connections cannot be made. Connectors shall be UL Listed for the quantity of conductors installed.
- 3. Conduit grounding bushings or ground clamps shall be provided for ground wire connection to conduit.
- 4. Irreversible mechanical crimp type connector shall be provided where "H" tapped ganged cabinet ground bonds are provided between the Telecommunications Equipment Bonding Conductor (TEBC) and each Rack Bonding Conductor (RBC).

5. Beam clamps with irreversible crimp connector and breakaway bolt head are permitted for ground bond connection to building steel columns. Beam clamps shall be in compliance with NEC 250-81 and NEC 250-91.
- D. Grounding Rods
1. Grounding rods shall not be provided.
- E. Exothermic Weld Connectors
1. Exothermically welded connections shall be provided at both connecting ends for all ground wire larger than No. 2 AWG.
 2. Comply with all requirements for use of open flame.
- F. Telecommunications Main Ground Busbar (TMGB) and Telecommunications Grounding Busbar (TGB)
1. Predrilled copper busbar with standard NEMA bolt hole sizing and spacing for two-hole connector lugs of type provided.
 2. Electroplated for reduced contact resistance.
 3. Insulated 2 inch stand-off bracket.
 4. Minimum dimensions shall be 6 mm (0.25 inch) thick by 100 mm (4 inches) wide by 584 mm (23 inches) long.
 5. Minimum hole capacity two tiers each of eight (8) No. 6 AWG copper two-hole compression lugs.
 6. Busbar length and hole capacity shall support immediate requirements and minimum 25% spare.
 7. Comply with ASTM B187 / B187M – 11.
- G. Rack Grounding Busbar (RGB)
1. Predrilled copper busbar with standard NEMA bolt hole sizing and spacing for no. 6 AWG two-hole connector lugs.
 2. Electroplated for reduced contact resistance.
 3. Mountable in standard 19-inch EIA-310-D compliant rack and with No. 12-24 mounting thread forming hardware. Self tapping or sheet metal screws shall not be permitted.
 4. RGB shall be full width channel (equal flange) type between mounting rails.
 5. Minimum dimensions shall be 19 mm (0.75 inch) width by 5 mm (0.1875 inch) thickness and maximum height shall not exceed one Rack Unit (RU).
 6. Minimum hole capacity to support eight (8) No. 6 AWG two-hole compression lugs.
 7. Comply with ASTM B187 / B187M.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. See Section 27 01 00, Paragraph 3.1.

3.02 INSTALLATION

- A. See Section 27 01 00, Paragraph 3.2.

- B. Install work following specification requirements, drawings, manufacturer's instructions and approved submittal data.

- C. General

1. All ground bonding conductor wire, busbars and conduit shall be UL listed.
2. Ground bonding conductor sizing shall comply with ANSI/TIA J-Std-607-A and the BICSI TDMM.
3. Ground bonding conductor sizing shall be minimum #6 AWG and maximum #3/0 AWG.
4. Maximum ground bond resistance shall not exceed 0.1 ohms.
5. The telecommunications grounding electrode system shall not exceed 5 ohms to true earth ground as measured by the fall of potential method per ANSI/IEEE Std. 81.

- D. Grounding Busbars

1. Provide TMGB and TGBs as indicated in the Drawings.
 - a. Locate TMGB to provide minimum Building Conductor for Telecommunications (BCT) length to building service equipment (power) ground.
 - b. Locate TGBs within telecommunication spaces to minimize the length of the bonding wire to the electrical panelboard.
2. Provide one RGB for each cabinet, rack and enclosure containing standard EIA-310-D mounting rails or brackets.
 - a. Where raised floors are provided, mount RGB at the lowest RU position at the back, or at the front where the back is not accessible.
 - b. Where no raised floor is provided, mount RGB at the highest RU position at the back, or at the front where the back is not accessible.

- E. Ground Bond Conductors

1. Provide Building Conductor for Telecommunications (BCT) sized at No. 3/0 AWG from TMGB to the building service equipment (power) ground.

2. For a metal frame structure (structural steel) building where the steel framework is readily accessible, provide ground bond sized at No. 4 AWG from each TMGB and TGB to the nearest vertical structural member of the building grounding electrode system, or as a second choice, to a bonded horizontal member of the building grounding electrode system.
3. Provide Telecommunications Bonding Backbone (TBB) sized at No. 3/0 AWG from the TMGB to each TGB.
4. Install TBB within the backbone conduit.
5. TBBs shall only be interconnected at TMGB or TGBs within telecommunication spaces.
6. Provide a No. 6 AWG bonding conductor from the TMGB or TGB to the ground bus of the nearest power distribution panel serving the room. Every effort shall be made, including TMGB/TMG relocation within the telecom room, to limit the length of this conductor to 30 feet (10 meters).
7. Provide a No. 6 AWG bonding conductor between each electrically discontinuous section of UL classified cable tray or conduit for ground bond continuity to the nearest TMGB or TGB.
8. Where UL classified cable tray fittings and splices are not utilized or where components have been modified, provide a No. 6 AWG bonding conductor along the length of the metallic cable tray and bond to each cable tray section as required to maintain ground conductivity to the nearest TMGB or TGB.
9. Provide ground bond conductors sized at No. 6 AWG and not to exceed 30 meters (100 feet) in length from the nearest TMGB or TGB to each metallic component located within or entering the room, including:
 - a. Equipment cabinets.
 - b. Racks.
 - c. Enclosures.
 - d. Workstation equipment consoles.
 - e. Conduits.
 - f. Water pipes.
 - g. Splice cases.
 - h. Cable tray and raceways.
 - i. Building Entrance Terminals (BET).
 - j. Surge protection devices.
 - k. Metallic cable shield, sheath and strength members.
 - l. Electrical equipment.
 - m. Battery racks.
 - n. HVAC equipment.
10. Rack Bonding Conductors (RBC) sized at No. 6 AWG may optionally be provided for up to six ganged telecommunications cabinets using irreversible compression connectors to a single Telecommunications Equipment Bonding Conductor (TEBC) routed to the TMGB or TGB.
11. The Unit bonding Conductor (UBC) for connection to active equipment grounding point shall be provided by the active equipment Contractor.

F. Ground Bond Conductor Routing and Connections

1. Bonding conductors shall be routed parallel and at right angles to architectural components and using minimum wire lengths, bends and changes in direction. Provide minimum bend radius of 200 mm (8 inches) with maximum 90 degrees per bend.
2. Bonding conductors shall be continuous segments between terminations and provided without splices.
3. Route ground bond conductors under raised floor where available, following designated telecom pathways.
4. Avoid placement of ground bond wire in conduit. Where ground wire is placed in a metallic conduit section in excess of 1 meter (3 feet) in length, the ground wire shall be bonded to both ends of the conduit.
5. Ground bonding is not required for short sections of wall and floor sleeves less than 1 meter (3 feet) in length.
6. Bonding connections shall only utilize two hole compression lug type connectors, irreversible compression type connectors or exothermic welding (see NEC Article 250) for parts of a grounding system that are subject to corrosion, that must carry high currents reliably or for locations that require minimum maintenance.
7. Make connections to dry surfaces only. Where busbar ground connection points are not provided, remove paint, rust, oxides, scales, grease and dirt from surfaces before making connection. Sand clean a one square inch area, drill, tap or provide nut, and bolt 2 hole conductor lug to sanded area. Ensure proper conductivity.
8. Where ground connection materials are not electrotin plated, the contact surfaces shall be cleaned prior to fastening of conductors and an appropriate corrosion inhibitor shall be applied to the contact area.
9. Ground wires ends shall have a minimum amount of insulation removed from each weld or terminating ground lug and a minimum amount of wire end protruding from the weld.
10. Provide ground bond conductor routing to support single point ground configuration and avoid establishment of ground loops within the telecommunications grounding system.

G. Integration with Electrical Systems

1. The communications grounding and bonding system shall be independent from all power grounding. Ground wire in power cable assemblies shall not be connected to telecommunication grounding and bonding systems.
2. Power grounding and/or bonding shall not be allowed to interfere or provide any back feed or be a conductor to the separate communications ground system source or to any communications bonded materials or equipment.
3. Ground bond connection to electrical ground bus within electrical panels shall performed by a licensed electrician.

H. Communications Cable Surge Protection

1. All provided communications cable which is routed exterior to the building structure, or with exposure to Lightning; shall be provided with surge protection devices in compliance with UL-1449 and per the NEC, upon entry into the building.

2. All OSP entrance cables shall utilize Building Entrance Terminal (BET) with primary and secondary protection and in compliance with UL-1449. All BETs shall be provided within telecommunications spaces and grounded to the nearest TMGB or TMG within the room.

I. Rooftop Antennas and Communications

1. All rooftop antennas, antenna lines, antenna mounting structures, metallic cable tray and enclosures shall utilize the Building Lightning Protection System.

J. Labeling shall be provided in compliance with Section 27 05 53 Identification for Communication Systems.

3.03 DOCUMENTATION

- A. See Section 27 01 00, Paragraph 3.3.

3.04 GENERAL TESTING REQUIREMENTS

- A. See Section 27 01 00, Paragraph 3.4.

- B. Upon completion of the telecommunications grounding and bonding system and the electrical system, including all grounding, the Contractor shall perform Two-Point bonding measurements using an earth grounding resistance tester configured for a continuity test. Test leads shall be connected separately from the nearest available TMGB or TGB to each cabinet and rack busbar and from TMGB and each TGB direct connection to the Building grounding electrode system to confirm an acceptable low impedance bond has been provided.

1. The maximum allowable value for bonding resistance is 0.1 ohms.

- C. Any specified item that does not satisfy the requirements of this specification shall be replaced, upgraded, or added by the contractor as necessary to correct the noted deficiencies. After correction of a noted deficiency, re-testing shall be performed to verify the effectiveness of the corrective action.

3.05 FACTORY ACCEPTANCE TESTING

- A. See Section 27 01 00, Paragraph 3.5.

3.06 INTEGRATION TESTING

- A. See Section 27 01 00, Paragraph 3e.

- B. Upon completion of the electrical system, including all grounding, the Contractor shall test the system for stray voltages, currents, ground shorts, etc. Approved instruments, apparatus, services, and qualified personnel shall be utilized. If stray voltages, currents, shorts, etc., are detected, eliminate or correct and/or coordinate with the Electrical Contractor as required.
 - 1. The maximum allowable AC current shall be less than one ampere and the maximum allowable DC current shall be less than 0.5 ampere.
 - 2. The maximum allowable potential voltage difference shall not exceed 1 volt between electrical power and telecommunications ground references for screened/shielded cabling applications.

3.07 ENDURANCE TESTING

- A. See Section 27 01 00, Paragraph 3.7.

3.08 MAINTENANCE AND SUPPORT

- A. See Section 27 01 00, Paragraph 3.8.

3.09 CLEANING

- A. See Section 27 01 00, Paragraph 3.9.

3.10 TRAINING

- A. See Section 27 01 00, Paragraph 3.10.

3.11 ACCEPTANCE

- A. See Section 27 01 00, Paragraph 3.11.
- B. Owner acceptance of the completed Customer Acceptance Plan.

END OF SECTION

SECTION 270528

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. See Section 27 01 00, Paragraph 1.1.
- B. Section 27 05 28 contains the technical specifications for Communication Pathways for Satellite E Elevator at the Miami International Airport (MIA).
- C. Drawings and general provisions of the Contract, including Contractual Conditions and Division 00 and Division 01 specifications sections apply to this section.
- D. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- E. This Section includes the following:
 - 1. Conduit, fittings and bodies.
 - 2. Plenum and Riser rated flexible raceway (innerduct) and fittings.
 - 3. Measured pull tape.
 - 4. Junction boxes, pull boxes and gutters.
 - 5. J Hook Cable Supports
- F. Refer to Section 27 11 00 Communications Equipment Room Fittings for cable tray/ladder rack within the telecommunications rooms.

1.02 REFERENCES

- A. See Section 27 01 00, Paragraph 1.2.

1.03 RELATED SECTIONS

- A. See Section 27 01 00, Paragraph 1.3.

1.04 SCOPE OF WORK

- A. All Telecommunication spaces and pathways shall be provided in accordance with ANSI/TIA 569-C Commercial Building Standard for Telecommunications Pathways and Spaces and the BICSI Telecommunications Distribution Methods Manual (TDMM).
- B. All work shall be in compliance with MIA Infrastructure Guidelines. (Latest revision)
- C. Seismic Performance Requirement: Cable pathways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - 2. Installations shall meet or exceed: an Importance Factor of 1.0

1.05 QUALIFICATIONS

- A. Project Qualifications: See Section 27 01 00, Paragraph 1.5.A.
- B. Organization Qualifications: See Section 27 01 00, Paragraph 1.5.B.

1.06 SUBMITTALS

- A. See Section 27 01 00, Paragraph 1.6.

1.07 INTELLECTUAL PROPERTY

- A. See Section 27 01 00, Paragraph 1.7.

1.08 WARRANTY

- A. See Section 27 01 00, Paragraph 1.8.

1.09 QUALITY ASSURANCE

- A. See Section 27 01 00, Paragraph 1.9.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. See Section 27 01 00, Paragraph 1.10.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, MANUFACTURERS SHALL MEET ALL SPECIFICATIONS REQUIREMENTS AND SHALL BE APPROVED BY THE ENGINEER

A. Metal Conduits, Fittings, J Hook Cable Supports

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Alpha Wire Company.
4. Anamet Electrical, Inc.
5. Crouse-Hinds, Appleton Electric
6. Electri-Flex Company.
7. O-Z/Gedney; a brand of EGS Electrical Group.
8. Picoma Industries; Subsidiary of Mueller Water Products, Inc.
9. Republic Conduit.
10. Robroy Industries.
11. Southwire Company.
12. Thomas & Betts Corporation.
13. Western Tube and Conduit Corporation.
14. Wheatland Tube Company; a division of John Maneely Company.
15. Approved Equivalent

B. Innerduct

1. Maxcell –fabric option
2. Alpha Wire Company.
3. Arnco Corporation.
4. Endot Industries Inc.
5. IPEX.
6. Lamson & Sessions; Carlon Electrical Products.
7. Approved Equivalent

C. Boxes, Enclosures and Cabinets

1. DAMAC
2. Adalet.
3. Cooper Technologies Company; Cooper Crouse-Hinds.
4. EGS/Appleton Electric.
5. Erickson Electrical Equipment Company.
6. Hoffman; a Pentair company.
7. Hubbell Incorporated; Killark Division.
8. Lamson & Sessions; Carlon Electrical Products.
9. Milbank Manufacturing Co.

10. Molex; Woodhead Brand.
11. Mono-Systems, Inc.
12. O-Z/Gedney; a brand of EGS Electrical Group.
13. RACO; a Hubbell company.
14. Robroy Industries.
15. Spring City Electrical Manufacturing Company.
16. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
17. Thomas & Betts Corporation.
18. Wiremold / Legrand.
19. Approved Equivalent

D. Fire Rated Poke Throughs for Communication and Power Systems

1. Hubbell Incorporated; Wiring Device-Kellems Division.
2. Lamson & Sessions; Carlon Electrical Products.
3. Mono-Systems, Inc.
4. Panduit Corp.
5. Wiremold / Legrand.

E. Measured Pull Tape

1. Fibertek.
2. Condux International.
3. Approved equivalent.

F. Cable Tray

1. Cabloflo/ Legrand, Snake Tray
2. Approved equivalent

2.02 MATERIALS

- A. All conduits, fittings, junction and pull boxes shall be UL listed.
- B. All conduits, fittings, junction and pull boxes shall comply with the NEC.
- C. All conduit fittings, junction and pull boxes shall provide minimum cable bend radius as required.
- D. Minimum Bend Radius:
 1. 42 inches for 4 inch conduit.
 2. 36 inches for 3 inch conduit
 3. 24 inches for 2 inch conduit.
 4. 10 times outside diameter for conduit less than 2".

5. 15 inch inside edge radius for cable tray, unless noted otherwise.
- E. Conduit Routing
1. 180 degree maximum total bends per conduit segment between pull box, junction boxes, cabinets, enclosures, device boxes and stubs.
 2. 270 degrees maximum total bends is permitted where conduit segments are limited to 50 feet and permitted fill is derated by 15%.
 3. Two (2) back to back 90 degree conduit bends shall not be provided.
 4. Maximum conduit segment length shall be 100 feet.
- F. All conduit fittings shall be reamed and have plastic bushings on all exposed conduit ends.
- G. Galvanized Rigid Steel Conduit (GRC):
1. Conduit to be seamless, hot dipped galvanized rigid steel in accordance with ASTM A123
 2. Threads to be cut and ends chamfered prior to galvanizing.
 3. Galvanizing to provide zinc coating fused to inside and outside walls of conduit.
 4. Provide an enamel lubricating coating on the inside of the conduit.
 5. Conduit to conform to ANSI C80.1 and listed and labeled under UL 6A.
- H. Aluminum Rigid Conduit (ARC):
1. Conduit to be seamless, 6063 alloy, T-1 temper.
 2. Conduit to conform to ANSI C80.5, and listed and labeled under UL 6A.
 3. Shall be used inside buildings only.
- I. Galvanized Intermediate Metal Conduit:
1. Conduit to be seamless, hot dipped galvanized rigid steel in accordance with ASTM A123.
 2. Threads to be cut and ends chamfered prior to galvanizing.
 3. Galvanizing to provide zinc coating fused to outside walls of conduit.
 4. Provide an enamel lubricating coating on the inside of the conduit.
 5. Conduit to conform to ANSI C.80.6 and be listed and labeled under UL 1242.
 6. Shall be used inside buildings only.
- J. Electrical Metallic Tubing (EMT):
1. EMT fittings shall be formed steel compression ring type. Die cast fittings are not allowed.
 2. Conduit to conform to ANSI C.80.3 and be listed and labeled under UL 797
 3. EMT shall conform to NEC Article 300.22.
 4. Shall be used inside buildings only for concealed wall and ceiling applications.
 5. Only manufacturer's fittings, transition adapters, terminators and fixed bends shall be used.
 6. All transition junction and pull boxes, fittings terminators and adapters shall be a metallic material.

- K. Raintight Sealing Hubs: Two piece type with outer internally-threaded hub to receive conduit, inner locking ring with bonding screw, insulated throat, and V shaped ring or O-ring.
- L. Conduit Bodies: Not permitted.
- M. Conduit Fittings
 - 1. All fittings shall be compression or threaded.
 - 2. Fittings shall provide a secure connection for pulling communications cables.
 - 3. Setscrew fittings are not permitted.
 - 4. ANSI/NEMA FB 1; material to match conduit.
 - 5. Couplings for rigid steel conduit and IMC to be single piece threaded, cadmium plated malleable iron.
 - 6. Couplings for rigid aluminum conduit to be of aluminum construction, 6063 alloy.
 - 7. Hubs for box connection to be two-piece with outer internally threaded hub to receive conduit and inner locking ring with bonding screw.
 - 8. Expansion fittings shall allow for a minimum of four inches of movement and shall be complete with bonding jumpers and hardware.
- N. Flexible conduit is not permitted.
- O. Non-metallic conduits are not permitted in above ground installations. Transition fittings are required for non-metallic (below ground) to metallic (above ground) transitions. Transition fittings shall be Galvanized Ridged Steel.
- P. Innerduct (Plenum):
 - 1. Application: Suitable for an indoor installation, typically within a riser system or backbone conduit, and within plenum spaces, such as above ceiling or within an access floor, for the support of telecommunications fiber optic cables.
 - a. Multi-cell fabric mesh.
 - 1) 3 – cell product for 2-inch conduit
 - 2) 3 x 3 cell for 4-inch conduit
 - b. High Density PE
 - 1) 1-inch OD. Install in 4-inch ridged backbone conduit
 - 2. Material:
 - a. Fabric fabricated from treated polyester-nylon with measured pull tape.
 - b. HDPE with pull tape

3. Only manufacturer's pulling technique, fittings, transition adapters, terminators and fixed bends shall be used.

Q. Telecom Outlet Backboxes

1. Telecom outlet backbox shall be sized rated to support CAT6 cable and terminations in metallic backbox with drywall flange and single gang cover, unless otherwise noted for high count data outlets positions.
2. Gangable boxes and box extension rings shall not be provided.

R. J Hooks, Hangers and Supports

1. Hangers and supports shall be UL listed and labeled for the intended use.
2. Provide only materials and equipment of new stock meeting ANSI, NEC, NEMA and UL requirements.
3. Each pull box shall be supported independently from the conduit system.
4. Conduits shall be supported within 3 feet (900 mm) of any type fitting and within 12 inches (300 mm) of each pull box. This shall apply to both horizontal and vertical runs.
5. J Hooks when used for cabling distribution shall be provided every 3 feet (900 mm) and within 12 inches (300 mm) of each outlet or device.

S. Spare Capacity

1. Backbone pathways: Provide spare capacity for 50% additional future cabling and without exceeding pathway fill requirements.
2. Horizontal pathways: Provide spare capacity for 25% additional future cabling and without exceeding pathway fill requirements.

T. Cable tray extended outside TR's and MPOE

1. Refer to Section 271100 for Cable Tray types planned inside TR's and MPOE
2. Cable tray shall be provided for the purpose of extending pathways above ceiling in locations where horizontal cabling is extended from multiple data outlets to the local TR. This is an alternate option (to EMT conduit or use with partial runs of EMT) for routing horizontal data cable only, no backbone or power cable shall route in cable tray.
3. Cable tray shall use permanent attachment method, no hooks type fasteners to hangers.
4. Cable tray shall be installed with proper distance between hangers to support a minimal load rating of 17 lbs per foot.
5. The product shall be wire mesh type cable tray which meets the following:
 - a. Wire: Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, bent, and surface treated after manufacture
 - b. Finish: Electrodeposited Zinc Plating: ASTM B 633, Type III, SC-1
 - c. Grounding: UL Classified splices where tray acts as Equipment Grounding Conductor (EGC)

- d. Size: 6" High x 12" wide or approved equivalent load capacity
- e. Include manufacturer's accessories as recommended to meet approved installation, support and grounding.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. See Section 27 01 00, Paragraph 3.1.
- B. Contractor's RCDD supervisor shall review and approve all shop drawings, coordination drawings and record drawings.
- C. Verify conduit system is properly sized for cables (minimum 1 inch, unless otherwise noted in Drawings).
- D. Verify general conduit route following Drawings.
- E. Verify substrates to which work is connected and determine detail requirements for proper support.
- F. Verify proper location and type of rough-in for conduit terminations.

3.02 INSTALLATION

- A. See Section 27 01 00, Paragraph 3.2.
- B. All conduit couplings, and junction/pull box covers shall be painted white.

3.03 DOCUMENTATION

- A. See Section 27 01 00, Paragraph 3.3.

3.04 GENERAL TESTING REQUIREMENTS

- A. See Section 27 01 00, Paragraph 3.4.

3.05 FACTORY ACCEPTANCE TESTING

- A. See Section 27 01 00, Paragraph 3.5.

- 3.06 INTEGRATION TESTING
 - A. See Section 27 01 00, Paragraph 3.6.

- 3.07 ENDURANCE TESTING
 - A. See Section 27 01 00, Paragraph 3.7.

- 3.08 MAINTENANCE AND SUPPORT
 - A. See Section 27 01 00, Paragraph 3.8.

- 3.09 CLEANING
 - A. See Section 27 01 00, Paragraph 3.9.

- 3.10 TRAINING
 - A. See Section 27 01 00, Paragraph 3.10.

- 3.11 ACCEPTANCE
 - A. See Section 27 01 00, Paragraph 3.11.

END OF SECTION

SECTION 270544

SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.01 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
1. Material: Galvanized-steel sheet.
 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.02 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
1. Manufacturers: Subject to compliance with requirements, provide products by the following] [provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: [EPDM] [Nitrile (Buna N)] rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: [Carbon steel] [Plastic] [Stainless steel].
 4. Connecting Bolts and Nuts: [Carbon steel, with corrosion-resistant coating,] [Stainless steel] of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by the following]
 - a. Presealed Systems.

2.04 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.05 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
 2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

- a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
- 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve-seal system.
- 3.02 SLEEVE-SEAL-SYSTEM INSTALLATION
- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.
 - B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.03 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 270553

IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. See Section 27 01 00, Paragraph 1.1.
- B. Section 27 05 53 contains the technical specifications for Identification for Communications Systems for the Satellite E Elevator at Miami International Airport (MIA).
- C. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- D. Drawings and general provisions of the Contract, including Contractual Conditions and Division 00 and Division 01 specifications sections apply to this section.
- E. This section includes the following:
 - 1. Identification for raceway and metal-clad cable.
 - 2. Equipment identification labels.
 - 3. Identification for enclosures.

1.02 REFERENCES

- A. See Section 27 01 00, Paragraph 1.2.

1.03 RELATED SECTIONS

- A. See Section 27 01 00, Paragraph 1.3.

1.04 SCOPE OF WORK

- A. All telecommunication components, areas, and cables shall be labeled, including but not limited to:
 - 1. Telephone Terminal Boards (TTBs).
 - 2. Telecommunications Rooms.
 - 3. Fiber Optic Cables and Individual Strands and bundles.
 - 4. Metallic Cable.

5. Ground Points.
6. Cross-connect Fields.
7. Exterior Enclosures.
8. Innerduct.
9. Cable Tray.
10. Conduit Ends (pathways).
11. Pull Boxes and Junction Boxes.
12. Equipment Racks and Cabinets.
13. Copper and Fiber Patch Panels.
14. Maintenance Holes.
15. Cables in Maintenance Holes and Pull Boxes.
16. Patch Cables/Jumpers.

- B. Pathways shall be defined but not limited to: any conduit, innerduct, underground duct bank, wiring troughs, pull boxes, and any wiring systems used to enclose cabling of any type.
- C. Labeling guidelines shall be ANSI/TIA-606 Administration Standards for Telecommunication Infrastructure of Commercial Buildings and as modified for conformance with the MIA telecommunications administrative standards and Owner specific asset nomenclature in Appendix(A).
- D. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- E. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- F. Coordinate installation of identifying devices with location of access panels and doors.
- G. Install identifying devices before installing acoustical ceilings and similar concealment.

1.05 QUALIFICATIONS

- A. Project Qualifications: See Section 27 01 00, Paragraph 1.5.A.
- B. Organization Qualifications: See Section 27 01 00, Paragraph 1.5.B.

1.06 SUBMITTALS

- A. See Section 27 01 00, Paragraph 1.6.

1.07 INTELLECTUAL PROPERTY

- A. See Section 27 01 00, Paragraph 1.7.

1.08 WARRANTY

- A. See Section 27 01 00, Paragraph 1.8.

1.09 QUALITY ASSURANCE

- A. See Section 27 01 00, Paragraph 1.9.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. See Section 27 01 00, Paragraph 1.10.

1.11 COMMISSIONING

- A. See Section 27 01 00, Paragraph 1.11.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers shall meet all specifications requirements and shall be approved by the Engineer.

2.02 GENERAL REQUIREMENTS

- A. Labeling guidelines are ANSI/TIA/EIA-606 Administrative Standard for Commercial Telecommunications Infrastructure and all active Addendums as modified in support of MDAD telecommunications administrative labeling standard and including Owner specific asset nomenclature.
- B. All label material shall be suitable for intended usage and environment, meeting the legibility, defacement and general exposure requirements listed in UL 969 for indoor and outdoor use. Where insert labels are used the insert label shall be covered with clear cover and securely held in place.

- C. Interior labeling: printer shall be of the thermal transfer type capable of printing self laminating labels of various size up to and including 1.5"by 1.5" printable area with a 4.5" self laminating tail. No non-self-laminating labels shall be approved.
- D. All labels shall be permanent, i.e. shall not fade, peel, or deteriorate due to environment or time.
- E. Handwritten labels are not acceptable.

2.03 CONDUITS AND PATHWAYS

- A. Conduits: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name, "Mondo Bondo" (Brady) or Approved Equivalent. Label size shall be appropriate for the conduit size. Font size shall be easily visible from the finished floor.
 - 1. All backbone conduit pathways shall be labeled within telecom rooms, within 5 feet of end stubs and at 100 feet intervals.
- B. Innerduct: Polyethylene general-purpose tagging material, Brady part number PTL-12-109 (.75 X 3.00) used with an R4310 ribbon or approved equivalent. This tag shall be attached using tie wraps.
- C. Junction, pull boxes and enclosures: General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name, "Mondo Bondo", Brady part number PTL-42-483 (1.00 X continuous) used with an R6010 ribbon or approved equivalent.

2.04 BACKBONE AND HORIZONTAL CABLE AND TERMINATIONS

- A. Fiber termination hardware (cover): General purpose label designed for powdered coated surfaces, trade name, "Mondo Bondo", Brady part number PTL-42-483 (1.00 X continuous) used with an R6010 ribbon or approved equivalent.
- B. Fiber termination hardware (designation strip): Thermal transfer printable label with a permanent acrylic adhesive, Brady part number PTL-10-423 (.75 X .25) used with an R6010 ribbon or approved equivalent.
- C. Patch panels: Gloss white film with a permanent acrylic based adhesive, Brady part number PTL-39-422 (.375 X .60) used with an R6010 ribbon or approved equivalent.
- D. 110 Copper termination hardware: Laser printable, non-adhesive label designed for 110 terminal block marking, Brady part number LAT-177-124 (available in various colors) or approved equivalent.

- E. Modular Faceplate: Highly durable, non-adhesive, polypropylene tag stock used for thermal transfer printing of faceplate designation strip, Brady part number PTL-40-412 (1.938 x .375) used with an R6210 ribbon or approved equivalent.
- F. Horizontal cabling, patch cords, inside copper and low pair count (12 strands or less) fiber optic cable: Permanent acrylic adhesive, self-laminating vinyl wire and cable identification, Brady part number PTL-31-427 (1.00 X 1.50 X .50) used with an R4310 ribbon or approved equivalent.
- G. Outside plant copper cable: Permanent acrylic adhesive, self-laminating vinyl wire and cable identification, Brady part number PTL-34-427 (1.50 X 6.00 X 1.50) used with an R4310 ribbon or approved equivalent.
- H. Inside and outside plant fiber cables: Permanent acrylic adhesive, self-laminating vinyl wire and cable identification, Brady part number PTL-33-427 (1.50 X 4.00 X 1.00) used with an R4310 ribbon or approved equivalent.

2.05 EQUIPMENT RACKS AND CABINETS

- A. General purpose label designed for powdered coated surfaces.
- B. Each cabinet and rack shall be labeled.

2.06 COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM (CMMS)

- A. Functionality
 - 1. Contractor shall prepare As-built telecommunications distribution system input documentation suitable for use with an Airport Cable Management System (CMS) software. The CMS input requirements include all provided cables, equipment, telecom infrastructure and systems.
 - 2. CMS input shall allow capability of maintaining and managing the physical layer details of the Terminal telecommunications infrastructure.
 - 3. The CMS input data shall include all components of the passive telecommunications infrastructure and as labeled, including telecommunications cable, pathways, patching, cross-connections, connected devices and spare capacity.
 - 4. The CMS input data may also include the following as requested by the Owner:
 - a. Manufacturer data with equipment description, warranty expiration dates, serial number and contact information.
 - b. All testing, test results and the testing date.
 - c. All requested As-built information per Part 3 of this Specification Section.
 - d. MS Excel compatible format.

- B. The Contractor shall enter the input documentation to populate the CMS with the complete project as-built information and provide a hardcopy of the system information to the Engineer who will verify the accuracy of the typed-in information against the actual installation, based on a minimum random 10% sampling,. Accuracy of 99% or greater is required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. See Section 27 01 00, Paragraph 3.1.

3.02 INSTALLATION

- A. See Section 27 01 00, Paragraph 3.2.
- B. Verify identity of each item before installing identification products.
- C. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- F. System Identification Color Banding for Raceways: Each color band shall completely encircle conduit. Locate bands at changes in direction, at penetrations of walls and floors, and at 20-foot maximum intervals.
- G. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.
- H. Conduits and Junction/Pull Boxes:
 - 1. All conduits, innerduct, junction boxes, gutters and pull boxes shall be labeled.
 - 2. Conduits shall be labeled with the word "communications" and the conduit's origination?
 - 3. Label conduit every 50 feet, at each wall and floor penetration and at each conduit termination, such as outlet boxes, pull boxes, and junction boxes, or as otherwise specified in other Sections.
 - 4. Junction boxes, gutters and pull boxes shall be labeled with identification name or number as determined by Contractor and submitted for approval.
 - 5. Labels on conduits, junction boxes, gutters and pull boxes shall be machine-generated and easily visible from the finished floor.

I. Backbone Copper Cable

1. All riser terminations including riser patch panels shall be labeled as follows:
 - a. Location: Building, floor, room #
 - b. From: Building, floor, room #
 - c. Pair #, or port # and patch panel # on each termination block
 - d. Identify any bad pairs
2. Each riser cable installed shall be labeled at each end as follows:
 - a. Cable #
 - b. From: Building, floor, room #
 - c. Pair count
3. The following information for riser cable installed shall be provided in Table Format. Both a hard copy and electronic copy are to be provided. Electronic information is to be in Excel or compatible format.
 - a. Cable #
 - b. Location: building, floor, room #
 - c. Pair Count
 - d. Intermediate rooms in path
 - e. Manufacturer
 - f. Date installed
 - g. Date Tested
 - h. Installed by: (Company)
4. A copy of the above shall be provided with as built documents and to Owner.

J. Horizontal Fiber Cable

1. Horizontal fiber cabling shall be installed on patch panels specified for horizontal fiber only.
2. Each horizontal fiber patch panel is to be labeled as follows:
 - a. Patch Panel #
 - b. Location: building, floor, room #
 - c. Areas served by room #
 - d. Number of 6 port bulkheads installed
 - e. Corresponding Work Area outlet port numbers
 - f. Date installed:
 - g. Date Tested:
 - h. Installed by: (Company)

3. Horizontal fiber cabling labeling shall reflect patch panel port to corresponding fiber outlet/jack.
4. Work Area outlets vary in ports per outlet configuration. Each outlet shall be labeled with the serving Telecom Room #, Patch Panel # and sequential numbering from lowest port number to highest port number. Each port shall be individually labeled with it's unique sequential port number.
5. The following information for each horizontal patch panel and each horizontal fiber cable installed shall be provided in Table Format. Both a hard copy and electronic copy shall be provided. Electronic information is to be in Excel or compatible format.
6. Horizontal fiber cables:
 - a. Cable #
 - b. Patch Panel # cable is landed in:
 - c. Work Area outlet ports (by number) provided by cable:
 - d. Type:
 - e. Manufacturer:
 - f. Strand Count:
 - g. Adapter Plate in Patch Panel that Strands are Landed On:
 - h. Date Installed:
 - i. Installed By: (Company)
 - j. Date Tested:
7. A copy of the above is to be provided with as built documents and to Owner.

K. Horizontal Copper Cable

1. Each horizontal shall be labeled with a unique designation. The Work Area outlet port/jack labeling shall reflect the corresponding patch panel and port number.
2. Work Area outlets vary in ports per outlet configuration. Ports for each outlet shall be terminated sequentially and with a consistent method on the patch panels.
3. The following information for each horizontal cable installed shall be provided in Table Format. Both a hard copy and electronic copy are to be provided. Electronic information is to be in Excel or compatible format.
 - a. Work Area outlet port #
 - b. Type: e.g. category 6A UTP
 - c. Location: building, floor, room #
 - d. Serving telecom room
 - e. Corresponding patch panel and port number
 - f. Manufacturer
 - g. Date installed:
 - h. Date Tested:
 - i. Installed By: (Company)

L. The following label color coding scheme shall be used:

1. Horizontal Wiring:
 - a. Common UTP Horizontal Blue
 - b. Common UTP Plenum Orange
 - c. Fiber multi-mode Aqua

2. Intra-building Backbone Cables:
 - a. Multi pair Copper Gray
 - b. Fiber multi-mode Aqua
 - c. Fiber single mode Yellow

M. Equipment Racks and Cabinets:

1. All racks and cabinets shall be properly labeled with permanent typewritten labels, easily visible from finished floor.
2. Label as indicated in approved shop drawings.

N. Cable Management System

1. Contractor shall input data for the following into the CMS spreadsheet:
 - a. All as-built telecommunications infrastructure identification.
 - b. Telecommunication end point devices.
 - c. Directly connected telecommunications equipment.
 - d. Interconnections (patch and cross-connections).
 - e. Individual test results for each cable pair and strand, including before and after on the reel tests.

O. Three copies of the cable record document containing the cable information required on the cable labels shall be delivered to the Owner.

3.03 DOCUMENTATION:

- A. See Section 27 01 00, Paragraph 3.3.

3.04 GENERAL TESTING REQUIREMENTS

- A. See Section 27 01 00, Paragraph 3.4.

3.05 FACTORY ACCEPTANCE TESTING

- A. See Section 27 01 00, Paragraph 3.5.

3.06 INTEGRATION TESTING

- A. See Section 27 01 00, Paragraph 3.6.

3.07 ENDURANCE TESTING

- A. See Section 27 01 00, Paragraph 3.7.

3.08 MAINTENANCE AND SUPPORT

- A. See Section 27 01 00, Paragraph 3.8.

3.09 CLEANING

- A. See Section 27 01 00, Paragraph 3.9.

3.10 TRAINING

- A. See Section 27 01 00, Paragraph 3.10.

3.11 ACCEPTANCE

- A. See Section 27 01 00, Paragraph 3.11.

END OF SECTION

SECTION 271100

COMMUNICATIONS EQUIPMENT ROOM FITTING

PART 1 - GENERAL

1.01 SUMMARY

- A. See Section 27 01 00, Paragraph 1.1.
- B. Section 27 11 00 contains the technical specifications for Communications Equipment Room Fittings for the Satellite E Elevator at the Miami International Airport (MIA).
- C. Drawings and general provisions of the Contract, including Contractual Conditions and Division 0 and Division 1 specifications sections apply to this section.
- D. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- E. Telecommunication Room buildout shall comply with MIA Standards of Practice, most recent revision at start of work. Cross reference this specification to Appendix (A).
- F. This Section includes the following:
 - 1. Telecommunications mounting elements.
 - 2. Backboards.
 - 3. Telecommunications equipment racks, cabinets, frames, and enclosures.
 - 4. Cable management.
 - 5. Rack mounted power protection and power strips.
 - 6. Security Cage.

1.02 REFERENCES

- A. See Section 27 01 00, Paragraph 1.2.

1.03 RELATED SECTIONS

- A. See Section 27 01 00, Paragraph 1.3.

1.04 SCOPE OF WORK

- A. A complete Communications Equipment Room Fittings system shall be provided in accordance with the related Specifications, Drawings, Manufacturer's recommendations and requirements, including:
1. Coordination and planning.
 2. Telecommunications equipment racks, cabinets, frames, and enclosures.
 3. Cable management.
 4. Rack mounted power protection and power strips.
 5. Backboards, hangers, and supports.
 6. Installation, termination, labeling and marking.
 7. As-built documentation.
 8. All other work, equipment and accessories required to provide a complete and fully operational system.
- B. Seismic Performance Requirement: Floor-mounted cabinets and cable pathways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 2. Installations shall meet or exceed: an Importance Factor of 1.0
- C. Coordination: Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
 2. Record agreements reached in meetings and distribute them to other participants.
 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
 4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.
 5. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

1.05 QUALIFICATIONS

- A. Project Qualifications: See Section 27 01 00, Paragraph 1.5.A.
- B. Organization Qualifications: See Section 27 01 00, Paragraph 1.5.B.

1.06 SUBMITTALS

- A. See Section 27 01 00, Paragraph 1.6.

1.07 INTELLECTUAL PROPERTY

- A. See Section 27 01 00, Paragraph 1.7.

1.08 WARRANTY

- A. See Section 27 01 00, Paragraph 1.8.

1.09 QUALITY ASSURANCE

- A. See Section 27 01 00, Paragraph 1.9.
- B. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of BICSI Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with ANSI/TIA-569-C.
- E. Grounding: Comply with ANSI-J-STD-607-A.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. See Section 27 01 00, Paragraph 1.10.
- B. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.11 COMMISSIONING

- A. See Section 27 01 00, Paragraph 1.11.

PART 2 - PRODUCTS

2.01 EQUIPMENT CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. DAMAC
 2. Approved Equivalent
- B. Freestanding Equipment Cabinets
1. Standard Cabinet is DAMAC P/N: CSN1284Z23077-3. Confirm this is the latest MIA approved P/N prior to submittal of product cut-sheets and ordering.
 2. Cabinet Size 84.00" H x 28.00" W x 36.00"D with 45 usable rack units and as shown on the drawings.
 3. This Part Number should include all accessories and configuration pre-approved by MIA.
 4. Cabinets shall include internal vertical and horizontal cable management.
 5. Cabinets shall be 4 post with 19-inch EIA-310-D compliant rack mounting rails
 6. Cabinet design shall restrict bypass of cooling airflow around mounted equipment.
 7. Cabinets shall be seismic rated with equipment load capacity of 2,000 lb.
 8. Cabinets shall have perforated locking front and rear doors with two-point Cam Latch locks independently keyed for each cabinet and matching locks for front and rear doors of a cabinet. Doors and roof shall be minimum 16 gauges.
 9. Front cabinet doors shall be single mesh, rear cabinet doors shall be split type mesh.
 10. Cabinets shall have solid top panels with appropriately sized cable openings and grommets.
 11. Cabinets shall have blanking panels installed at all open rack unit spaces.
 12. Provide seismic kit, casters, leveling feet, and bolt-down stabilization bracket and seismic bracing below raised floor for each cabinet. Coordinate installation of all owner furnished seismic protection devices.
 13. Adjacent cabinets shall be ganged together using manufacturer kits. One side panel shall be provided between adjacent cabinets and at each end of the cabinet row.
 14. Cabinets and doors shall be black.
- C. Wall Mounted Equipment Cabinets
1. Provide wall mounted equipment cabinets where indicated in Project drawings.
 2. Swing-out body for access to the back of installed equipment, black in color with internal vertical wire management.
 3. Cabinets shall have perforated metal front doors with locks independently keyed for each cabinet.
 4. Cabinets shall be equipped with vented side panels.
 5. Provide 19-inch EIA-310-D compliant rack mounting rails.
 6. Threaded #12-24 Equipment Mounting holes.

7. Dimensions: 36" H x 24" W x 24" D with 18 usable rack units.
8. Provide all required mounting rails, and hardware to secure cabinet to wall types.
9. Load capacity: 200 lb of equipment.

D. Wall-Mount Enclosure

1. Provide wall-mount enclosure for 6 rack units of equipment.
2. 19-inch EIA-310-D compliant rack mounting rails.
3. Threaded #12-24 Equipment Mounting holes.
4. Dimensions: 38.5" H x 28" W x 8.6" D.
5. Provide all required hardware to secure cabinet to wall.
6. Finish: powder coat paint in black.

E. Telecommunication Enclosure (TE)

1. Provide lockable wall-mount TE for 6 rack units of equipment.
2. 19-inch EIA-310-D compliant rack mounting rails.
3. Threaded #12-24 Equipment Mounting holes.
4. Capacity: minimum of:
 - a. 2 RU space for UPS
 - b. 2 RU space for POE switch
 - c. 2 RU for 24 port fiber Patch Panel
 - d. 2 RU for 24 Port CAT 6A Patch Panel
5. Air conditioning: 4000 BTU
6. Dimensions: 42" H x 37.4" W x 12" D. (approx)
7. Provide all required hardware to secure cabinet to wall.
8. Finish: manufacturers standard finish
9. Armarac Modula or approved equal

F. Cable Management

1. Horizontal Cable Management: Provide 19-inch rack mountable horizontal wire management for each copper termination panel, data switching equipment, and as shown in approved shop drawings.
 - a. Provide 1 RU horizontal cable management mounted above and below each 48 port patch panel and network switch.
2. Vertical Cable Management Free Standing Equipment Cabinet: Provide internal finger style wire management 4 inch wide by 8 inch deep.

G. Power Distribution Units (PDUs): 120V Single-Phase

1. Refer to DAMAC Cabinet package.
2. Coordinate power in cabinets with other trades as required.

3. Connect one PDU to normal power and one to emergency power.
4. Input Power: Each PDU shall be rated for 20A at 120 VAC, single-phase.
5. Input Connector: (1) 10 foot, NEMA L5-20P cord.
6. Output Power: 120VAC
7. Output Connector: (24) NEMA 5-20R
8. Dimensions: Minimum length of 63 inches and complies with UL 60950.
9. Each unit shall be unswitched to prevent accidental power down of equipment.
10. Each unit shall have integral surge protection.
11. Route and connect all power cords to the PDU allowing maximum air circulation through the equipment cabinet. Neatly tie all excess PDU cord.
12. PDUs for Wall Mount Cabinets: specifications as above except (8) output connectors and length approximately 17" for mounting horizontally in a 19" cabinet.

H. Power Receptacles for 208V Three-Phase

1. Refer to DAMAC Cabinet package.
2. Coordinate power for network switch equipment and Paging equipment with manufacturers recommendations and other trades.
3. Provide receptacles in cabinets in quantities and locations identified in approved shop drawings.
4. Input Power: Each PDU shall be rated for 5.7kW at 208 VAC, 3-phase.
5. Input Connector: (1) 10 foot, ground locking type NEMA L21-20P cord.
6. Output Power: 120VAC, 208VAC
7. Output Connector: (21) NEMA 5-20R, and (6) NEMA L6-20R
8. Dimensions: Minimum length of 70 inches and complies with UL 60950.
9. Each unit shall be unswitched to prevent accidental power down of equipment.
10. Each unit shall have integral surge protection.
11. Route and connect all power cords to the PDU allowing maximum air circulation through the equipment cabinet. Neatly tie all excess PDU cord.

I. Uninterruptible Power Supply

1. Refer to Room UPS equipment defined by Div 16.

J. Plywood Backboard Wall Lining

1. Plywood backboard shall be minimum AC grade, void-free plywood, 8 ft high with a minimum thickness of ¾ inch and provided where indicated on the drawings.
2. Plywood backboards shall have one of the following fire resistant treatments:
 - a. Fire-rated and mounted with the A grade and fire rating stamp viewable
 - b. Painted on all sides with at least two coats of fire-resistant paint. Do not paint over fire rated stamps (FR-S) on plywood.
3. Plywood shall be installed over wall surface with the grade "A" surface viewable.

4. Securely fasten the plywood to wall-framing members to ensure support for attached equipment using recessed head hardware. Provide minimum 1 inch gap from finish floor.
5. Coordinate with power trades as required for cutout locations of convenience power outlets.

K. Plywood Backboard Accessories

1. Furnish and install wire training and routing accessories including D-Rings and Wireways as needed to properly support cabling with MIA and industry standard neatness.

L. Spare Capacity

1. Provide equipment mounting configuration to maximize availability of future rack mounting space.
2. Provide cabinets as indicated on Drawings to maintain all required clearances and maximize available rack mounting space in each Telecom Room.

2.02 CABLE TRAY-TR AND MPOE ROOMS

A. Manufacturers: Refer to MIA Standards of Practice for preferred product, subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. PW Industries/ Legrand
2. Chalfant Manufacturing Company.
3. Cooper B-Line, Inc.
4. Cope, T. J., Inc.; a subsidiary of Allied Tube & Conduit.
5. GS Metals Corp.; GLOBETRAY Products.
6. MONO-SYSTEMS, Inc.
7. MPHusky.
8. Panduit
9. Approved Equivalent.

B. Cable Tray General

1. Cable tray widths, depth and routing shall be as shown on drawings. Maximum cable tray depth shall not exceed 6 inches.
2. All straight sections shall be supplied in standard lengths, except where shorter lengths are required to facilitate tray assembly lengths as shown on drawings.
3. Cable tray shall be made to manufacturing tolerances as specified by NEMA. Contractor and manufacturer shall provide test reports in accordance with the latest revision of NEMA VE-1 or CSA C22.2 No. 126
4. Fabricate cable tray products with rounded edges and smooth surfaces.
5. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

6. Provide all necessary cable tray supporting hardware, connectors, transitions, and bonding jumpers as recommended by cable tray manufacturer.
7. Provide Firestopping for cable tray penetration of room walls

2.03 TR AND MPOE OVERHEAD CABLE TRAY

- A. Ladder type trays shall consist of two longitudinal members (side rails) with transverse members (rungs) welded to the side rails. Rungs shall be spaced 6 inches on center.
- B. Straight section and fitting side rails and rungs shall be extruded from Aluminum Association Alloy 6063. All fabricated parts shall be made from Aluminum Association Alloy 5052
- C. Cable tray inside edge radius shall be a minimum of 12 inches.
- D. Rungs shall have a minimum cable-bearing surface of 7/8 inch with radius edges. No portion of the rungs shall protrude below the bottom plane of the side rails. Each rung must be capable of supporting the maximum cable load, with a safety factor of 1.5 and a 200 pound concentrated load when tested in accordance with NEMA VE-1, section 5.4.
- E. Straight tray sections shall have side rails fabricated as I-Beams. All straight sections shall be supplied in standard lengths, except where shorter lengths are required to facilitate tray assembly lengths as shown on drawings.
- F. Splice plates shall be the bolted type made as indicated below for each tray type. The resistance of fixed splice connections between adjacent sections of tray shall not exceed .00033 ohms. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing rated loading capacity of the cable tray.
 1. Aluminum - Splice plates shall be made of 6063-T6 aluminum, using four square neck carriage bolts and serrated flange locknuts. Hardware shall be zinc plated in accordance with ASTM B633, SC1. If aluminum cable tray is to be used outdoors then hardware shall be Type 316 stainless.
 2. Steel (including Pre-galvanized and Hot-dip galvanized) - Splice plates shall be manufactured of high strength steel, meeting the minimum mechanical properties of ASTM A1011 HSLAS, Grade 50, Class 1. Each splice plate shall be attached with four ribbed neck carriage bolts with serrated flange locknuts. Hardware shall be zinc plated in accordance with ASTM B633 SC1 for pre-galvanized cable trays, or Chromium Zinc in accordance with ASTM F-1136-88 for hot-dip galvanized cable trays.
- G. Cable Tray Supports: Shall be placed to ensure support spans do not exceed maximum span indicated on drawings and as recommended by the manufacturer. Supports shall be constructed from 12 gauge steel formed shape channel members with necessary hardware. Cable trays installed adjacent to walls shall be supported on wall mounted brackets. Each hanger shall be supported by two 0.5 inch (minimum) diameter rods.

- H. Provide full width cable tray drop out pans with radius supports above each cabinet. Provide a second drop out pan above cabinets containing patch panels, and as necessary to support all cables entering the top of each cabinet.
- I. Warning Sign Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "WARNING! NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."

2.04 CABLE TROUGH FOR FIBER OPTIC PATCH CABLES

- A. Provide isolated cable troughs attached to overhead cable tray for the purpose of supporting and protecting fiber optic patch cables extended from fiber termination panels to various cabinets within the TR's and MPOE.
- B. Include radius supported drops to each cabinet to minimize sidewall pressure and potential for microbends in fiber optic patch cables.
- C. Suitable cable trough products include:
 - 1. 2"x4" wire mesh cable tray
 - 2. Panduit 2x2 FiberRunner TM
 - 3. ADC 2 x 2 FiberGuide

PART 3 - EXECUTION

3.01 EXAMINATION

- A. See Section 27 01 00, Paragraph 3.1.

3.02 INSTALLATION

- A. See Section 27 01 00, Paragraph 3.2.
- B. Equipment Cabinets
 - 1. Shall be properly positioned, leveled, ganged, anchored, grounded and powered.
 - 2. Shall be populated as noted in drawings with termination hardware, equipment, proper patch cord lengths, cable management and power outlets.
 - 3. Install and anchor all floor mounted cabinets to floor.
 - 4. Install below raised floor bracing for all floor mounted cabinets on raised floor systems, following the drawings and manufacturer's instructions.
 - 5. All cabinet doors shall be configured as shown in the drawings.
 - 6. Power cords shall not be routed together with communication cables.

7. All cabinet cable entrances shall be provided with bushings.
- C. Vertical cable management shall be mounted vertically on both sides of each cabinet to function with placement of horizontal wire management provided for patch cordage
- D. Vertical power strips shall be mounted on sides of each free standing cabinet toward the back.
- E. Comply with NECA 1.
- F. Comply with BICSI TDMM and ANSI/TIA-569-C for layout and installation of communications equipment rooms.
- G. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-C.
- H. Bundle conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools. Velcro ties shall be used; zip ties shall not be allowed.
- I. Equipment cabinet clearances shall be:
 1. Clearance distances are measured from the outermost surface of devices installed in rack or mounted on wall, rather than from the rack or backboard
 2. Minimum 3 feet (1m) in front and rear of cabinets and racks.
 3. Minimum 1 inch (25 mm) cabinet side clearance in corners and end walls.
 4. Minimum 3 feet (1m) unobstructed aisle clearance for ingress and egress.
 5. Minimum 1 foot (300mm) above and below cable tray/ladder rack.
 6. Minimum 1 foot (300mm) clearance above top-most item (cable tray, ladder rack or fiber through) to any ceiling or overhead condition.
- J. Firestopping
 1. All Penetrations to TR and MPOE walls shall be Fire stopped to meet wall ratings as well as documented local code, MIA Standards and project specifications.
 2. Firestopping shall comply with TIA/EIA-569-C.
 3. Comply with BICSI TDMM, "Firestopping Systems" Article.
- K. Grounding
 1. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
 2. Provide grounding to all cabinets, cable tray and conduit within the TR and MPOE spaces. Refer to LAWA ITG Standards for additional requirements.
 3. Comply with ANSI-J-STD-607-A.

- 3.03 DOCUMENTATION
 - A. See Section 27 01 00, Paragraph 3.3.

- 3.04 GENERAL TESTING REQUIREMENTS
 - A. See Section 27 01 00, Paragraph 3.4.

- 3.05 FACTORY ACCEPTANCE TESTING
 - A. See Section 27 01 00, Paragraph 3.5.

- 3.06 INTEGRATION TESTING
 - A. See Section 27 01 00, Paragraph 3.6.

- 3.07 ENDURANCE TESTING
 - A. See Section 27 01 00, Paragraph 3.7.

- 3.08 MAINTENANCE AND SUPPORT
 - A. See Section 27 01 00, Paragraph 3.8.

- 3.09 CLEANING
 - A. See Section 27 01 00, Paragraph 3.9.

- 3.10 TRAINING
 - A. See Section 27 01 00, Paragraph 3.10.

- 3.11 ACCEPTANCE
 - A. See Section 27 01 00, Paragraph 3.11.

END OF SECTION

SECTION 271300

COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section 27 13 00 contains the technical specifications for Communication Backbone Cabling for the Satellite E Elevator Building at the Miami International Airport (MIA).
- B. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- C. Drawings and general provisions of the Contract, including Contractual Conditions and Division 00 and Division 01 specifications sections apply to this section.
- D. Telecommunication Backbone Cabling shall comply with MDAD Standards of Practice, most recent revision at start of work. Cross reference this specification to Appendix (A).
- E. This section includes the following:
 - 1. Backbone Fiber and Copper Cables
 - 2. Splice Cases
 - 3. Terminal Blocks and Cross-Connect Systems
 - 4. Copper Cable Termination Equipment
 - 5. Fiber Termination Equipment
 - 6. Cabling identification products
- F. This Section covers only communications backbone cables and terminations
- G. Performance Requirements: Backbone cabling system shall comply with transmission standards listed in Section 27 01 00, Paragraph 1.2.

1.02 REFERENCES

- A. See Section 27 01 00, Paragraph 1.2.

1.03 RELATED SECTIONS

- A. See Section 27 01 00, Paragraph 1.3.

1.04 SCOPE OF WORK

- A. Provide all backbone cabling, terminating hardware, adapters, and cross-connecting hardware necessary to interconnect telecommunication rooms, equipment rooms and building service entrances as part of the structured cabling system (SCS).
- B. The structured cabling system provides a consolidated communications infrastructure comprised of copper cables, and fiber optic cables routed throughout the facility. This system shall provide transmission media for voice and data signals. The Contractor shall provide structured cabling transmission media, components, and testing to conform to the Owner's standards as specified herein or shown on the plans and in conformance with manufacturers' requirements and recommendations.

1.05 QUALIFICATIONS

- A. Project Qualifications: See Section 27 01 00, Paragraph 1.5.A.
- B. Organization Qualifications: See Section 27 01 00, Paragraph 1.5.B.

1.06 SUBMITTALS

- A. See Section 27 01 00, Paragraph 1.6.

1.07 INTELLECTUAL PROPERTY

- A. See Section 27 01 00, Paragraph 1.7.

1.08 WARRANTY

- A. See Section 27 01 00, Paragraph 1.8.
- B. Complete required cable tests and warranty forms to provide owner with a minimum of 25 years of system warranty for installed cable plant.

1.09 QUALITY ASSURANCE

- A. See Section 27 01 00, Paragraph 1.9.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. See Section 27 01 00, Paragraph 1.10.
- B. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system (where applicable) is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- C. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.11 COMMISSIONING

- A. See Section 27 01 00, Paragraph 1.11.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:
 - 1. Backbone Riser Copper Cable, Patch Cords and Connecting Hardware
 - a. Belden Inc.
 - b. General Cable
 - c. Superior Essex
 - d. Other Approved Equivalent
 - 2. Backbone Optical Fiber Cable and Connecting Hardware
 - a. Corning
 - b. SYSTIMAX
 - c. Other Approved Equivalent
 - 3. Patch Cables and Connecting Hardware

- a. Corning
- b. SYSTIMAX
- c. Realm Communication Group

2.02 GENERAL

- A. All cables and terminations and protection shall be UL rated.
- B. All cables, terminations and protection shall comply with the NEC.

2.03 COPPER BACKBONE

- A. Manufacturers: Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:

- 1. Copper Backbone Cable, Patch Cords and Connecting Hardware

- a. Belden Inc.
- b. Commscope
- c. General Cable
- d. Superior Essex
- e. Other Approved Equivalent

- B. Copper Backbone Cable

- 1. Description: Multi-pair 100-ohm balanced, 50, 100, 200, or 300 -twisted-pair 22 AWG solid copper cable, formed into 25-pair binder groups covered with a thermoplastic jacket. Refer to Drawings for strand counts for each cable.

- a. Comply with ANSI/ICEA S-90-661 for mechanical performance requirements, testing and test methods.
- b. Comply with ANSI/TIA-568-C.2 Category 5e performance specifications applicable to multi-pair cabling.
- c. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

- 1) Communications Riser Rated; Type CMR.
- 2) Communications, Plenum Rated: Type CMP, complying with NFPA 262.

- C. Copper Backbone Patch Panels

- 1. Component certified to meet or exceed terminated cable performance requirements.
- 2. Modular RJ-45 non-keyed 8-position jack port and 110 IDC termination.
- 3. Factory labeled port numbers.

4. Rear cable management bar.
5. T568A/B to match existing pin-out scheme.
6. 50 ports per punch down.
7. Rated for minimum 500 re-connections,
8. Black finish.
9. Terminate pair 1 only of consecutive patch panel ports with consecutive pairs of multi-pair backbone cable.
10. Installation of patch panels shall include bonding patch panels to telecommunications room grounding system
11. All modular cross connect panels shall be UL listed.

2.04 FIBER BACKBONE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. CommScope, Inc.
 2. Corning Cable Systems.
 3. General Cable Technologies Corporation.
- B. Fiber Optic Backbone Cable General Requirements
 1. Fiber optic cable shall be of loose tube, non gel-filled design, provided in counts as indicated on the Drawings.
 2. Fiber optic cabling system shall comply with ANSI/TIA-568C.0 and C.3
 3. Fiber optic cable shall be certified to meet all parts of TIA-455 and comply with TIA-492, ISO/IEC 11801, ANSI/ICEA S-83-596 and ANSI/ICEA S-83-640 and the NEC.
 4. Fibers shall have coating to ensure color retention, minimize microbending losses and improve handling. The coating shall be mechanically strippable.
 5. Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked OFNP (optical fiber non-conductive plenum) in accordance with the NEC.
 6. Buffered fibers shall be organized in subunits of fibers, reinforced with aramid yarn for extra strength and surrounded with a color-coded low smoke tube.
 7. No cabling shall be placed in plenum without written permission from the Owner.
 8. Fiber optics conductors shall follow standard color code schemes. Fiber numbers and binders shall correspond to the color codes as follows:
 - a. Fiber/Binder No. 1 – blue.
 - b. Fiber/Binder No. 2 – orange.
 - c. Fiber/Binder No. 3 – green.
 - d. Fiber/Binder No. 4 – brown.
 - e. Fiber/Binder No. 5 – slate.
 - f. Fiber/Binder No. 6 – white.
 - g. Fiber/Binder No. 7 – red.

- h. Fiber/Binder No. 8 – black.
 - i. Fiber/Binder No. 9 – yellow.
 - j. Fiber/Binder No. 10 – violet.
 - k. Fiber/Binder No. 11 – rose.
 - l. Fiber/Binder No. 12 – aqua.
9. The fiber optic cable shall be shipped on reels in lengths as specified with a minimum overage of 10 percent.
 10. The cable shall be wound on the reel so that unwinding can be done without kinking the cable.
 11. Two meters of cable at both ends of the cable shall be accessible for testing.
 12. Marking: Each reel shall have a permanent label attached showing length, cable identification number, cable size, cable type, attenuation, bandwidth, and date of manufacture. Labels shall be water resistant and the writing on the labels shall be indelible.
 13. Cable Minimum Bending Radius:
 - a. During Installation: 20 times cable diameter
 - b. After Installation: 10 times cable diameter
 14. Operating Range: -76°F to 185°F (-60°C to 85°C).
 15. Storage Temperature Range: -40°F to 149°F (-40°C to 65°C).
 16. All fiber optic cable outside of communications rooms not encased in conduit or innerduct must be armor-jacketed with proper outer covering.
- C. Multimode Fiber Requirements
1. No Multimode Fiber currently planned for the project.
- D. Single Mode Fiber Requirements
1. Single mode fiber shall be Low Water Peak," ITU recommendation G.652D.
 2. Attenuation: ≤ 0.4 from 1310 to 1625nm, ≤ 0.3 at 1550nm, and at 1383nm, \leq that specified at 1310nm, after hydrogen aging.
 3. Macrobend ≤ 0.5 dB at 1625nm
 4. PMD ≤ 0.2 ps/sqrt(km).
 5. Manufacturer: Corning SMF28e+
- E. OPTICAL FIBER CABLE HARDWARE
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Corning Cable Systems.
 - b. SYSTIMAX Solutions; a CommScope, Inc. brand.

2. Modular Fiber Optic Termination /Patch Panels
 - a. Patch Panel enclosures shall be rack or wall mounted in accordance with the Drawings, and with black all metal solid surfaces, hasps on front and rear doors, and legends inside front access door.
 - b. Enclosures shall provide front or rear access with integral adapter plates, splice trays, blanking panels, cable slack storage and mounting hardware. Blank positions and additional enclosures shall be provided for spare capacity requirements.
 - c. Shall support modular LC connector front access bulkhead panels.
 - d. Singlemode bulkhead connectors and end connectors shall be designed specifically for singlemode fiber. Multi-mode bulkhead connectors and end connectors shall be designed specifically for multi-mode fiber.
 - e. Single mode connector/coupler covers shall be yellow, multimode connector/coupler covers shall be aqua.
 - f. Side cable entry and side jumper entry.
 - g. All coupler panels shall be ceramic sleeves/ferrules.
 - h. Cable shall be terminated with fusion splice to pigtails supported by splice trays within Termination/patch panels.

3. Fusion Splice Case:

- a. Outside plant cabling shall be fusion spliced in approved splice case. Provide splice case with the following features:
 - 1) High capacity, multiple cable support
 - 2) Fusion splice trays(12 or 24 strand) –labeled
 - 3) Splice protection sleeve
 - 4) Weather tight seal pressurized or approved equal

4. Cable Connecting Hardware:

- a. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2, TIA-604-3-A, and TIA-604-12. .
- b. Comply with ANSI/TIA-568-C.3
- c. Fiber optic cable connector shall be APC-SC type with ceramic ferrules.
- d. Connector shall be properly sized for fiber type.
- e. All termination methods shall be as specified as acceptable to the fiber cable manufacture to maintain full cable manufacturer’s warranty and industry standard expected life cycle. Construction shall be applicable for the intended installation environment.

F. FIBER OPTIC PIGTAILS AND PATCH CABLES:

1. All connector terminations shall be factory built and tested.
2. Terminations shall be Angle Polished Connectors (APC) SC type

3. Lengths shall be determined per panel and application to provide no excess loops or routing between panels, racks and equipment.
4. Connector loss shall not exceed industry Standard as defined in EIA/TIA- 568-C.
5. Labeling shall be customized as defined in MDAD Standards of Practice. Refer to appendix(A)
6. Manufacturer
 - a. Realm Communication Group (RCG)
 - b. Approved equivalent

PART 3 - EXECUTION

3.01 EXAMINATION

- A. See Section 27 01 00, Paragraph 3.1.
- B. Contractor's on-site RCDD supervisor shall review, approve and stamp all shop drawings, coordination drawings and record drawings.
- C. Verify cable schedule matches conduit system, length and routing is in accordance with drawings and schedules.
- D. Verify all cable and materials have been tested prior to and after installation.
- E. Verify all cable splices have been identified and adequate equipment is on hand to perform splicing.
- F. Verify all equipment is certified and tested before being used to test cables.

3.02 INSTALLATION

- A. See Section 27 01 00, Paragraph 3.2.
- B. Coordinate locations with other trades prior to installation.
- C. Install work following drawings, manufacturer's instructions and approved submittal data.
- D. Installation plans and requests for information (RFIs) shall be reviewed by contractor's on-site RCDD.
- E. All work shall be supervised and reviewed by contractor's on-site RCDD.
- F. Locations and Types:

1. Install cables in galvanized rigid steel conduits in outdoor above-ground locations, inside vaults and in corrosive and wet environments.
2. Install cables in PVC conduits buried in duct banks or encased in concrete.
3. Install cables in groups to maximize the usage of conduit. Fiber cables should be grouped together in conduits. Copper cables should be grouped together in conduits.
4. Cables may pass through areas with temperature differential of 20 degrees F or more. Seal with proper fitting at barrier between areas of differing temperature.
5. Contractor's RCDD shall coordinate with drawings of other disciplines to determine availability of space for installation.

G. INSTALLATION OF CABLES

1. Comply with NECA 1.
2. General Requirements for Cabling:
 - a. Comply with ANSI/TIA-568-C.0 and C.1.
 - b. Comply with BICSI ITSIM.
 - c. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - d. Cables may not be spliced except to attach pigtail connectors. Secure and support cables at intervals not exceeding 30-inches (762 mm) and not more than 6-inches (152 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - e. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - f. Bundle conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM. Use lacing bars and distribution spools.
 - g. Conduit fill for backbone cable, including spare capacity requirements, shall be limited to 40 percent fill for 3 cables and over, 31 percent fill for 2 cables and 53 percent fill for 1 cable. Comply with BICSI TDMM.
 - h. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - i. In the communications equipment room, provide a 10-foot-long backbone cable service loop.
 - j. Pulling Cable: Comply with BICSI ITSIM. Monitor cable pull tensions.
 - 1) Optical Fiber Cable Installation: Comply with ANSI/TIA-568-C.0 and C.1.
 - k. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
 - l. Group connecting hardware for cables into separate logical fields.
3. Separation from EMI Sources:

- a. Comply with BICSI TDMM and ANSI/TIA-569-C recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
- b. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - 1) Electrical Equipment Rating Less than 2 kVA: A minimum of 5-inches.
 - 2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12-inches.
 - 3) Electrical Equipment Rating More than 5 kVA: A minimum of 24-inches.
- c. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - 1) Electrical Equipment Rating Less than 2 kVA: A minimum of 2-1/2-inches.
 - 2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6-inches.
 - 3) Electrical Equipment Rating More than 5 kVA: A minimum of 12-inches.
- d. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - 1) Electrical Equipment Rating Less than 2 kVA: No requirement.
 - 2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3-inches.
 - 3) Electrical Equipment Rating More than 5 kVA: A minimum of 6-inches.
- e. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA and Larger: A minimum of 48-inches.
- f. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5-inches.

H. Firestopping

- 1. Comply with ANSI/TIA-569-C "Firestopping."
- 2. Comply with NECA 1.

3.03 DOCUMENTATION

- A. See Section 27 01 00, Paragraph 3.3.
- B. Identify system components, wiring, and cabling complying with ANSI/TIA-606 and as modified for compliance with MDAD telecommunications administrative standard.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid

frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

3.04 GENERAL TESTING REQUIREMENTS

- A. See Section 27 01 00, Paragraph 3.4.

- B. Post-Installation Testing

1. Contractor shall test each copper cable pair and each fiber strand of every optical fiber cable prior to acceptance.
2. Contractor shall supply all of the required test equipment used to conduct acceptance tests.
3. Contractor shall submit acceptance documentation as defined below. No cabling installation is considered complete until test results have been completed, submitted and approved.

- C. Test Procedure

1. Owner reserves the right to be present or to assign a representative to be present during any or all testing.
2. All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the Owner.
3. Testing of all copper and fiber wiring shall be performed prior to system(s) cutover.
4. 100 percent of the installed cabling shall be tested. All tests shall pass test criteria defined below.
5. Test equipment shall be fully charged prior to each day's testing.
6. Any pairs not meeting the requirements of the standard shall be brought into compliance by the contractor at no charge to the Owner. Complete end-to-end test results shall be submitted to the Owner.

- D. Standards Compliance and Test Criteria

1. Fiber optic cable shall meet or exceed ANSI/TIA-568-C.3 Optical Fiber Cabling Components Standard requirements and meet the manufacturer's specifications for the installed product.

- E. Cable Test Documentation

1. Cable test documentation shall be submitted in hard copy in three-ring binders and electronic (CD-ROM) formats. If proprietary software is used, CD shall contain any necessary

software application required to view test results. If the results are delivered in a standard format like Excel, Access, CSV files, etc., software to read these files is not required. Electronic reports shall be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate shall reference traceable circuit numbers that match the electronic record.

2. The following reports shall be submitted. Any individual test that fails the relevant performance specification shall be marked as FAILED.
 - a. Certification test report for Category 5e backbone cable.
 - b. Certification test report for Fiber Optic cable.
 - c. OTDR and power meter test report for Fiber Optic cable.
3. Test reports shall include the following information for each cabling element tested:
 - a. Wiremap results that indicate that 100 percent of the cabling has been tested for shorts, opens, miswires, splits, polarity reversals, transpositions, presence of AC voltage and end-to-end connectivity.
 - b. Length (in meters), propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
 - c. Cable manufacturer, cable model number/type and nominal velocity of propagation (NVP)
 - d. Tester manufacturer, model, serial number, hardware version, and software version
 - e. Circuit ID number and project name
 - f. Origination and destination locations.
 - g. Autotest specification used
 - h. Overall pass/fail indication
 - i. Date of test
 - j. Test reports shall be submitted within seven 7 business days of completion of testing.

F. Fiber Cable Testing

1. Perform bi-directional end to end Optical Time Domain Reflectometer (OTDR) testing on each fiber optic conductor per TIA-455-61. The system loss measurements shall be provided at 850 and 1300 nanometers for multimode fibers and 1310 and 1550 for single mode fibers. Measured results shall be plus/minus 1 dB of submitted loss budget calculations.
2. For cable length less than 1000 feet, initially test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA-526-14A: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable.
 - a. Measured results shall be plus/minus 1 dB of submitted loss budget calculations.
 - b. If loss figures are outside this range, test cable with optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.

3. Fiber links shall have a maximum loss of: (allowable cable loss per km)(km of fiber in link) + (.4dB)(number of connectors) = maximum allowable loss
4. Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two.
5. Any link not meeting the requirements of the standard shall be brought into compliance by the contractor, at no charge to the Owner.
6. Submit OTDR and/or Power Loss test results and include the following:
 - a. Fiber Type
 - b. Wavelength
 - c. Fiber and cable number
 - d. End point locations
 - e. Test direction
 - f. Reference power measurement (when not using a power meter with a Relative Power Measurement Mode)
 - g. Measured attenuation of the link segment
 - h. Acceptable link attenuation
 - i. Test equipment model and serial numbers
 - j. Date
 - k. Reference setup
 - l. Operator (crew members)

7. Acceptable Attenuation Values

- a. The general attenuation equation for any link segment is as follows; Acceptable Link Attn. = Cable Attn. + Connection Attn. + Splice Attn. + Coupled Power Ration (CPR) Adjustment.
- b. Note: A connection is defined as the joint made by mating two fibers terminated with re-mateable connectors (e.g. SC, LC).

G. Backbone copper testing – Backbone Level 3 cable; every cable installed between buildings, MDFs or IDF's shall be tested for continuity and impedance. Selected circuits shall be tested to demonstrate Category 5e transmission capability. Test results to show at minimum:

1. Comm. room end points.
2. Cable UCI number.
3. Pair count.
4. Cable physical characteristics.
5. Impedance.
6. Date.
7. Operator.

H. Cable Test Equipment

1. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers shall be ISO 9001 certified.
2. Test equipment for Category 6A UTP shall be UL verified to meet Level III accuracy as specified in ANSI/TIA-568-C.2. The cable installers shall have a copy of this reference in their possession and be familiar with the contents.
3. Test equipment for multimode fiber cabling shall meet the requirements of ANSI/TIA-526-14-A. The light source shall meet the launch requirements of ANSI/TIA-455-50B, Method A. The cable installers shall have a copy of these references in their possession and be familiar with the contents.
4. The test instrument shall be within the calibration period recommended by the manufacturer.
5. Test instruments shall have the latest software and firmware installed.
6. All test tools of a given type shall be from the same manufacturer, and have compatible electronic results output.
7. Test adapter cables shall be approved by the manufacturer of the test equipment. Adapters from other sources are not acceptable.

3.05 FACTORY TESTING REQUIREMENTS

- A. See Section 27 01 00, Paragraph 3.5.

3.06 INTEGRATION TESTING

- A. See Section 27 01 00, Paragraph 3.6.

3.07 PERFORMANCE TESTING

- A. See Section 27 01 00, Paragraph 3.7.
- B. Test all cables in accordance with referenced standards and manufacturer's recommended testing procedures.
- C. Test all Fiber strands in accordance with referenced standards and manufacturer's recommended testing procedures.
- D. OTDR testing shall be performed for each fiber strand in each direction.

3.08 ENDURANCE TESTING

- A. See Section 27 01 00, Paragraph 3.7.

3.09 MAINTENANCE AND SUPPORT

- A. See Section 27 01 00, Paragraph 3.8.

3.10 CLEANING

- A. See Section 27 01 00, Paragraph 3.9.

3.11 TRAINING

- A. See Section 27 01 00, Paragraph 3.10.

3.12 ACCEPTANCE

- A. See Section 27 01 00, Paragraph 3.11.

END OF SECTION

SECTION 271500

COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.01 SUMMARY

- A. See Section 27 01 00, Paragraph 1.1.
- B. Section 27 15 00 contains the technical specifications for Communications Horizontal Cabling for the Satellite E Elevator Building at Miami International Airport (MIA).
- C. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- D. Drawings and general provisions of the Contract, including Contractual Conditions and Division 00 and Division 01 specifications sections apply to this section.
- E. Telecommunication Horizontal Cabling shall comply with MDAD Standards of Practice, most recent revision at start of work. Refer to Appendix (A).
- F. This Section includes copper horizontal cabling, termination hardware and patch cables.
 - 1. UTP Copper: Category 6 rated horizontal cabling with related components.
 - 2. Fiber Optic: Single mode and 50 μ m Laser Optimized Multimode (horizontal distribution).
 - 3. Copper Backbone multi-pair cabling.
- G. This Section provides telecommunications infrastructure that will be installed using a phased approach and schedule.
- H. Performance Requirements: Horizontal cabling system shall comply with transmission standards listed in Section 27 01 00, Paragraph 1.2.

1.02 REFERENCES

- A. See Section 27 01 00, Paragraph 1.2.

1.03 RELATED SECTIONS

- A. See Section 27 01 00, Paragraph 1.3.

1.04 SCOPE OF WORK

- A. Provide all horizontal cabling, terminating hardware, adapters, and cross-connecting hardware necessary to connect work area outlets to the structured cabling system (SCS).
- B. The structured cabling system provides a consolidated communications infrastructure comprised of copper and fiber optic cables routed throughout the facility. This system shall provide transmission media for voice and data signals. The Contractor shall provide structured cabling transmission media, components, and testing to conform to the Owner's standards as specified herein or shown on the plans and in conformance with manufacturers' requirements and recommendations.
- C. Horizontal cable and its connecting hardware shall provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
 - 1. ANSI/TIA-568-C.1 requires that a minimum of two telecommunications outlet/connector ports be installed for each work area.
 - 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 - 3. Bridged taps and splices shall not be installed in the horizontal cabling.
 - 4. Splitters shall not be installed as part of the optical fiber cabling.
- D. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 9 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 21 feet in the horizontal cross-connect.
- E. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.
- F. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.
- G. Provide 15 year extended Warranty for Horizontal Category 6 structured cabling system.

1.05 QUALIFICATIONS

- A. Project Qualifications: See Section 27 01 00, Paragraph 1.5.A.
- B. Organization Qualifications: See Section 27 01 00, Paragraph 1.5.B.

1.06 SUBMITTALS

- A. See Section 27 01 00, Paragraph 1.6.

1.07 INTELLECTUAL PROPERTY

- A. See Section 27 01 00, Paragraph 1.7.

1.08 WARRANTY

- A. See Section 27 01 00, Paragraph 1.8.

1.09 QUALITY ASSURANCE

- A. See Section 27 01 00, Paragraph 1.9.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. See Section 27 01 00, Paragraph 1.10.
- B. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system (where applicable) is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- C. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CommScope, Inc.

2. General Cable
 3. SYSTIMAX Solutions; a CommScope, Inc. brand.
 4. Approved equivalent
- B. Horizontal copper cable shall be Category 6 four pair UTP as specified in the Drawings.
- C. Cable jacket shall comply with NEC Article 800 for use as Plenum rated with UL and c (UL) Listed.
- D. Cable shall terminate on an eight-pin miniature modular jack at each outlet. All horizontal cabling shall meet or exceed the associated category performance requirements per ANSI/TIA-568-C.2
- E. Cables shall be marked as UL verified with a minimum of Category 6 rating.
- F. The cable shall support Voice, Analog Baseband Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS-422, RS-485, 10BASE-T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 10 Gbps Ethernet, , as well as all 77 channels (550 MHz) of analog broadband video.
- G. The maximum horizontal cable length for horizontal copper UTP cable from the termination of the cable in the communications room to the outlet is 90 meters.

2.02 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Panduit Corp.
 2. Commscope / SYSTIMAX
 3. Other Approved Equivalent
- B. General Requirements for Cable Connecting Hardware:
1. Comply with ANSI/TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 2. Connectors shall be rated for minimum 500 re-connections.
 3. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC with minimum Category rating to meet or exceed terminated cable Category performance. Provide stand-off brackets blocks for the number of cables terminated on the block, plus 25 percent spare.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.

- E. Consolidation Point (CP)
 - 1. Consolidation Point shall consist of 110 type category rated connecting blocks to match cable type and cable management mounted within and enclosure.
 - 2. Connecting block hardware shall be provided to allow termination of future UTP cabling extended to future telecom outlets and eliminate need for patching or cross-connection at the CP.
 - 3. Port quantity shall be per Telecom Outlet Schedule.
 - 4. Comply with ANSI/TIA 568-C.1 and C.2.

- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
 - 1. Data Jacks shall be orange in color
 - 2. Outlet face plates shall be Almond color (confirm with Architect prior to ordering)

- G. Patch Cords: Factory-made, CAT6 compliant, four-pair stranded round cables; terminated with eight-position modular plug at each end. Route within cable management as necessary to provide connectivity between rack mounted equipment and patch panels.
 - 1. Patch cords shall have bend-relief-compliant boots and latch guards to protect against snagging.
 - 2. Patch cords shall have color-coded boots for system identification.
 - 3. Provide patch cords in quantities to match horizontal cable terminated port quantities.
 - 4. Patch cables shall be performance and impedance matched with horizontal cables and provided by the same manufacturer of the horizontal cable.
 - 5. Patch cords at telecom outlets located in plenum areas shall be plenum rated.
 - 6. Patch cables shall be provided in two colors:
 - a. Patch cables shall be Orange
 - b. Other Tenant patch cable colors -TBD

- H. Remote Equipment Cords: shall be provided as required per each System Specification in accordance with the requirements for Patch Cords contained within this Section. Length shall be minimum 6 feet (2 meters) to 9 feet (3 meters) and as required to allow proper cord routing and eliminate unsupported spans. Cords are generally available in lengths to 20 feet (6 m) and longer in 24-inch (600-mm) increments.

2.03 COPPER TERMINATION HARDWARE

- A. CAT6 Rated Copper Patch Panels
 - 1. Component certified to meet or exceed terminated cable Category standards.
 - 2. Modular RJ-45 non-keyed 8-position jack port to 110 IDC terminations for patch panels and RJ-45 to RJ-45 to cabinets.

3. Printed port numbers and label holder.
4. Rear cable management bar.
5. T568A/B to match existing pin-out scheme.
6. Individual patch panel size not to exceed 48 ports, black finish.
7. Installation of patch panels shall include bonding patch panels to telecommunications room grounding system
8. All modular cross connect panels shall be UL listed.

B. CAT6 Work Area Outlet Ports

1. 8P8C non-keyed modular outlets ANSI/TIA-568-C.2 compliant for Category 6 transmission requirements
2. T568A/B eight-position jack pin/pair assignments to match existing pin-out.
3. Faceplates shall be white, ivory or stainless steel to match electrical outlets.
4. Wall Phone Plates: Single jack wall plates shall be stainless steel, contain RJ45 eight conductor jacks and accept standard wall phones.
5. Provide adequate clearance within backbox for CAT6 cable bend radius.
6. Jacks shall be Orange in color

2.04 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Corning Cable Systems.
5. General Cable Technologies Corporation.
6. Optical Connectivity Solutions Division; Emerson Network Power.
7. Superior Essex Inc.
8. SYSTIMAX Solutions; a CommScope, Inc. brand.
9. 3M.
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Horizontal Fiber Optic Cable General Requirements

1. Fiber optic cable shall be of tight buffered, non gel-filled design, provided in counts as indicated on the Drawings.
2. Fiber optic cable shall be certified to meet all parts of TIA-455 and comply with TIA-492, ISO/IEC 11801, ANSI/ICEA S-83-596 and ANSI/ICEA S-83-640 and the NEC.
3. Fibers shall have D-LUX coating or approved equivalent to ensure color retention, minimize microbending losses and improve handling. The coating shall be mechanically strippable.

4. Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked OFNP (optical fiber non-conductive plenum) in accordance with the NEC.
5. Buffered fibers shall be organized in subunits of fibers, reinforced with aramid yarn for extra strength and surrounded with a color-coded low smoke tube.
6. No cabling shall be placed in plenum without written permission from the Owner.
7. Fiber optics conductors shall follow standard color code schemes. Fiber numbers and binders shall correspond to the color codes as follows:
 - a. Fiber/Binder No. 1 – blue.
 - b. Fiber/Binder No. 2 – orange.
 - c. Fiber/Binder No. 3 – green.
 - d. Fiber/Binder No. 4 – brown.
 - e. Fiber/Binder No. 5 – slate.
 - f. Fiber/Binder No. 6 – white.
 - g. Fiber/Binder No. 7 – red.
 - h. Fiber/Binder No. 8 – black.
 - i. Fiber/Binder No. 9 – yellow.
 - j. Fiber/Binder No. 10 – violet.
 - k. Fiber/Binder No. 11 – rose.
 - l. Fiber/Binder No. 12 – aqua.
8. The fiber optic cable shall be shipped on reels in lengths as specified with a minimum overage of 10 percent.
9. The cable shall be wound on the reel so that unwinding can be done without kinking the cable.
10. Two meters of cable at both ends of the cable shall be accessible for testing.
11. Marking: Each reel shall have a permanent label attached showing length, cable identification number, cable size, cable type, attenuation, bandwidth, and date of manufacture. Labels shall be water resistant and the writing on the labels shall be indelible.
12. Cable Minimum Bending Radius:
 - a. During Installation: 20 times cable diameter
 - b. After Installation: 10 times cable diameter
13. Operating Range: -76°F to 185°F (-60°C to 85°C).
14. Storage Temperature Range: -40°F to 149°F (-40°C to 65°C).
15. All fiber optic cable outside of communications rooms not encased in conduit or innerduct must be armor-jacketed with proper outer covering.

C. Multimode Fiber Requirements

1. Multimode Fiber currently not planned for this project.

2.05 OPTICAL FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Corning Cable Systems.
 2. SYSTIMAX Solutions; a Commscope, Inc. brand.
- B. Modular Fiber Optic Termination / Patch Panels
1. Patch Panel enclosures shall be rack or wall mounted in accordance with the Drawings, and with black all metal solid surfaces, hasps on front and rear doors, and legends inside front access door.
 2. Enclosures shall provide front or rear access with integral adapter plates, splice trays, blanking panels, cable slack storage and mounting hardware. Blank positions and additional enclosures shall be provided for spare capacity requirements.
 3. Shall support modular APC/SC connector front access bulkhead panels.
 4. Singlemode bulkhead connectors and end connectors shall be designed specifically for singlemode fiber. Multi-mode bulkhead connectors and end connectors shall be designed specifically for multi-mode fiber
 5. Single mode connector/coupler covers shall be yellow, multimode connector/coupler covers shall be aqua.
 6. Side cable entry and side jumper entry.
 7. All coupler panels shall be ceramic sleeves/ferrules.
 8. Cable shall be terminated with fusion splice to pigtails supported by splice trays within Termination/patch panels.
- C. Fiber Optic Splice Cases
1. Splices shall not be permitted in Horizontal fiber cable.
- D. Fiber Patch Cords:
1. Factory-made, APC-SC connectors.
 2. Patch cables shall be performance matched with horizontal cables and provided by the same manufacturer of the horizontal cable.
 3. Route within cable management at minimum lengths up to 21-feet (5 meters) as necessary to provide connectivity between rack mounted equipment and patch panels.
 4. Provide duplex patch cords in quantities to match horizontal cable termination pair quantities
 5. Cords located in plenum areas shall be plenum rated.
 6. Labeling shall be customized as defined in MDAD Standards of Practice
 7. Manufacturer
 - a. Corning
 - b. SYSTIMAX

- c. Realm Communication Group (RCG)
- d. Approved equivalent

E. Cable Connecting Hardware:

- 1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2, TIA-604-3-A, and TIA-604-12. Comply with TIA-568-C.3.
- 2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
- 3. Rated for minimum 500 e-connection.

2.06 SPARE CAPACITY

- A. Patch Panel Terminations: Provide spare capacity for 25% additional future terminations.
- B. Telecom Outlet cabled ports: Provide minimum overall terminated spare capacity of 25% additional ports available for use and as indicated on the Telcom Outlet Schedule.

2.07 GROUNDING

- A. Comply with ANSI-J-STD-607-A.

2.08 IDENTIFICATION PRODUCTS

2.09 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to ANSI/TIA-568-C.0.
- C. Factory test UTP cables according to ANSI/TIA-568-C.2.
- D. Factory test optical fiber cables according to TIA-526-14-A and ANSI/TIA-568-C.0.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. See Section 27 01 00, Paragraph 3.1.

3.02 INSTALLATION

- A. See Section 27 01 00, Paragraph 3.2.

- B. Wiring Methods:

1. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - a. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
3. Wiring within Enclosures: Bundle cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

- C. Comply with NECA 1.

- D. General Requirements for Cabling:

1. Comply with ANSI/TIA-568-C.0 and C.1.
2. Comply with BICSI ITSIM Install 110-style IDC termination hardware unless otherwise indicated.
3. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.
4. Terminate conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

6. Provide hook and loop cable restraints for loose bundling of cables. Plastic cable ties are not permitted.
 7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 8. Bundle conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable, including replacement of any cable suffering paint spatters, which may void the cable warranty.
 10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
 12. Pulling Cable: Comply with BICSI ITSIM. Monitor cable pull tensions.
- E. UTP Cable Installation:
1. Comply with ANSI/TIA-568-C.0 and C.1.
 2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
- F. Optical Fiber Cable Installation:
1. Comply with ANSITIA-568-C.0 and C.1.
 2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- G. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Cable shall not be installed in hangers or run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- H. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
 2. Install cabling after the flooring system has been installed in raised floor areas.
 3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.
- I. Group connecting hardware for cables into separate logical fields.
- J. Separation from EMI Sources:

1. Comply with BICSI TDMM and ANSI/TIA-569-C for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

K. Firestopping

1. Firestopping shall comply with ANSI/TIA-569-C.
2. Comply with BICSI TDMM, "Firestopping Systems" Article.

L. Grounding

1. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
2. Comply with ANSI-J-STD-607-A.
3. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
4. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.03 DOCUMENTATION

- A. See Section 27 01 00, Paragraph 3.3.

3.04 GENERAL TESTING REQUIREMENTS

- A. See Section 27 01 00, Paragraph 3.4.

- B. Perform tests and inspections.

- C. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with ANSI/TIA-568-C.0 and C.2.
2. Provide field testing and balanced twisted-pair field tester requirements per TIA-1152.
3. Testing shall be based on guidelines in IEC 61935-1.
4. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
5. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
6. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in ANSI/TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
7. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.0. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.

- 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in ANSI/TIA-568-C.0.

8. UTP Performance Tests:

- a. Test for each outlet. Perform all applicable testing per ANSI/TIA-568-C.2 to include:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.

9. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to ANSI/TIA-568-C.0 and ANSI/TIA-568-C.3.

10. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

- a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
- b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.05 FACTORY ACCEPTANCE TESTING

A. See Section 27 01 00, Paragraph 3.5.

3.06 INTEGRATION TESTING

- A. See Section 27 01 00, Paragraph 3.6.

3.07 PERFORMANCE TESTING

- A. Test all cables in accordance with referenced standards and manufacturer's recommended testing procedures
- B. Test all Fiber cables in accordance with referenced standards and manufacturer's recommended testing procedures.
 - 1. OTDR testing shall be performed for each fiber strand in each direction.

3.08 ENDURANCE TESTING

- A. See Section 27 01 00, Paragraph 3.7.

3.09 MAINTENANCE AND SUPPORT

- A. See Section 27 01 00, Paragraph 3.8.

3.10 CLEANING

- A. See Section 27 01 00, Paragraph 3.9.

3.11 TRAINING

- A. See Section 27 01 00, Paragraph 3.10.

3.12 ACCEPTANCE

- A. See Section 27 01 00, Paragraph 3.11.

END OF SECTION

SECTION 27 15 13
COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 GENERAL

1.01 SUMMARY

A. Communications Copper Horizontal Cabling

1. Horizontal cabling for voice and data circuits shall be enhanced category 6, 24 (CMR) AWG, 4-pair U/UTP, UL/NEC CMR rated, and be independently verified for compliance.
2. Maximum cable diameter for CMR rated 620 cable shall be .210inches.
3. Maximum cable diameter for CMR rated 630 cable shall be .235inches.
4. Cable performance shall be independently verified and characterized to 600 MHz.
5. (TE620P & TE620R) Enhanced category 6 rated cable shall have a margin of 11 dB for pair-pair NEXT at 250 MHz.
6. (TE630P & TE630R) Enhanced category 6 rated cable shall have a margin of 12 dB for pair-pair NEXT at 250 MHz.

PART 2 PRODUCTS

2.00 OWNER FURNISHED

- A. No owner furnished materials in this project.

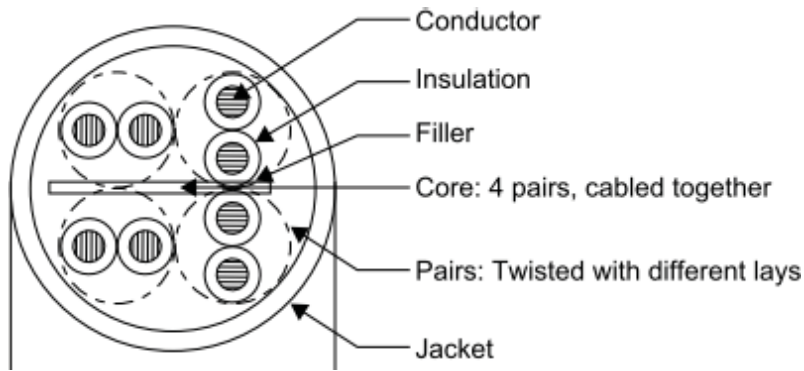
2.01 MANUFACTURED COMPONENTS

A. Manufacturer List

1. TE Connectivity

B. Product Options

1. Enhanced category 6 U/UTP Horizontal Cabling



Cat 6 TE620 Series 4-Pair Cable

- a. Horizontal cabling for voice and data circuits shall be 24 (CMR) 4-pair U/UTP, NEC/NFPA CMR rated and be independently verified for compliance. Cable performance shall be independently verified by ETL and meet the TIA/EIA-568-C.2 Category 6 requirements.
- b. Cable jacketing shall be white, blue and yellow] and lead-free. Cable shall be packaged on a 1000ft reel-in-box,. Cable shall be independently verified for flammability by UL and shall comply with NEC article 800 and NFPA 70; CMR (ANSI/UL 1666).
- c. Horizontal cable shall be TE Connectivity product part number See Table 1.

Description	NEC/NFPA Rating	Packaging	Part Numbers			
			Blue	White	Gray	Yellow
Enhanced Category 6 U/UTP Cable, 620 Series	CMR	Reel-in-box, 1000 ft	TE620R-BLRB	TE620R-WTRB	TE620R-GYRB	TE620R-YLRB
		Pull-box, 1000 ft	TE620R-BLII	TE620R-WTII	TE620R-GYII	TE620R-YLII
		Reel, 1000 ft	TE620R-BL02	TE620R-WT02	TE620R-GY02	TE620R-YL02

Description	NEC/NFPA Rating	Packaging	Part Numbers			
			Blue	White	Gray	Yellow
Enhanced		Reel-in-box, 1000 ft	TE630R-BLRB	TE630R-WTRB	TE630R-GYRB	TE630R-YLRB

Category 6 U/UTP Cable, 630 Series	CMR	Reel, 1000 ft	TE630R-BL02	TE630R-WT02	TE630R-GY02	TE630R-YL02
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TABLE 1
HORIZONTAL CABLE PART NUMBERS

PART 3 EXECUTION

3.03 INSTALLATION

- A. Install all systems in accordance with manufacturer’s printed instructions, as well as all Miami-Dade County codes and standards.
- B. All copper horizontal cables shall be installed in the following manner:
 1. Cable raceways shall not be filled greater than the NEC maximum fill for the particular racewaytype
 2. Cables shall be installed in continuous lengths from origin to destination (no splices) unless specifically addressed in this document
 3. The cable’s minimum bend radius of 4 times the cable diameter and maximum pulling tension of 25 lbs shall not be exceeded
 4. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of four-foot intervals – at no point shall cable(s) rest on acoustic ceiling grids or panels
 5. Horizontal distribution cables shall be bundled in groups of not greater than 40 cables (cable bundle quantities in excess of 40 cables may cause deformation of the bottom cables within the bundle)
 6. Cable shall be installed above fire-sprinkler and systems and shall not be attached to the system or any ancillary equipment or hardware
 7. The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices
 8. Cables shall not be attached to ceiling grid or lighting support wires
 9. Where light support for drop cable legs is required, install clips to support the cabling
 10. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced prior to final acceptance at no cost to the Owner

11. Cables shall be identified by a self-adhesive label
12. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate
13. Cables shall be dressed and terminated in accordance with the recommendations in ANSI/TIA-568-C standards, manufacturer's recommendations, and/or best industry practices.
14. Pair untwist at the termination shall not exceed 0.25 inch for connecting hardware
15. Cables shall be neatly bundled and dressed to their respective panels or blocks
16. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame
17. The cable jacket shall be maintained as close as possible to the termination point
18. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties
19. Cable labels shall not be obscured from view
20. Data Center and SAN Communication cabling should run under the access floor in the hot aisle.

END OF SECTION

SECTION 27 15 43

COMMUNICATIONS FACEPLATES AND CONNECTORS

PART 1 GENERAL

1.01 SUMMARY

A. Communications Faceplates and Connectors

1. Wall and modular furniture faceplates shall contain 2 category 6 jacks for voice and data communications. Faceplate jacks shall be terminated with category 6 cables and inserted into the communications faceplate. Faceplates shall contain location designations as defined in scope of work and approved by MDAD contracting officer.

PART 2 PRODUCTS

2.00 OWNER FURNISHED

- ###### A. No owner supplied materials in the project.

2.01 MANUFACTURED COMPONENTS

A. Manufacturer List

1. TE Connectivity

B. Product Options

1. Category 6 Jacks

- a. Two communications faceplate ports shall contain Category 6 jacks. Jacks shall be terminated to the horizontal cabling and inserted into the communications faceplate.
A two port faceplate shall contain 1 data port and 1 voice port.
- b. Modular jacks shall terminate using 110-style pc board connectors, color-coded for both T568A and T568B wiring. Each modular jack shall be wired to T568B. The 110-style insulation displacement connectors shall be capable of terminating 22-24 AWG solid or 24 AWG stranded conductors. The insulation displacement contacts shall be paired with additional space between pairs to improve crosstalk performance. Modular jacks shall utilize a secondary PC board separate from the signal path for crosstalk compensation. Modular jacks shall meet the ANSI/TIA- 568-C.2 requirements for category 6 performance.

- c. Modular jacks shall be compatible with the TE Connectivity SL series modular jack termination tool part number 1725150-1. Modular jacks shall be UL Listed under file number E81956.
- d. Work area data jacks shall be TE Connectivity product part number 1375055-6 and be blue in color.
- e. Work area voice jacks shall be TE Connectivity product part number 1375055-8 and be white in color.
- f. CCTV and ICM data jacks shall be TE Connectivity product part number 1375055-3 and be yellow in color

2. Wall Faceplates

- a. Work area wall outlets shall be white, standard, single gang 2-port faceplates.
- b. Data/voice outlets shall be loaded with modular jacks. Faceplates shall contain labeling scheme defined in the scope of work and approved by MDAD contracting officer.
- c. Faceplates shall be TE Connectivity product part number 2111009-3.

PART 3 EXECUTION

3.03 INSTALLATION

- A. Install all systems in accordance with manufacturer's printed instructions, as well as all Miami-Dade County codes and standards.

END OF SECTION

SECTION 27 16 19

COMMUNICATIONS PATCH CORDS, STATION CORDS, AND CROSS-CONNECT WIRE

PART 1 GENERAL

1.01 SUMMARY

A. Communications Patch Cords, Station Cords, and Cross-Connect Wire

1. Data and voice cable assemblies for the horizontal cross-connect and the workstation shall be Category 6 assemblies. Cable assemblies shall be factory-assembled by the manufacturer of the cabling system.
 - a. Each telecommunications room (TR) shall require 8-foot cable assemblies to connect between the horizontal data patch panels and network equipment. The total quantity of cable assemblies required in each TR shall be equally divided between the three assembly lengths. Each workstation shall require one 10-foot cable assemblies for Data.
2. Data backbone cross-connect assemblies in the MC and TR shall be fiber optic cable assemblies factory-terminated using duplex OM3 50/125µm or single-mode cable. Data backbone cross-connect optical fiber cable assemblies shall be duplex LC to LC duplex (depending upon the electronic interface).

PART 2 PRODUCTS

2.00 OWNER FURNISHED

- A. No owner furnished material in this project.

2.01 MANUFACTURED COMPONENTS

A. Manufacturer List

1. TE Connectivity

B. Product Options

1. Category 6 Patch Cords

- a. Data cross-connect and workstation cable assemblies shall be constructed using RJ45 modular

plugs. The cable assemblies shall utilize colored cable and "snagless" cable boots. Cable assemblies shall comply with ANSI/TIA-568-C.2 category6 performance requirements and shall be factory-assembled.

- b. Cross-connect data cable assemblies shall be blue, white and yellow in color. Cross-connect data cable assemblies shall be TE Connectivity product part number(s); 1933118-X see Table 1.
- c. Workstation data cable assemblies shall be blue in color. Workstation data cable assemblies shall be TE Connectivity product part number 1933118-X See table 1.

2. Cable Assemblies for Backbone Data Circuits

- a. Backbone data cable assemblies shall be optical fiber assemblies' factory-terminated using duplex OM3 50/125um or Single-mode cable.
- b. Optical fiber cable assemblies shall be duplex LC to Duplex LC (depending upon the electronic interface).
- c. Optical fiber cable assemblies shall be riser rated.
- d. Optical fiber cable assemblies shall be TE Connectivity product part number(s) see Table 2.

(Replace R with P for plenum rated fiber cable assemblies)

Connector End 1	Fiber Type	Connector End 2			
		Standard MT-RJ	Duplex SC	Duplex LC	Dual ST
Duplex LC	OM3 50/125um	PAT-LCMC-R30CxxxM	PAT-LCSC-R30CxxxM	PAT-LCLC-R30CxxxM	PAT-LCTC-R30CxxxM
Duplex LC	Single-mode	PAT-LCMC-RS0CxxxM	PAT-LCSC-RS0CxxxM	PAT-LCLC-RS0CxxxM	PAT-LCTC-RS0CxxxM

XXX DENOTES LENGTH IN METERS

TABLE 2
FIBER OPTIC CABLE ASSEMBLY PART NUMBERS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install all systems in accordance with manufacturer's printed instructions, as well as all Miami-Dade County codes and standards.

END OF SECTION

SECTION 28 00 00

SECURITY ACCESS CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security Access Control System.

1.02 REFERENCES

- A. For requirements relating to reference standards, edition dates and additional information, refer to Section 014219 (MDAD 01090) - Reference Standards
- B. Products of workmanship that are specified by association, trade, or federal standards shall comply with the requirements of the following reference standards, except when more rigid requirements are specified or are required by applicable codes.
 - 1. American National Standards Institute (ANSI).
 - 2. Building Industries Consulting Service International (BICSI):
 - a. BICSI (TDMM) - Telecommunications Distribution Methods Manual.
 - 3. Electronic Industries Alliance (EIA).
 - 4. Institute of Electrical and Electronic Engineers (IEEE).
 - 5. International Organization for Standards (ISO):
 - a. ISO 9001 -- Quality Management Systems - Requirements.
 - 6. National Fire Protection Association (NFPA):
 - a. NFPA 70 -- National Electrical Code.
 - 7. Telecommunications Industry Association (TIA):
 - a. ANSI/TIA/EIA 568-B -- Commercial Building Telecommunications Cabling Standard.
 - (1) ASNI/TIA/EIA-568-B.1 -- General Requirements.
 - (2) ASNI/TIA/EIA-568-B.2 -- 100 Ohm Twisted Pair Cabling Standards.
 - (3) ASNI/TIA/EIA-568-B.3 -- Optical Fiber Standards.
 - b. ANSI/TIA/EIA-569-A -- Commercial Building Standards for Telecommunications

Pathways and Spaces.

- c. ANSI/TIA/EIA-606-A -- The Administration Standard for the Telecommunications Infrastructure of Commercial Building.
- d. ANSI/TIA/EIA-607 -- Commercial Building Grounding and Bonding Requirements for Telecommunications.

C. Electrical Code Compliance: Comply with applicable Federal, State and Local code requirements of the authority having jurisdiction.

1.03 RELATED WORK

- A. Surveillance and control devices identification as specified elsewhere.
- B. Providing all cabling, conduit and connections as required for complete and functional systems as specified elsewhere.
- C. Providing 120 VAC uninterruptible power as required for all equipment provided under this section as specified elsewhere.
- D. Assemble equipment furnished disassembled in accordance with manufacturer's recommendations as specified elsewhere.
- E. Providing door hardware for remote monitoring and control of openings as scheduled under this section as specified elsewhere.

1.04 SYSTEM DESCRIPTION - SECURITY/PERIMETER ACCESS CONTROL SYSTEM

- A. Access Control: Building and selected areas using proximity cards, magnetic swipe, barcode, or biometric identifiers.
 - 1. Exterior Doors: Control access into building at locations as shown on drawings.
 - 2. Interior Building Areas: Control access into areas as shown on drawings.
 - 3. Restrict Access of individual credential-holders by time of day, day of week/month/year and specific points of entry via user-configurable software.
 - 4. Unlock Doors to building and selected areas automatically, where shown on drawings, for a scheduled period of time throughout the day allowing free access and egress without the use of a card and avoiding the generation of an alarm condition on the access control system. The system GUI computer operator shall be able to unlock doors from the computer system.
 - 5. Monitor Points in building and selected areas as shown on drawings that may provide unauthorized access or egress and may be a point for forced entry. The system shall report changes in status for all monitored points indicating the specific location so the operator can respond appropriately.
 - 6. Photo Identification for all credential-holders to be stored in conjunction with database information.

7. Video Monitoring of doors and alarms when access is requested or a door is opened. This is provided by connection between the Access Control System, Video Surveillance System over an IP or 232 Interface.
 8. Provide graphical display of building maps with dynamic display of door status and alarms on all access control workstations.
 9. Provide report generation for all alarm signals.
- B. System Interface: Shall provide a real-time display of all alarms and system events, archive all events in a history file to a relational database and serve as the instrument through which all system programming is accomplished. Computer/Workstation shall be configured for the intended system function by loading the appropriate services and operating system software.
1. Security Monitoring Station Computer: Shall be installed in CCR control console.
- C. Central Database Server: The Gateway service shall provide a connection between the Central Database Server all Access Control Panels (ACP's). The connection to the ACP's will be over a Local Area Network (LAN) connection. The central system will provide real-time transactional storage of all system events, archive time configured events into a separate Archive Database serve as the instrument through which all system programming is stored.
- D. Access Control Panels shall be installed in the equipment rooms as indicated on the Contract Documents, communicating to the Central Server over a local LAN connection. The ACP's shall connect to all reader and alarming devices. The system shall provide:
1. Access Control: to building and selected areas using proximity cards, magnetic swipe, barcode and biometric scanners.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Include system components and controls, installation requirements, and relationship with adjacent construction.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Company specializing in manufacturing the products specified with minimum 20 years documented experience, and with a certified servicing organization within 150 miles (225 km) of Project.
 2. Manufacturer shall be capable of providing through its resellers a sole-source, turn-key solution including, but not limited to system server, customary cameras, wiring,

networking components, and other peripherals essential for operation of the solution.

3. Manufacturer shall be directly accessible to end users for advice on service, support, and warranty issues. Manufacturer shall maintain support information for public access on a web site and facilitate contact with technical resources.
4. Software updates shall be freely accessible for download from the manufacturer's web site. Terms for release of software revisions offering substantially new capabilities shall be offered for sale at the discretion of the manufacturer.
5. Manufacturer's operation manual and training tutorials shall be directly accessible through the system server main menu and provided on PC-compatible CD for installation on any personal computer. The manual and tutorial shall provide for intuitive topic search and help for system operation and function explanations. Additional computer support and help utilities shall be included on the system server main menu to assist in managing functions such as multi-media control, file management, disk and media management, file authentication, backup and more.

B. Installer Qualifications:

1. Company specializing in installing the Products specified in this section and Related Work with minimum five years documented experience. Experience shall include projects with access control systems of similar scope and magnitude. Company shall be a Certified Dealer of the manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 COORDINATION

- A. Provide system including network computers, controllers, credential readers, credentials and badging station.
- B. Provide detection devices.
- C. Connect electric strikes and monitor status of door controls.
- D. Provide request for egress Passive Infrared Detectors (PIR) and pushbuttons.

- E. Provide all required power supplies. Provide all cabling connections required. Provide all specialty conduit requirements. Coordinate with the Electrical Contractor.
- F. The security contractor in coordination with the door hardware supplier shall provide the security components as scheduled and indicated on the Contract Drawings.

1.10 WARRANTY

- A. Security/Perimeter Access Control System:
 - 1. Provide a full performance and material guarantee for two years from the final acceptance of the system. The warranty shall be unconditional and include all manufacturer hardware material to maintain the system in operational condition.

1.11 SPECIAL TOOLS, EQUIPMENT AND MATERIALS

- A. The Contractor shall deliver to the Owner's representative all special tools, equipment and materials necessary to maintain the system provided under this Contract. A list of all special tools, equipment and materials associated with each system shall be submitted to the Owner minimum 2 weeks prior to final acceptance test.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Frontier / Matrix Systems for existing doors in wayside areas and any new doors being added on this project.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 ACCESS CONTROL AND MANAGEMENT SYSTEM

- A. System: Access Control System by Matrix Systems®.
- B. System Requirements:
 - 1. All devices required to complete the installation may not be described but shall be provided as if specifically called for within the Specification. It is the responsibility of the Contractor to provide a complete working system.
 - 2. All system components shall be approved and certified for the function they will perform.
 - 3. The system shall be of an open architecture design and shall support industry standard databases such as Microsoft SQL Server 2000/2005, MSDE or SQL Server

- 2005 Express.
4. A system server for enterprise wide database services, system programming, system monitoring, administrative services, report and proximity card generation.
 5. A workstation computer shall provide interfacing and control of the local, site specific, Access/Security System and located within the CCR for use by the CCO.
 6. The System shall be of a distributed database design, using intelligent microprocessor panels, to make smart decisions at the door.
 7. The system shall be capable of utilizing a true client server network configured to support the system database service, all panel services and user interfaces optimizing the users' options for system programming, event monitoring and record keeping.
 8. The database service shall be ODBC compliant allowing the system to access an existing compatible ODBC compliant database as the system data source. A single system database shall maintain both credential-holder's records as well as access system information and programming parameters.
- C. Security Terminal Cabinets (STC):
1. The STC shall be a metal cabinet suitable for wall mounting.
 2. The following components shall be mounted in the STC:
 - a. Site Controller, Alarm Interfacing Panels.
 - b. Terminal Strips. Double row barrier terminal strips.
 - c. Power Supplies and Batteries
 - d. Tamper switch.
 - e. Other equipment which is required to provide a functional, working system.
 - f. The door shall be protected by an anti-tamper device in such a way that a tamper alarm shall be generated if any portion of any door moves more than one quarter of an inch from its closed position. This alarm shall be sent to the Computer.
 - g. Enclosure shall be dust tight, equivalent to Hoffman NEMA 4, 12 or 13 styles.
- D. Power Supply Systems
1. The Access Control Systems shall be fed from the UPS system power at 120 volt AC.
 2. The electric mortise and/or electric strike lock power supply be 24VDC, 4 Amp, 6 Amp, or 10 Amp as required by site loads. These panels shall be fed from the UPS system power at 120 volt AC. The lock power supply shall include multiple DC outputs on separate Class 2 current limited fuses, fused line voltage input, individual manual on/off switching with individual LED indicated power status. These power supplies shall be used to power all access controlled electric door hardware. It shall be Altronix or qualified and approved equal.
 3. Each Security Remote Control Panel shall have sealed, no-maintenance, rechargeable batteries.
 - a. Sufficient power shall be included to allow the RCP to operate a minimum of 8 hours when loaded to its maximum configuration and capacities.
 - b. Power back-up shall be of such size and capacity that 8 hours can be increased to a minimum of 24 hours.
 - c. The batteries shall be enclosed in the RCP or in a Security Terminal Cabinet.
 - d. An alarm with descriptive message shall be generated at the Computer

- whenever a RCP loses AC power and is operating on battery power.
 - e. An alarm with descriptive message shall be generated at the Computer whenever a RCP loses back-up battery power.
- E. Life Safety
 - 1. Card access system shall be connected to the fire alarm system by the Security Contractor.
 - 2. All electric doors in the pathway of building egress shall release as required by life safety code.
- F. Access Control - Primary Security Server Station: Provide computer operating latest generation Microsoft Server operating system supported by manufacturer, with 100 GB hard

drive, internal-drive backup, 1Gig RAM, 128 MB-Video RAM, CD-RW Drive, 17" SVGA Monitor, Optical Mouse, Keyboard, two (2) serial comm. ports, One (1) parallel comm. Port, two (2) USB 2.0 ports, 10/100 Mbps fiber optic NIC Ethernet card.

1. Provide complete programming as required for:
 - a. Graphical User Interface (GUI) including graphic maps/floor plans with all devices shown. Provide all alarm, trouble, access, signaling, and GUI operator interfacing through the graphic maps in the system software.
 - b. Database management including credential reader, fingerprint scan data, credential-holder data, access groups, time zones, and input/output devices.
 - c. Password protection and operator levels.
 - d. System Management Reports. Provide and interface report printer as specified in this Section.
 - e. ODBC Data Import/Export.
 - f. Event Log Output.
 - g. Data Audit Trail.

2.3 READERS

- A. Proximity cards and card readers, long range proximity card reader shall be manufactured by HID Corporation, Matrix, or approved equal.
- B. Keypad Readers: As recommended by manufacturer.

PART 3 EXECUTION

3.1 INSPECTION AND PREPARATION WORK

- A. This contractor shall examine the conditions under which the system installation is to be performed and notify the Owner's Representative or Design Professional in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to provide a workmanlike installation.
- B. Review areas of potential interference and resolve conflicts before proceeding with the work. Coordinate ceiling layout and wall layout and other work that penetrates or is supported throughout the space of the building. All work shall be flush and workmanlike in all finished areas.

3.2 INSTALLATION

- A. Install materials and equipment in accordance with manufacturer's printed instructions to comply with governing regulations and industry standards applicable to the work and as shown on approved shop drawings.

- B. Arrange and mount all equipment and materials in a manner acceptable to the Design Professional and Owner.
- C. Installation shall conform to the basic guidelines.
 - 1. Use of approved wire, cable, raceways, wiring, devices, hangers, supports and fastening devices.
 - 2. Separation of high and low voltage wiring is required throughout the installation.
 - 3. All wiring shall be thoroughly tested for grounds and opens.
- D. All power wiring shall be in metallic conduit. The maximum conduit fill shall not exceed 40% of rated capacity. Refer to NFPA 70-NEC for additional requirements.
- E. Cabling and Wire Requirements:
 - 1. Low voltage signal and/or control wiring shall run in separate conduit/raceway from electric power cables. Cables for door locks are power cables. Provide separation from lighting fixtures and other electrical appurtenances. Provide electrical interference protection circuits as required to maintain the signal quality specified herein and required by system manufacturers.
 - 2. The individual systems low voltage cabling shall use separate junction boxes and enclosures.
 - 3. The minimum low voltage cabling for security, communications and safety systems shall be as required by the manufacturers without cost increases to owner for the full function intended. The systems cabling shall meet the requirements of NFPA 70/NEC Articles 725, 760 and 800 as applicable for each type of system specified.
 - a. All dimensions and conditions shall be verified in the field. The Contractor shall notify the Architect of any discrepancies before proceeding with the work.
 - b. Card reader cables shall be NFPA 70, Article 725 compliant.
 - c. Electrified mortise and door strike power cabling shall be NFPA 70, Article 725 compliant.
 - d. Touch sensor bar power cabling shall be NFPA 70, Article 725 compliant.
 - e. Door control/door monitoring power cabling shall be NFPA 70, Article 725 compliant.
 - f. Elevator and fire alarm interfacing cabling shall be NFPA 70, Article 725 compliant.
 - g. Card Readers to Control Panel: maximum length shall not exceed 500 feet.
 - h. Extended Reader Line Drivers: may be used between the Central Unit and the Remote Unit for a maximum length not to exceed 10,000 feet (3050 m). Cabling between the Central unit and the control panel shall be as specified for a reader, request to exit and a relay. Cabling between the Remote Unit shall be as specified for a reader, request to exit and a door strike.
 - i. Alarm Point and Request to Exit Point to Control Panel: maximum length shall not exceed 500 feet (150 m).
 - j. Relay to Device: maximum distance shall not exceed 1,000 feet (300 m).
 - k. Refer to the riser diagram located on the Contract Drawings.
 - 4. The minimum bend radius of all security, communication conduits provided under this project shall be 6 inches (150 mm). Provide and maintain pull strings/tapes/ropes in all

conduits for future installation of additional fiber optic cabling.

F. Fire Stopping:

1. Provide code required fire stopping at all fire rated wall, floor and partition penetrations with UL listed fire stopping materials.

G. Junction Boxes, Enclosures/Cabinets, Equipment Racks:

1. The junction and pull boxes shall be securely attached to the structural members of the building at locations accessible for servicing. Provide access doors at locations accessible for servicing. Provide access doors at locations where access is not readily available.
2. The equipment enclosures shall be installed at approved locations and be typically ventilated as required to maintain the environmental conditions specified by the electronic equipment manufacturers.
3. All junction boxes and pull boxes shall be labeled. The box label shall state the system and use of cabling. The labeling shall be made with markers which are indelible when and after in contact with water and oil. Labeling of junction boxes visible to inmates shall be approved by Architect/Engineer and Owner.
4. Each box and enclosure shall contain a cabling and wiring log identifying all cabling accessible whether is connected or is passing by.

H. Grounding and Surge Protection:

1. Provide single point grounding of the individual systems as recommended by IEEE and system manufacturers. Provide all cabling, bonding and insulation materials as required. Provide surge protection and clamping for all circuits. Coordinate all grounding, surge protection and clamping circuit requirements with the system manufacturers.
2. Coordinate grounding requirements with other trades and contractors to preclude closing of ground loops via peripheral equipment supplied from different electrical power sources. Provide isolation transformers and other equipment as required.

3.3 PROGRAMMING

- A. Complete system programming shall be provided by the installer and system manufacturer.
1. Programming shall be accomplished by direct interface and review with the Owner.
 2. Programming shall continue until all interfaces, reports and system operation meet the Owner's requirements.
 3. Actual building CADD drawing shall be used as the graphical maps for the backgrounds of device location.

3.4 FIELD QUALITY CONTROL

- A. A project manager shall be appointed during the course of the installation. This shall assure complete coordination and technical information when requested by other trades. This

person shall be responsible for all quality control during installation, equipment set-up and testing. This individual shall have training to provide first hand knowledge of the installation.

3.5 ADJUSTING, TESTING AND CLEANING

- A. Contractor shall be required to perform complete testing and verification of the following:
 - 1. Card Reader maximum access time shall be 0.75 seconds under all system loads, i.e. regardless of number of cards presented simultaneously.
 - 2. Proper operation of electric door strikes, egress switching (where required), door position monitor switches and exit hardware.
 - 3. Proper operation of magnetic door switches.

3.6 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's field services for the start-up, commissioning and training of this system.
 - 1. Include services of technician to supervise programming, adjustments, final connections, system testing and training Owner's personnel.

3.7 DEMONSTRATION

- A. Provide system demonstration.
 - 1. Demonstrate normal and abnormal modes of operation and required response to each.
 - 2. Provide system training.

3.8 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 28 08 00

COMMISSIONING OF ACCESS CONTROL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security Access Control System Commissioning.

1.02 REFERENCES

- A. For requirements relating to reference standards, edition dates and additional information, refer to Section 014219 (MDAD 01090) - Reference Standards
- B. For general commissioning requirements, refer to section 019113 (rev-E).
- C. For commissioning of New Steel Doors & Door Hardware, refer to section 080800.
- D. Products of workmanship that are specified by association, trade, or federal standards shall comply with the requirements of the following reference standards, except when more rigid requirements are specified or are required by applicable codes.
 - 1. American National Standards Institute (ANSI).
 - 2. Building Industries Consulting Service International (BICSI):
 - a. BICSI (TDMM) - Telecommunications Distribution Methods Manual.
 - 3. Electronic Industries Alliance (EIA).
 - 4. Institute of Electrical and Electronic Engineers (IEEE).
 - 5. International Organization for Standards (ISO):
 - a. ISO 9001 -- Quality Management Systems - Requirements.
 - 6. National Fire Protection Association (NFPA):
 - a. NFPA 70 -- National Electrical Code.
- E. Electrical Code Compliance: Comply with applicable Federal, State and Local code requirements of the authority having jurisdiction.

1.03 RELATED WORK

- A. Surveillance and control devices identification as specified elsewhere.
- B. Providing all cabling, conduit and connections as required for complete and functional systems as specified elsewhere.
- C. Providing 120 VAC uninterruptible power as required for all equipment provided under this section as specified elsewhere.
- D. Assemble equipment furnished disassembled in accordance with manufacturer's recommendations as specified elsewhere.
- E. Providing door hardware for remote monitoring and control of openings as scheduled under this section as specified elsewhere.

1.04 QUALITY ASSURANCE

- A. Pre-testing / certification:
 - 1. All egress doors shall be subjected to the Access Control Functional Test for performance to owner specifications and NFPA requirements. Testing shall be conducted prior to owner review using the Access Control Functional Test form located in appendix 'A'.

PART 2 PRODUCTS (Not Used in this Specification)

PART 3 EXECUTION

3.1 GENERAL

- A. Execution of the commissioning process for the systems to be commissioned is specified in Section 019113 (MDAD 01810) - Commissioning Requirements.

3.2 ADJUSTING, TESTING AND CLEANING

- A. Contractor shall be required to perform complete testing and verification of the following:
 - 1. Card Reader maximum access time shall be 0.75 seconds under all system loads, i.e. regardless of number of cards presented simultaneously.
 - 2. Proper operation of electric door strikes, egress switching (where required), door position monitor switches and exit hardware.
 - 3. Proper operation of magnetic door switches.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's field services for the start-up, commissioning and training of this system.
 - 1. Include services of technician to supervise programming, adjustments, final connections, system testing and training Owner's personnel.

3.4 DEMONSTRATION

- A. The Contractor shall notify the CA after the first system has been installed but prior to covering for verification. The Contractor will be responsible for taking four (4) photos per unit being installed and completing a photo log and installation checklist provided by the CA. A sample form is provided in Schedule "A". Provide at least 3 megapixel resolution digital photos of the area at different stages of installation. Photos must be of sufficient detail to show proper installation.
- B. The Contractor will demonstrate proper installation of a representative sample of the systems listed in "Schedule A" located at the end of this specification. If the CA discovers any issues at that time, the Contractor shall correct the issue prior to continuing installation.
- C. Provide system demonstration.
 - 1. Demonstrate normal and abnormal modes of operation and required response to each.
 - 2. Demonstrate the function of the following (TP10's)
 - a. Access control install and supporting hardware
 - b. Door position switch
 - c. Sounder
 - d. Request to exit
 - e. Locking hardware
 - f. Card reader / keypad
 - g. Tamper switch
 - h. Anti-passback (if applicable)
 - i. Interlock (if applicable)
 - j. Fire alarm interface
 - 3. Provide system training to MDAD designee and/or representative.

3.5 COMMISSIONING COMPLETION

- A. Commissioning Completion is when all commissioning responsibilities of the Contractor are completed.
- B. The CA will determine when commissioning is complete and so advise the PM.

END OF SECTION

Attachments:

SCHEDULE A - ACCESS CONTROL FUNCTIONAL TEST CHECKLIST.

SECTION 28 23 00

CCTV CAMERA, AUDIO INTERCOM INSTALLATION AND PROGRAMMING
INTEGRATION SERVICES

PART 1 GENERAL

1.01 SUMMARY

- A. Miami-Dade Aviation Department - MDAD (the "Owner") as part of Miami International Airport (MIA) requires Installation and Programming Integration Services ("Work") of Audio Interface Units ("Intercoms") and Closed Circuit Television cameras ("CCTV") for Miami International Airport's Central Baggage Inspection Service (CBIS) ("Project"). The Project Manual, associated Drawings including General Notes and Sequence of Operation, further specifies CCTV and Intercom installation and programming integration requirements.
- B. CCTV Installation Services: Trade Contractor shall install, terminate, adjust Field of View (FOV), test and commission all CCTV cameras throughout the CBIS facility and associated baggage delivery system.
- Trade Contractor shall provide, install, integrate and commission ceiling, wall and rooftop fixed and PTZ cameras, lenses & housings in locations directed by Owner's Drawings. Trade Contractor shall provide all required cameras, lenses, including any special housings, brackets and pedestals.
- C. Intercom Installation Services: Trade Contractor shall provide, terminate, test and commission all required Intercom components including Intercom Stations (w/speaker and call button), Audio Interface Unit Mixer, and 25-pair connector throughout the CBIS facility and associated baggage delivery system.
- D. Trade Contractor shall terminate Intercom Stations to Audio Multiplex Equipment and integrate with existing Owner's Security Systems. The 24-channel Audio Mixer Interface Unit provides power and distribution point for all signals to and from the Intercom Station.
- E. Power Supplies: Trade Contractor shall provide, terminate and test all required camera Power Supplies associated with new ANALOG camera installations. Supply to the Junction Box and tie Power Supplies to Emergency/Dedicated Circuit.
- F. Additional Head-End Equipment: IF additional Head-End Equipment is required, Trade Contractor shall be requested to provide, terminate, program, test and commission Head-End Devices. Trade Contractor shall provide all cost associated with providing, programming, documentation, testing and commissioning such devices.

IF Trade Contractor be requested to provide additional head-end equipment, then Trade Contractor shall also produce shop drawings for layout and configuration of head-end security equipment existing and required to be added and installed. Shop Drawings shall provide full detail for Trade Contractor to perform installation and interconnection of head-end equipment. Shop drawings shall be to scale for affected MSR(s) showing equipment layout for floor plan, rack and wall elevations. Shop drawings shall include schedules of all necessary products (assemblies, equipment and systems, including racks, cabinets, UPS and head-end security equipment to be installed. Shop Drawings shall depict both, existing and installed equipment.

- G. Programming Integration Services: Trade Contractor shall integrate and test all newly installed Intercoms and CCTV Cameras with existing Access Control System (ACS), Owner's Security System and the Security Operation Workstation (SOW). Programming Integration Services include configuration and interfaces to CellStack Gateway, Qognify Digital Video Recording System (DVRS), Matrix Access Control System and CellStack, video equipment, Emcom Audio Interface Mixer/Intercom and Juniper MPLS Network.
- H. Ensure Device Compatibility: Trade Contractor shall warrant all CCTV and Intercom devices, associated terminations; software, interfaces and integration are 100% compatible with existing MDAD Systems.

Implementation: Trade Contractor shall install and program Intercoms and CCTV cameras to meet program system implementation. The components described in this section are all part of the MIA Security Systems Integration, which includes proprietary developed software that allows all subsystems to operate in unison and deliver functions specifically defined and required at Miami International Airport.

MDAD Building Systems Manager MUST review and approve the certified personnel that will be required to perform these activities.

1.02 RELATED DOCUMENTS

Project Manual including Drawings, Division 0, Division 1, Division 26, 27 and 28 Sections shall form an integral part of the Project requirements.

1.03 DEFINITIONS, ABBREVIATIONS, ACRONYMS

Reference standards, abbreviations, and definitions contained in this Section are not necessarily a complete list, but are general to the extent they may not be defined explicitly elsewhere.

A. DEFINITIONS:

Managing General Contractor (MGC) – Contractor selected through bid and award process

Trade Contractor – CCTV/Intercom Installation and Program Integration provider

whose Individual, firm, partnership, joint venture or corporation enters into a Contract with the Managing General Contractor, including all subcontractors, vendors and suppliers at all tiers.

MGC Project Manager / MGC Project Superintendent – Authorized representative charged with the professional administration of this construction Contract.

MGC Safety Manager – Authorized and qualified MGC representative charged with the professional administration of the Safety Requirements of the Project.

Owner’s Representative – An authorized representative of the Owner who is an employee of the County.

Design Professional (DP) –, Engineer of Record

B. ABBREVIATIONS – ACRONYMS

ACS	Access Control System
A/E	Architectural/Engineering Firm
AHJ	Authority Having Jurisdiction
AOA	Aircraft Operation Area
API	Application Program Interface
CAD	Computer-Aided Design
CCTV	Closed Circuit Television
CMS	Cable Management System
DGM	Design Guideline Manual
DP	Design Professional
DRS	Digital Recording System
DVADTSDigital	Video, Audio and Data Transport System Network
DVRS	Digital Video Recording System
DVTS	Digital Video Transport System
FAA	Federal Aviation Agency
FOV	Field of View
LAN	Local Area Network
MDAD	Miami-Dade Aviation Department
MSR	MDAD Security Room
MTR	MDAD Telephone Room
NTP	Notice To Proceed
PTCS	Preliminary Trade Contractor Schedule (of Work)
SIA-TVAC	Security Institute Association CCTV to Access Control
SIDA	Security Identification Designated Area
SOW	Security Operation Workstation
TCS	Trade Contractor Schedule (of Work)
TCSSSP	Trade Contractor Site Specific Safety Plan

1.04 REFERENCED REQUIREMENTS

The publications listed below shall form an integral part of this specification. Specific reference to codes, rules, regulations, standards, requirements of regulatory agencies, MDAD Life Safety Master Plan shall meet the latest printed edition of each in effect at date of Project Manual unless document referenced herein is specifically dated.

Trade Contractor performance shall comply with all Owner and manufacturer's requirements, Closed Circuit Television Manufacturers Association (CCTMA) guidelines and requirements of Authorities Having Jurisdiction (AHJ).

All Work shall be performed in accordance with following standards:

- A. All applicable Federal, State, and local codes, rules, regulations, and ordinances governing the Work, are as fully part of Specification and Project Manual as if hereto attached. If Trade Contractor should note items in the drawings or specifications, construction of which would be code violations, Trade Contractor shall promptly call them to attention of Managing General Contractor and Design Professional in writing. Where requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.
- B. SIA TVAC - 01: CCTV to Access Control – Message Set for System Integration document
- C. SFBC: South Florida Building Code, including adopted standards
- D. MDAD Design Guideline Manual, Section 13710, titled Card Reader / Security Doors Sequence of Operation.
- E. MDAD Terminal Life Safety Master Plan – Mandatory Requirements
- F. NEC Standards
- G. NEMA: National Electrical Manufacturers' Association
- H. NFPA 15, 70, 72, 90A and 101
- I. ANSI/TIA/EIA Standards (refer to drawings)
- J. UL Underwriters Laboratory including but not limited to, UL 1863
- K. FCC Part 68-76 inclusive
- L. Building Industry Consulting Services International (BICSI®) publications:
 - 1. BICSI – Telecommunications Distribution Methods Manual
 - 2. BICSI – Telecommunications Cabling Installation Manual
- M. General Requirements – Division 26, 27 and 28 of the Project Manual are applicable in the execution of this Work.
- N. In event of conflicts, ambiguities, or discrepancies, precedence in resolving such conflict, ambiguities, or discrepancies shall be in accordance with General Conditions Provisions and the following:
 - a. Large-scale details shall govern over small-scale details

b.

- O. In case of discrepancies between plans and specifications not determined by above, the Design Professional shall be sole determiner of the intent. Such interpretations by Design Professional shall be in writing, and shall be consistent with, and reasonably inferable from intent of the Project requirements.

1.05 CCTV, INTERCOM AND SECURITY SYSTEM DESCRIPTION

A. General Description

Analog CCTV cameras and Intercoms shall connect to an existing special security network consisting of Juniper / CellStack digital network transmission equipment and a Qognify Systems digital video recording system. Video, voice and data connections are through communications rooms to demarcation panels located in MDAD Security Rooms (MSR). The MSRs' contains Security System infrastructure to support installation the installation of CCTV and Intercom devices.

IP CCTV Cameras shall connect to the Juniper Security network. All connectivity requirements, to extend existing Juniper network, to new MTR's will be included and provided in this project. Two (2) additional network switch's will be required in MSR H1472 Model (EX4200-48PX, with redundant power supply) is current standard network switch.

Owner's Security System consist of access control, live video/audio surveillance, audio/video recording and overall transport of audio, video and data, including high-speed data network and video/audio transmission and video/audio storage components.

The CCTV and Intercom Systems shall be electrically served from the Emergency Power Systems. CCTV Power Supply shall be connected to a dedicated emergency circuit provided by Building Contractor.

Trade Contractor shall ensure Intercom and CCTV installation along with program integration are completed in accordance with Schedules as defined in Division 1, Section 01310.

B. CCTV System Description

Functionally, Security Operation Workstation (SOW) notifies a Security Operator monitoring the Airport at his console position when a security event occurs such as a security door violation.

I. Audio – Intercom System Description

Functionally the Audio Interface Unit provides two-way audio communications between Security Operation Workstation and Intercom Stations located throughout the Airport.

The Intercom Station is a surface-mounted, hands free, full duplex intercom. Its internal amplifiers and speaker operate from line level audio IN and its microphone

and preamp provide line level audio OUT to DVTS interface. This Station provides contact signaling information to alert DVTS subsystem of activation and has two LED indicators to advise user of call placed and received status.

Two-way audio shall be connected between a security operator and intercom station when one of two scenarios occur and are acted upon by the security operator.

Scenario One – When security operator initially acquires alarm from ACS queue, he/she has the option of establishing audio connection based upon how that alarm has been configured in ACS.

Scenario Two – When call button is pushed, it applies a contact closure signal to remote expansion unit of DVTS.

1.06 SCOPE OF WORK – DESCRIPTION

A. Scope of Work – General

Trade Contractor shall provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all Work and to ensure Work complies with requirements stated or as reasonably inferred by Project documents. In addition, Trade Contractor shall:

- ~~4.~~ Employ job superintendent or project manager during the course of the installation to provide coordination of Work described in this specification and with other trades. Trade Contractor shall provide technical information when requested by other trades and attend project coordination / status meetings. This person shall be responsible for quality control during installation, equipment set-up, and testing in accordance with provisions stated in the Project Manual.
2. Ensure programming integration service is performed by personnel who are Qognify, Juniper Networks, Emcom and Matrix approved/certified for type of Integration Services required ensuring continuity of Owner's original equipment manufacturer's warranty and services for Head-End Systems.
3. Provide all required documentation.
4. Provide accurate set of redline and shop and as-built drawings. Trade Contractor shall keep redlined drawings up to date on a daily basis. This set will be used to submit periodic updated and final As-Built Drawings per schedule shown below.
 - ❖ Pay applications
 - ❖ Project Close-Out (Final)
7. Trade Contractor installation responsibilities shall include end-to-end coordination of general troubleshooting, camera adjustment, field of view, placement and camera / intercom software interfaces.

8. Trade Contractor shall provide wire management including cable dressing and machine printed labels for identification of Intercom and camera cabling, surge suppression and power as required by Project Manual. Cable identification shall be in accordance with format nomenclature referenced in structured cable specifications.
9. Trade Contractor shall submit updated Inventory Log on first day of each month for all installed Intercoms and installed or modified cameras.

Trade Contractor shall coordinate with Managing General Contractor, Owner and other subcontractors for implementation of Work in accordance with Project Manual requirements.

B. Scope of Work - New CCTV and Intercom Installations

Trade Contractor shall provide all equipment, materials, labor and services required to install, program, integrate and test CCTV and Intercom Systems including but not limited to the following:

1. Camera Installation: Trade Contractor shall:
 - (a) Provide and Install cameras, housing, lenses, and other associated equipment
 - (b) Trade Contractor shall provide PTZ Converters, Bi-Phase Converters, all cabling, patch cords, terminations to Owner's Head-End equipment, mounting brackets, mounting kits, surge protection, power supplies and components.
 - (c) Ensure all camera installations are in accordance with equipment manufacturer's written instructions, in compliance with National Electrical Code, and with recognized industry practices, to ensure CCTV system complies with requirements and serves intended purposes.
 - (d) Be responsible for complete installation and testing of all CCTV cameras and camera settings.
 - (e) Install flexible conduit, fittings from existing junction box to cameras, provide indoor ceiling mounting kits, mini-coax 2 foot patch cables (for elevator cab only), mounting brackets/kits, and surge suppression for outdoor camera (PTZ or fixed).

Camera power is provided from communications rooms to the camera locations. Coaxial Copper cable is utilized for video signal transmission.

2. Field of View Adjustment: Trade Contractor shall adjust Field of View (FOV) and focus for each newly installed camera in accordance with design requirements.

Trade Contractor shall aim each fixed CCTV camera for optimum view of the area that it is intended to cover, using a monitor to view camera output.

Trade Contractor shall set and name all preset positions per Owner's direction. Owner shall approve final aiming and PTZ camera preset prior to Final Acceptance. All required presets are to be shown on drawing updates.

3. Surge Suppression: All exterior cameras shall include fast acting transient voltage surge suppression on all copper conductors. Signal paths for all exterior mounted cameras shall be fully protected against transient voltages with fast acting surge suppressors at every termination point. The suppression equipment shall protect each conductor utilizing both common mode and differential mode devices. Trade Contractor shall be responsible to provide, install and test suppressors for exterior cameras in accordance with requirements stated in Project Manual and manufacturer's instructions.

The suppressor shall be installed in-line with copper circuits at the point where they enter building and via rack mountable surge suppressors at active equipment (inside MSR).

Trade Contractor shall submit in their closeout documents a letter from the surge protection manufacturer stating that the manufacturer or the manufacturers' representative has inspected the installation. The certification letter must state that the installation has been done in accordance with the manufactures' requirements and the warranty is in effect.

4. Video, Control, Power and Audio Cabling – MSR Room Set-up: Except as specified in drawings and specifications, PDS contractor will provide low voltage cabling and base building contractor will provide 110V power wiring. However, Trade Contractor shall provide, install and test camera Power Supply and patch cords in Communication Rooms and MSRs.

Trade Contractor shall terminate the connections of video, audio, control and power cables at each camera and intercom location. Trade Contractor shall patch all associated control, video / audio and power cable in each communication and MSR room and integrate Camera video and control Circuits along with two-way intercom audio with appropriate Security Systems.

5. Camera Troubleshooting and Adjustment of Focus and Field of View: For new cameras *installed and commissioned under this Project*, Trade Contractor shall provide camera troubleshooting and adjustment on "as requested basis" throughout the duration of this Contract-
6. Mounting Brackets: Trade Contractor shall:
 - ❖ Provide all CCTV mounting kits, indoor and outdoor rated as required. Roof top kits will include a lightning protection device and attachment to to the building grounding / bonding system, rated for lightning dissipation.
 - ❖ Submit a detailed shop drawing indicating all mounting components proposed for each camera location.
 - ❖ Ensure all exterior camera mounts are installed rigidly to eliminate camera

movement in winds up to 185 mph.

7. Dipswitch: Trade Contractor shall set all PTZ Camera addressing dipswitches. Dipswitch Information shall be provided by Integrator and approved by Owner.
8. Elevator Patch Cable: Trade Contractor shall provide mini-coax two (2) foot patch cable as required.
9. Elevator Cameras: Trade Contractor shall provide (unless otherwise directed) and test elevator cameras. All cables, cross connects and enclosure will be provided by Elevator Installer. Trade Contractor must coordinate with Elevator Installer prior to performing any Work.
10. Flex Conduit: Trade Contractor shall provide flexible conduit from junction box serving the camera-to-camera housing.
11. Power Supplies: For new installations, Trade Contractor shall provide (furnish and install) and test all CCTV Power Supplies in Telecom Rooms and MDAD Security Rooms. Trade Contractor shall provide, install and terminate jumper wire from power cable demarc to the Power Supply. Trade Contractor shall extend ¾" conduit and circuit to do a hard wire connection (if applicable and UL compliant).
12. Intercom installation: Trade Contractor shall provide and test all required door and elevator Intercom Systems in strict accordance with intent of the plans, drawings and specifications subject to terms and conditions of Contract Documents.

Signals from Intercom shall be received on standard 18 AWG (SOLID CORE) wire and terminated to demarc terminal block mounted in the MSR.

Audio Interface Unit shall mix audio IN and audio OUT from each Intercom and provide the combined output at line level to DVTS and DVRS. The Audio Mixer shall connect to the demarc via a 50-pin telephone connector (Amphenol type).

Trade Contractor shall interface Intercom Systems with existing Headset Preamps located at Security Operation Workstation(s). The Preamps enable low power audio headsets to interface with line level audio in/out devices. The headset's microphone output is amplified to line levels while incoming line level audio is adjusted to earpiece levels. In addition, the Preamp provides adjustable level, monitor tone to the audio out path. Upon connection, this tone provides a record warning tone to the Intercom Station.

Trade Contractor Intercom Installation responsibilities include:

- a. Termination of all connections, and provide all fastenings and support, sleeves, inserts, grommets, rings, frames, and field adjustments.
- b. Integration of Intercom System with Owner's Security System.
- c. Ensure all equipment exposed to elements is weather protected.

C. Scope of Work - CCTV and Intercom Programming Integration Services

To keep continuity under responsible party needed to maintain equipment until successful commissioning and start of warranty, Trade Contractor shall use only technicians certified by Juniper Networks, Qognify, and Cellstack (Telindus). Trade Contractor will submit the following minimum certifications of individuals performing the work to ensure compliance with this requirement.

- a. Digital Video, Audio and Data Transport System (DVADTS)
 - (1) Juniper Ingenious Champion – Switching
 - (2) Juniper Ingenious Champion – Routing
- b. Digital Video Recording System (DVRS)
 - (1) NICE Vision Technical Certification
- c. Digital Video Transport System (DVTS)
 - (1) CellStack Surveillance Solutions Certification

Certified Technician shall integrate all Security Control Cameras, Camera pan-tilt-zoom (PTZ) control, and Emcom Intercoms, MDAD Security System, and Qognify DVRS. In addition, Trade Contractor shall ensure interfaces support Security Operations' ability to use all current video display applications that allow selection and viewing of selected cameras and two-way communication of Intercom System. A certified Contractor will be required to integrate the ACS with the CCTV System.

a. Security System Interface includes (but is not limited to):

- ❖ Digital Video, Audio and Data Transport System (DVADTS) – Juniper Network. This existing system is a high-speed 20GbE MPLS Ethernet data network that spans the Airport. DVADTS's sole purpose is to provide high-speed inter-connectivity and integration of all security system components, equipment, computers and any other security devices needing this type of connectivity.
- ❖ Digital Video/Audio Recording System (DVRS) is a Qognify (formerly NICE) System. This existing system records video from the operational or security CCTV cameras and audio from Intercoms and makes this information available to Security Operation Workstation. Recording is also automatically initiated by any alarm monitored by Access Control System or continuously recorded 24 x 7 x 365.
- ❖ Digital Video Transmission System (DVTS) is a Cellstack System. This existing system is a real time video and audio Ethernet based switching system that provides video and audio selected by operator of the Security Operation Workstation or automatically initiated by any alarm monitored by Access Control System.

b. Trade Contractor Programming Integration Services shall include:

- (1) Interface and Integration Implementation shall be performed for:
 - ❖ All fixed and PTZ Camera video and Intercoms
 - ❖ PTZ camera Control, Intercom Audio and Control signals
 - ❖ DVRS and DVTS Video, audio and control signals
 - ❖ All new DVRS and DVTS equipment with existing and new DVADTS
 - ❖ New DVADTS equipment with existing Security System equipment
 - ❖ All hardware and software configuration, logical and physical settings, operating systems and application code required to integrate all new equipment to existing Security System
 - ❖ All network configuration including but not limited to IP addresses, VLAN configuration, firewall configurations, etc.
 - ❖ All physical connections, including demarcations, jumper cables and cable management required to connect new devices
 - ❖ Configuration of Cellstack and Nice Equipment to allow users to access, control and view live, recorded video and listen to live and recorded audio synchronized camera and intercom from respective security door.
 - ❖ Create and implement graphics and user interface controls in Qognify , Cellstack, audio and video systems
 - ❖ Configure Qognify Equipment to allow users to access, control and view live and recorded video from each respective camera
 - ❖ Integrate the controls for all PTZ cameras
 - ❖ Provide interfaces that support Digital Video Transmission System control of cameras installed as part of this Project
 - ❖ Provide interfaces between Intercom System and Digital Video Transmission System
 - ❖ Integrate functions of the Intercom within Digital Recording System
 - ❖ Verify through testing all cameras and Intercom installed under this Project meet required sequence of operations
 - ❖ A5.3): (1)Interface and integration to ACS alarm processing software, the digital video, audio display, voice, and video from the camera and intercom areas. (2) Integrate Matrix System door alarm with respective door camera to automate the coordinated access control, camera and intercom response for each respective door, (3) Configure Matrix camera workstation viewing application to access all new operational cameras and intercoms.
- (2) Inter-rack cabling: A service loop will be found on top of the DVRS Rack. Trade Contractor shall run and connect cabling from Qognify video and audio input over to DVTS rack and connect to CellStack Chassis. This shall include dressing the cable, applying connections and terminations.
- (3) Each camera and intercom must be individually configured to transmit a

video /audio signal. Trade Contractor shall associate camera and Intercom with a port on the chassis and configure that port in CellStackManager. In addition, each camera and intercom shall be placed in a map with its corresponding address and configuration assigned in Manager Database.

- (4) Trade Contractor shall test and verify CellStack Manager Database to chassis signaling.
- (5) Trade Contractor shall provide Gateway Video and Audio configuration. All new camera inputs shall be configured and tested from the sub-systems to accept API calls. Trade Contractor shall provide gateway information to ACS Vendor for ACS interface.
- (6) Trade Contractor shall provide Vision Channel configuration. Each camera and Intercom shall be individually assigned to a DVRS channel and configured for that channel.
- (7) Trade Contractor shall ensure all Systems and workstations are time sequenced. Configuration includes, but is not limited to:
 - ❖ Record Mode settings
 - ❖ Recording Parameters
 - ❖ Video and Audio Channel Settings
 - ❖ Manual Start/Stop Recording
 - ❖ Each camera and Intercom shall be placed into its proper grouping.
- (8) Trade Contractor shall test end-to-end solution. This shall involve video stream testing, local camera and Intercom configuration verification, DVADTS, DVTS and DVRS testing. Note: testing requires Trade Contractor to physically test at end station location.
- (9) Trade Contractor shall provide Inter-Rack, Coax cabling, PTZ wiring and configuration.
- (10) Trade Contractor shall update data tables with:
 - ❖ Alarm ID number
 - ❖ Camera ID number
 - ❖ Camera location description
 - ❖ Intercom ID Number
 - ❖ Intercom location description
 - ❖ Audio Interface Mixer Unit port ID numbers
 - ❖ DVADTS camera/intercom port ID numbers
 - ❖ DVRS and DVADTS controller ID numbers with each device's network address, so to ensure when ACS reports an alarm DVRS and DVADTS can be sent a message as to which camera's images to display
 - ❖ Presets and camera home position

D. Testing and Commissioning

Testing and Commissioning of CCTV Camera and Intercom Systems shall be a process of quality assurance and testing to ensure CCTV and Intercom Installation and Integration Services meet performance, functionality and quality requirements. Trade Contractor shall perform System Testing and Commissioning for all new camera and Intercom installations and integration end-to-end in accordance with requirements stated in Project Manual.

Trade Contractor shall be required to perform Out-of Phase Testing and Commissioning for CCTV and Intercom installations that are deemed substantially complete and are available for Beneficial Occupancy. This shall hereafter be known as "Phased Testing and Commissioning". In such event, Trade Contractor shall perform all testing and documentation requirements, satisfy all punch list items and accompany Managing General Contractor and Owner's Representative or their designee on all Phased Testing and Commissioning.

Shutdown Requirements: Trade Contractor shall follow Owner's Shutdown requirements prior to performing work on operational (live) CCTV Cameras.

1.07 SUBCONTRACTOR'S QUALIFICATIONS

- A. Trade Contractor Qualification Requirements: Trade Contractors must have at least five (5) years of successful installation experience with projects of similar size and environments utilizing brand of CCTV equipment proposed for this project. Installation experience must be for Work completed within last five (5) years and must include at least one (1) airport installation of similar size, complexity, and brand of CCTV and Head-End equipment.
- B. Trade Contractor shall include with Bid a list of references with specific information regarding type of project, size of project, involvement in providing of equipment and systems, name of CCTV, Intercoms and head-end equipment manufacturers. List shall include contact names and contact phone numbers.

1.9 TRADE CONTRACTOR DUTIES (include, but not limited to)

- A. Trade Contractor shall provide Installation and Programming services for CCTV Cameras and Intercoms in a neat, safe and professional manner.
- B. Trade Contractor shall provide material and equipment that is new, and conforms to grade, quality, and standards as specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout duration of Contract. If supply, availability or construction environment requires substituting any product for a product specified herein or previously Approved, Trade Contractor shall notify Managing General Contractor as described in Division 1 of Project Manual.
- C. Trade Contractor shall be responsible for providing a safe work environment for its own employees as well the general public, Owner's employees and contractors,

airline employees and contractors, and vendors or other airport customers and service personnel.

- D. Trade Contractor shall take all necessary precautions and preventative steps in assuring its employees, subcontractors and others are completely protected from any harm because of construction activities.
- E. Trade Contractor shall comply with MDAD Site Safety, Health & Environmental Program. Trade Contractor is held accountable for implementing all OSHA, Federal, State, and local codes, standards or regulations that are applicable to Work being performed under this Contract.

1.10 PERMITS, FEES, AND CERTIFICATES OF APPROVAL

- A. As applicable, Trade Contractor shall make application and coordinate obtaining permits for all construction and installation that are part of this Project. All cost associated with such Permits and Fees shall be deemed included in Contract Pricing.
- B. As prerequisite to final acceptance, Trade Contractor shall satisfactorily complete commissioning and all punch list items.
- C. Current Calibration Certifications must be submitted for all test equipment.

1.11 SUBMITTALS

- A. General: Trade Contractor submittals shall comply with all requirements stated in Project Manual including:
 - Division 1, Section 01740 Warranties and Bonds

Process for documentation submittals and approval are further described in Division 1.

- B. Submittal Log: Within ten (10) days after Notice to Proceed (NTP), Trade Contractor shall provide a Submittal Log matrix listing all required submittals and scheduled date for each submittal. This Log shall be updated monthly with the date documents were submitted and status of each submittal.
- C. Installation and Programming Plan: Within fifteen (15) days after NTP, Trade Contractor shall submit, for approval, an Installation Plan and Schedule for entire project indicating when (and number of days required) for procurement, installation, programming, testing and commissioning. The Plan shall detail how Work will be accomplished, highlighting minimal interruption to ongoing Airport operations and/or construction activities. Plan shall provide daily Work Schedule for employees and subcontractors, protection of existing equipment, daily cleanup and other activity that assures continuing operation with minimal impact on other construction activities.

Plan shall meet requirements of the Project Schedule and reflect phasing requirements for all trades. Approved Installation Plan and Schedule shall be maintained and updated in accordance with Division 1, Section 01310. At a minimum, Plan and Schedule shall clearly show:

1. Specific location / identification of each Work activity per phasing drawings
 2. Sequence and interdependency of all activities required for complete performance
 3. Delivery activities for all equipment including dates for ordering long lead items
 4. Detailed schedule for all pretesting and phased commissioning / testing activities
- D. Three-Week Rolling Schedule: Trade Contractor shall submit a Three Week Rolling Schedule each week to be used at weekly progress and coordination meetings. The Rolling Schedule shall reflect previous week's activity progress along with a projection of activities expected during following two-week period.
- E. Project Management Plan: Trade Contractor shall provide at Pre-Construction Meeting a Project Management Plan describing basic goals, budget, strategic, logistic, physical and technical objectives for project and quality control standards. Plan shall also include the following:
- (1). Work Flow Chart describing each stage of the project
 - (2). Organization Chart showing Trade Contractor and their subcontractors and interrelationships with Managing General Contractor and Owner along with their lines of authority
 - (3). Description of Trade Contractor project personnel and daily duties
 - (4). Total dollar value of Project with estimated dollar value of each Phase Description
 - (5). Method to be used to ensure cost containment
 - (6). Value Engineering Recommendation
- F. Safety and Security Plan: At the Pre-Construction Meeting, successful Contractor shall submit for approval a Site Specific Safety Plan in accordance with Project Manual - Division 0, Section 00010. Safety Plan includes, but not limited to:
- ❖ Hurricane Preparedness Plan
 - ❖ Emergency Response Plan
 - ❖ Emergency Action Plan
 - ❖ Security Plan
 - ❖ Incident Reporting Plan
- G. Schedule of Value: Within seven (7) days after execution of Contract, Trade Contractor shall submit for review and approval, a Schedule of Value in compliance with requirements of Division 1, Section 01370 including, but not limited to, submittal of a preliminary Schedule of Values allocated to various portions of Work.
- H. Functional Testing and Commissioning Plan: Trade Contractor shall submit for review and approval, a Functional Testing and Commissioning Plan six (6) weeks

after NTP. Plan shall detail the objectives of all tests, test methods, test procedures, test scripts, witness sign-off and test report format.

Functional Testing and Commissioning Plan shall clearly demonstrate CCTV and Intercom Systems and their components fully comply with the requirements specified herein.

- I. Manufacturer's Instructions: Four weeks prior to start of first camera / intercom installation, for all Trade Contractor provided equipment, Trade Contractor shall submit six copies of the manufacturer's current printed instructions, for storage, assembly, installation, startup, adjusting and testing. These documents shall become an integral part of Testing and Commissioning process and final Close-Out Documentation.
- J. Shop Drawings & Product Data - General: In accordance with Division 1 Requirements, Trade Contractor shall submit to Managing General Contractor shop drawings, product data (including cut sheets and catalog information), and samples. Trade Contractor shall submit shop drawings, product data, and samples as a complete set for initial submission and for resubmission required for approval, as described in Division 1, Section 01340.

Trade Contractor shall submit shop drawings, product data, and samples with such promptness and in such sequence as to cause no delay in the Work or in activities of separate contractors. Trade Contractor, showing date and Trade Contractor's legitimate firm name, shall sign all drawings and documentation submittals.

1. By submitting shop drawings, product data, and samples, Trade Contractor represents it has carefully reviewed and verified materials, quantities, field measurements, and field construction criteria related thereto. Trade Contractor also represents it has checked, coordinated and verified information contained within shop drawings, product data, and samples conform to requirements of Work.
2. The approval of shop drawings, product data and samples submitted by Trade Contractor shall not relieve Trade Contractor of responsibility for deviations from Project requirements, unless Trade Contractor has specifically informed Managing General Contractor in writing of such deviation at time of submittal and Trade Contractor received written approval of each specific deviation.
3. Managing General Contractor/Owner/Design Professional will not check illegible submittals.
4. If substitution of any product is required, Trade Contractor shall submit shop drawings, product data and samples in accordance with Division 1 Section 01630 for approval. Trade Contractor shall test requested substitutions in Owner's test lab to ensure it meets specification and compatibility requirements.

5. The review and approval, or other appropriate action upon shop drawings, product data and samples, is for limited purpose of checking for conformance with information given and design concept expressed. Owner/MGC, DP review of such submittals is not conducted for determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Trade Contractor. The review shall not constitute approval of safety precautions or of construction means, methods, techniques, sequences, or procedures. The approval of a specific item shall not indicate approval of an assembly of which item is a component.
 6. Trade Contractor shall perform no portion of Work requiring submittal and review of shop drawings, product data, or samples until the respective submittal is approved.
- K. Shop drawings – Specific Requirements: Trade Contractor shall comply with Division 1 requirements pertaining to Shop drawings. Shop drawing must provide detail indicating all mounting components proposed for each camera / intercom location. Submittal requirements include but are not limited to the following:
1. Show Equipment Quantities, locations, types and arrangements
 2. Rough-in diagrams
 3. Design calculations and methods
 4. System block diagram, indicating interconnection between system components and subsystems
 5. Wiring diagrams showing field installed wiring
 6. Schedule and Tables
 7. Flow Diagram showing normal flow of data throughout the Intercom and CCTV Systems and other systems they interface with
 8. Interface requirements, including connector types to external systems and systems or components not supplied by Trade Contractor
 9. Programming settings and presets
 10. For Rack mounted equipment, provide assembly drawing of every equipment rack with locations, quantities, model numbers of individual components contained in the rack. MSR Cabinet Layout shall document Rack/Cabinet Number, depict location of each head-end system, serial number and asset number of each device associated with Intercoms and CCTV Cameras, and related UPS and Network devices. This is regardless if Head-end System was existing or new (installed under this contract). Trade Contractor shall provide such drawings for all eight (8) MSR Rooms.
- L. Parts List – Specific Requirements: Within thirty (30) days after NTP, Trade

Contractor shall submit a complete list of major products included in this installation. List shall incorporate all products provided by Trade Contractor, including spare parts. Parts List shall include every component used by Trade Contractor in the Installation of Cameras and Intercoms. Parts Lists shall include part numbers, model numbers, and supplier's address and contact information. Owner requires parts lists to identify each component (to lowest repairable unit) along with ordering information.

- M. Product Data – Specific Requirements: Product Data shall include the manufacturer name, model number and related Specification paragraph numbers for each product provided by Trade Contractor. Product data shall show products' mechanical and electrical specifications, as applicable. Trade Contractor shall provide catalog cut sheets and information for the following:
1. All metallic and nonmetallic conduits, including surface raceways, outlet boxes, and fittings and flex conduit used at camera and Intercom mounting location
 2. Terminal blocks and patch panels
 3. Equipment housings
 4. Camera ceiling and roof-top mounting kits
 5. Camera mounting brackets
 6. Surge protection devices and enclosures
 7. Power Supplies and enclosures
 8. Elevator Cameras, housing, kits and brackets
 9. Intercom devices
 10. Video Extenders
 11. Head-End Equipment (if applicable)
- N. Samples: Trade Contractor shall comply with requirements of Division 1 as it pertains to samples. At a minimum, sample submittals include the following:
1. Connectors
 2. Flex conduit used at camera mounting
 3. Surge Protection and Enclosure
 4. Power Supply and Enclosure
- O. Operation, Maintenance and Programming Data (O&M): Trade Contractor shall provide Operation and Maintenance Manuals for all Trade Contractor provided devices, such as but not limited to Cameras (provided by Trade Contractor), Intercoms, Surge Protection, and Power Supplies. Manuals shall include installation, operation and maintenance, including preventative maintenance instructions from the manufacturer. O&M Manuals shall meet or exceed the requirements of Division 1, Section 01730. O&M Manuals shall:
1. Serve as training and reference manual for all aspects of day-to-day-maintenance and major system repairs.

2. Include complete set of as built installation drawings for each system
 3. Include photographs and drawings showing installation details and locations of equipment Routine preventive maintenance procedures, corrective diagnostic troubleshooting procedures
 4. Programming Manual shall detail any software packages supplied with the systems and independent programming of system, point schedule, and software trouble shooting procedure
- P. Project Close-Out Documentation: Trade Contractor shall comply with all Project Closeout requirements shown in Division 1, Section 01700. Trade Contractor shall submit as-built project records, including but not limited to the following:
1. Approved shop drawings
 2. Plan drawings indicating locations and identification of Intercoms, CCTV cameras, field of view, telecommunications and MSR rooms
 3. Labeling and administration documentation
 4. Software Licenses in the name of the Owner (if applicable)
 5. Combined Warranty Statement from the Trade Contractor
 6. Warranty documents from 3rd party vendors for equipment and materials
 7. All approved Test Reports
 8. Final Inventory Logs
 9. Product List and Product Data Sheets
 10. Manufacturer's Instructions
 11. Operation & Maintenance Manuals
 12. Recommended Spare Parts List
 13. Data Table Print Out
 14. Photographs
 15. Approved (fully signed) 16997 Pre-functional Checklist completed for each Phased Installation
 16. Approved (fully signed) 16998 Functional Testing and Commissioning for each Phased Installation
- Q. Test Report: Trade Contractor shall submit test results to Managing General Contractor as required.
- R. Progress Report: Trade Contractor shall provide a Progress Report weekly to Managing General Contractor. Such report shall detail Work completed and any issues that may impede installation schedule.
- S. Camera As-Built Inventory Log: Throughout the term of this Contract, Trade Contractor shall record and maintain Camera Inventory Log on an Excel spreadsheet. Inventory records shall include, but is not limited to, the following information:
1. Installed Camera Number
 2. Installed Camera Model Number

3. Installed Camera Serial Number
 4. Installed Camera Asset Number
 5. Installed Camera IP address
 6. Floor Location
 7. Drawing Sheet Number
 8. Camera Type (Fixed / PTZ)
 9. Camera Specification Description (CM-1, CM-2, etc)
 10. Installed Lens
 11. Surge Suppressor ID
 12. Dip Switch Setting (Address)
 13. Location Coordinates (column lines)
 14. Power Supply ID
 15. Controls Punch Down ID
 16. Control Converter Punch Down ID
 17. Centauri Video Punch Down ID
 18. Centauri Control Punch Down ID
 19. Jukebox Punch Down ID
 20. NVR Video Punch Down ID
 21. Elevator ID, if applicable
 22. Related Door ID, if Applicable
 23. Date of Installation
 24. Date of Commissioning
 25. Equipment Provided by Owner or Trade Contractor
 26. Starting Date and Ending Date of 36 month Warranty (applicable to devices provided by Trade Contractor)
1. Intercom As-Built Inventory Log: Throughout the term of this Contract, Trade Contractor shall record and maintain Intercom Inventory Log on an Excel spreadsheet. Inventory records shall include, but is not limited to, the following information:
 1. Installed Intercom ID
 2. Installed Intercom Model Number
 3. Intercom Serial Number
 4. Intercom Asset Tag Number
 5. Floor Location
 6. Location Coordinates (column lines)
 7. Power ID

8. Intercom Punch Down
9. Control Converter Punch Down ID
10. Intercom Cable ID
11. Intercom 25-pair connector cable ID
12. Audio Unit Cable and Mixer ID
13. Related Door ID, if Applicable
14. Date of Installation
15. Date of Commissioning
16. Starting Date and Ending Date of 36 month Warranty

- U.** Training Documentation: Trade Contractor shall submit all training documentations as required by Division 1, Section 01670, Systems Demonstrations.

1.12 QUALITY ASSURANCE

- A.** Trade Contractor shall ensure provided productions and installation and programming services meet all requirements including but not limited to:
- ❖ Division 1, Section 01440 – Trade Contractor’s Quality Control
 - ❖ NECA 1
 - ❖ NFPA 70
 - ❖ UL Approval

1.13 WARRANTY

- A.** Trade Contractor shall provide a joint written warranty of the manufacturer(s) (of devices provided by Trade Contractor) and installation and programming integration services on a single document.
- B.** Trade Contractor shall warrant parts supplied by Trade Contractor, complete installation and programming of the equipment to be free from defects in materials and workmanship for a period of no less than thirty-six (36) Months. The starting point for the warranty shall be from date of final acceptance as determined by successful completion of Testing and Commissioning.

Trade Contractor shall submit a written warranty signed by Trade Contractor, installer and program integrator for cameras and intercoms agreeing to correct system deficiencies and replace components that fail in materials or workmanship with specified warranty period when installed and used according to manufacturer’s written instructions. This warranty (parts and labor) shall be in addition to, and shall not limit, other rights Managing General Contractor and Owner may have under other provisions of the Contract.

- C.** In addition to Warranties required, Trade Contractor shall ensure all manufacturers’ warranties are transferred to Owner. Trade Contractor shall submit these warranties on each item provided by Trade Contractor. Warranty shall detail specific

equipment or subparts that are subject to separate conditional warranty. Final payment shall not relieve Trade Contractor of these obligations.

- D. During the warranty period, Trade Contractor shall begin rework or replacement of equipment within 2 hours of first notification and must be completed within 24 hours. Repair must be raised to the highest priority until work is completed. If repairs cannot be completed during this period, or if ordering of parts is required, Trade Contractor shall provide Managing General Contractor and Owner written update, every 24 hours, on the progress of repairs.
- E. Upon receipt of notice from Managing General Contractor/Owner of the failure of any part during the Warranty period, Trade Contractor shall replace affected parts or parts with new parts and software corrected promptly at no cost to Owner for labor or parts.

1.14 COMMISSIONING AND ACCEPTANCE

Commissioning is a systematic process to ensure all CCTV and Intercom equipment and systems performs interactively according to design intent and Owner's operational needs.

- A. Final Acceptance of each phase of installation shall be withheld until the following have been completed successfully:
 - 1. Acceptance of all submittals and required documentation
 - 2. Successful Testing & Commissioning
 - 3. Completion of Punch List
- B. All cost associated with Testing and Commissioning shall be deemed included in Contract total.

1.15 INVOICING

Prices in Schedule of Values shall be referenced when invoicing for parts, installation and documentation that have received Owner's Acceptance.

1.16 SEQUENCING AND SCHEDULING

- A. Trade Contractor shall complete Work according to Sequence of Work described below.
 - 1. CAMERAS
 - a. Contractor shall provide un-terminated wire and cable. The coax and twisted pair cables shall be coiled in the service loop at the designated location for cable.
 - b. Contractor shall pull wiring through conduit to junction boxes provided by the Electrical contractor. CCTV Trade Contractor must coordinate with PDS contractor for camera mounting location and distribution needs to ensure connection paths.

- c. CCTV Trade Contractor installs the flex conduits, etc., and pull un-terminated coax and twisted pair copper through the conduit.
- d. Contractor is responsible to install Owner Approved BNC connector on CCTV Coax and test all cables before connection to camera and intercoms.

Contractor is responsible to install Owner Approved RJ45 connector on CCTV CAT6E and test all cables before connection to camera and intercoms
- e. CCTV Trade Contractor shall then terminate Coax and Twisted Pair Copper to Camera and begin sequence of settings, adjustments, focusing and pre-testing.
- f. CCTV Trade Contractor shall coordinate with Owner and Managing General Contractor to ensure installation and programming of new CCTV cameras shall not disrupt existing equipment and/or Airport and Construction operations.
- g. When modifying existing installation, Trade Contractor shall coordinate Work to be done so not to disrupt Airport and Construction Operations.
- h. When adding, deleting, or working on live CCTV Systems, Trade Contractor shall follow Shutdown Procedures shown in Project Manual. (Note: MDAD Shutdown request is required when adding or deleting any device or component to an active System.)
- i. Trade Contractor shall be responsible for testing and commissioning of CCTV Systems and interfaces with the Security System back to the Security Operation Workstation.

2. INTERCOMS

- a. Contractor shall pull wiring through conduit to junction boxes provided by the Electrical subcontractor.
- b. Contractor shall provide un-terminated wire and cable. The twisted pair cables shall be coiled in the service loop at designated location for the cable.
- c. Trade Contractor shall provide Push-to-Call full duplex Intercom and associated terminations. Conduit, wiring (4 pair, 18 gauge) and junction boxes will be provided by Electrical contractors. Contractor will provide termination at existing termination block.
- d. Trade Contractor shall terminate Intercom connection from termination block to Emcom Mixer Interface Unit using Trade Contractor provided Telco standard 50-Pin Amphenol connectors, male- male (or Male to open leads punched down) CUSTOM made cables as distance varies from room to room.

- e. Trade Contractor shall terminate from front of Emcom Mixer to (existing) CENTAURI TX-4 or HAD Audio Interface using Trade Contractor provided DB-9 Male – Female Patch Cord.
 - f. Trade Contractor shall terminate Emcom Mixer Interface Unit to (existing) Qognify ALI-24CCA Logger using Trade Contractor provided Telco Standard 50-Pin Amphenol Connectors, Male-Male.
 - g. Trade Contractor shall terminate Audio Interface Mixer Channel 1 – 24 to (existing) CellStack REU using Trade Contractor provided RJ-11 to RJ45 on CellStack I/O Unit.
 - h. Trade Contractor shall coordinate with Owner and Managing General Contractor to ensure installation and programming of new intercoms shall not disrupt existing equipment and/or Airport and Construction operations.
 - i. When modifying existing installation, Trade Contractor shall coordinate Work to be done so not to disrupt Airport and Construction Operations. (Note: Shutdown request is required when adding or deleting any device to an active System.)
 - j. Trade Contractor shall be responsible for testing and commissioning of the Intercom Systems and interfaces with the Security System back to the Security Operation Workstation.
- B. Trade Contractor shall perform all Work in accordance with current Construction Schedule as defined in Division 1, Section 01310.

PART 2 PRODUCT

2.01 GENERAL

The approved equipment manufacturers are listed below. Functional equivalents shall be considered so long as hardware/software meets or exceeds this Specification and is 100% compatible with existing system(s). Compatibility shall be proven in Owner's Test Lab.

A.

CAMERAS – BOSCH , VICON and Axis

- a. Bosch LTC Series or Owner approved equal
- b. Bosch ENV Series or Owner approved equal
- c. Bosch G3A Series or Owner approved equal
- d. Vicon 894 Roughneck Series or Owner approved equal
- c. AXIS P3364 –V or Owner approved equal.

If Trade Contractor wants to seek Owner's approval for "Equal", Trade Contractor shall test recommended substitution in Owner's Test Lab and show recommended substitution meet Specification and System compatibility requirements.

Trade Contractor shall designate and coordinate delivery dates for each product in

Trade Contractor's Schedule of Work with Project PM to request required equipment from Owner's Inventory.

Trade Contractor shall assemble, install, connect adjust and finish products in accordance with manufacturer's recommendations.

- C. TRADE CONTRACTOR PROVIDED EQUIPMENT: Trade Contractor shall provide, test and commission all other equipment as needed to complete Work indicated by this specification and supporting drawings, including but not limited to:

CAMERAS – BOSCH , VICON and Axis

- a. Bosch LTC Series or Owner approved equal
- b. Bosch ENV Series or Owner approved equal
- c. Bosch G3A Series or Owner approved equal
- d. Vicon 894 Roughneck Series or Owner approved equal
- c. AXIS P3364 –V or Owner approved equal.

- D.

2. Transient and Surge Suppression Equipment:

- a. Ditek
- b. Polyphaser

Surge Protection Devices shall also provide noise filtering for electromagnetic and radio frequency interferences (EMI/RFI), as recommended by equipment manufacturer. Frequency range for (EMI/RFI) noise filtering suppression shall be 10KHz to 100MHz at 40 db.

3. Power Supply:

The following Power Supply shall be used for all new and remedial Fixed and PTZ camera installations:

Manufacturer: Bosch

Power Supply Model: G3A-PSU1-16

In accordance with North Terminal Design Directive No. 49, CCTV power supplies shall be placed inside (Trade Contractor provided) "Hoffman" enclosures, serviced by one (1) 110/120V AC emergency input circuit to each power supply box. Each emergency power supply shall provide 24V AC output with fused protection to each camera. Power supplies shall provide service for up to 16 combination PTZ/Fixed cameras.

4. Mounting Accessories

- a. Camera mounting bracket and accessories shall be provided by Trade Contractor as required for each camera position and as shown in Project Drawings.

- b. The product for all exterior camera mounts shall be installed rigidly to eliminate camera movement in winds up to 185 mph. See Project Drawings for rooftop mounting configuration and mounting systems.
 - c. Roof-top mounting accessories shall include waterproof electrical box with surge protector inside.
 - d. Certain interior mounting brackets shall be custom designed to Owner's specification. Trade Contractor shall coordinate with Managing General Contractor/Owner for specific mounting bracket product to be used.
5. Intercom and Audio Mixer
- a. The Intercom Station shall be Emcom Systems Model 842.
 Intercom shall be surface-mounted, hands-free, full-duplex $\frac{3}{4}$ " metal button, submersible speaker. Its internal amplifier and speaker shall operate from line level audio in and its microphone and preamp shall provide line level audio to remote systems. The unit shall provide contact signaling information to alert of activation and shall have two indicators to advise of a call placed or received. It shall include following additional features:
 Dimensions: 5.00"H x 5.00"W x 1.8"D.
 Panel: Stainless Steel
 Weight: 3 lbs
 Connectors: 8 position terminal strip
 Power: 12 to 24V DC
 Contact Relay: 120mA, 250VAC
 - b. Audio Interface Unit (AIU) shall be Emcom Systems Model 844. The AIU shall provide power for up to 24 Intercoms and a distribution point for all signals from the Intercom(s). AIU shall mix audio IN and audio OUT from each intercom and shall provide combined output at line level to a Telco standard 50-pin connector for monitoring and recording. The audio IN and audio OUT signals shall be passed through to DB-9 connectors for distribution to other devices. The contact closure pairs from each Intercom shall be provided on individual RJ-12 connectors. It shall include following additional features:
 Dimensions: 3.5"H x 178.25"W x 10"D with rack
 Material: Steel
 Power: 120 V AC
 Connectors: Intercom: (4) 50-pin female
 Monitor: (1) 50-pin female
 Audio Thru: (12) DB9 Female
 Contact Closure: (24) RJ-12
 - c. Cable for Intercom Mixer – Trade Contractor shall provide Audio Unit Interface Mixer Cables with custom built lengths to accommodate individual

MSR rooms.

d. Authorized Supplier Information:

Certified Network Professionals, Inc.

Contact: Orlando Suero

Phone: (954) 610-0443

Email: ogsuero@cnetpro.net

6. PTZ Converters

Trade Contractor shall provide PTZ Converters for all PTZ Cameras. PTZ Converter shall be Bosch LTC 8016/90 and LTC 8786/60 as determined by Integrator. (Or Owner approved equivalent.)

7. Testing Equipment

Trade Contractor shall use a waveform monitor, vectorscope and processing amplifier – as needed, to test video signals.

Trade Contractor shall provide a control keypad that is compatible with PTZ cameras to be used for testing camera PTZ functions.

8. Surge Suppression Equipment

Trade Contractor shall provide Surge Suppression devices for all outdoor cameras. Surge suppression devices shall protect all power, video, and PTZ data cables.

9. UPS

If requested by Owner, Trade Contractor shall provide Minuteman Model E 2300 UPS for use in the MSRs. UPSs are to be installed in cabinets or 19” racks as directed by Owner. Contractor shall energize and test the UPSs. UPS requirements are as follows:

UPC: 784755150738

Warranty: Include 3 years – Parts and labor including batteries

2300VA/1380W 120 VAC true sinewave,

SNMP Card Required: YES

Back-up time – full load: 9.6 minutes

Back-up time – half load: 23.5 minutes

10. Connectors

BNC Connectors for COAX terminations shall be compression type with center conductor soldered to connector

11. Conduit, Cable Trays, J-Boxes, Hoffman Type Boxes, RG-59/RG-6, CAT5E, UL Racks and Cabinets (Items listed in Attachment A, Section B2)

If requested by Owner, Trade Contractor shall provide any necessary Conduit, Cable Trays, RG-59/RG-6 Coaxial cable, CAT6A 4-pair 18 AWG Stranded and 4-pair 18 AWG Solid copper conductors individually shield plenum rated CMP, 19

Inch Racks and/or Cabinets needed to complete the work. All such items shall be provided, installed and tested in accordance with the Contract requirements, including but not limited to Specification Sections: 16005, 16050, 16111, and 16195.

C. CAMERA QUANTITY AND MOUNTING TYPE

Estimated quantity and mounting type is shown below:

Approximate Camera Quantities (Refer to drawings for actual count)		
CM1	FIXED	
	PTZ	
CM2	FIXED	15
	PTZ	
CM3	FIXED	
CM4	FIXED	88
	PTZ	
CM5	FIXED	
	PTZ	
CM6	FIXED	2
TOTAL		115

Refer to Project Drawings for exact detail on quantity and Mounting Type.

D. INTERCOM QUANTITY AND MOUNTING TYPE

Estimated Quantity of Intercoms and Audio Interface Mixer Units is shown below:

Emcom 842 Intercoms: 15 Each
Emcom 844 Audio Interface Mixers: 1 Each
Emcom 25 Pair Connector Cable: 1 Each

2.02 SYSTEM REQUIREMENTS

- A. Video signal format shall comply with NTSC standard composite video - interlaced. Composite video signal termination shall be 75 ohms impedance.
- B. The installed and integrated CCTV System shall include a Fast Address mode to set the camera address number for control and shall be remotely programmable from system controller keyboard or directly settable via thumbwheel switches located within the camera.
- C. Cameras shall have:
 - 1. High resolution color
 - 2. High dynamic range for eliminating or significantly reducing adverse background lighting conditions

3. Function in very low light and nighttime lighting conditions

2.03 CAMERA ENVIRONMENTAL SPECIFICATIONS

- A. Humidity: 0% to 90% relative, non-condensing
- B. Operating temperature: 14 F to +122 F (-10 C to +50 C)
- C. Storage Temperature: 14 F to +140 F (-10 C to +60 C)
- D. Enclosure rating:
 - 9350 Series: NEMA 4 (IP65)
 - 9349 Series: Plenum rated

2.04 INTERCOM ENVIRONMENTAL SPECIFICATIONS

- A. Operating Temperature: -20C to +50C

2.05 AGENCY APPROVALS

- A. Safety: CE, UL

PART 3 EXECUTION

3.01 GENERAL

- A. Trade Contractor shall ensure all Work performed shall be in accordance with requirements described in the Project Manual. Trade Contractor shall immediately correct Work performed in deviation of the requirements without additional charges, regardless of the stage of completion.
- B. Owner assumes no responsibility or liability for storage fees, freight, taxes, or other costs associated with delivery and storage of system components. Trade Contractor shall be responsible for loss or damage of all material until transfer of title to Owner.
- C. Before attempting installation, Trade Contractor shall verify all cables, connections and support equipment are ready for installation and integration with the rest of the system.

3.02 COORDINATION REQUIREMENTS

- A. Trade Contractor shall comply with Managing General Contractor/Owner requirements to coordinate work of various trades having independent responsibilities for installing, connecting to and placing in service associated equipment and products.
- B. Trade Contractor shall coordinate with other trades towards the general purpose of having installation/construction progress as rapidly and as smoothly as possible with minimum interference between trades.
- C. Trade Contractor shall make provisions to coordinate with Managing General

Contractor to minimize disruption of the construction operation. This may require part of installation Work performed in off-peak hours-

- D. Whenever Work (or portion thereof) is dependent upon the work of other subcontractors or if Work will affect another subcontractor, or if Work may potentially be impacted by another subcontractor, then CCTV/Intercom Trade Contractor is required to, at a minimum:
- ❖ Notify Managing General Contractor
 - ❖ Coordinate its Work with dependent work of other subcontractors as required by the Contract
 - ❖ Provide necessary dependent data and requirements to Managing General Contractor and appropriate subcontractor(s)
 - ❖ Examine dependent drawings, specifications and submittals
 - ❖ Examine previously placed dependent work
 - ❖ Check and verify dependent dimensions of previously placed work. Notify Managing General Contractor if dependent dimensions which are unsatisfactory or will prevent a satisfactory installation of its Work
 - ❖ Attend and participate in coordination meetings with other subcontractors
- E. Integration Programming Coordination: In addition to the above, the following Owner Organizations are involved in Programming Coordination of CCTV Cameras and Intercoms:
1. MDAD Information Systems and Telecommunications Division: This Division will be responsible for operation and maintenance of the data network and Network Management components of the Security System.
 2. MDAD Facilities Maintenance: This organization will be responsible for maintenance of video and audio recording and switching component of Security System. Once each Phase is tested and commissioned, this organization will be responsible for the entire System, including Cameras and Intercoms, and video / audio to the transmission, recording and monitoring equipment.
- F. This Contract requires close coordination with Matrix Systems representative, the vendor for Access Control System and Certified Network Professionals, Inc. , the vendor for the Security Systems and Network.
- G. If Managing General Contractor/Owner or their authorized representatives determine Trade Contractor is failing to coordinate Work with the work of other contractors as required by this Contract, Managing General Contractor/Owner or its authorized representatives may upon 72 hours written notice:
1. Withhold any payment otherwise owed hereunder until Trade Contractor complies with MGC/Owner's directions
 2. Direct others to perform portions of Contract and charge cost of Work against Trade Contractor's Contract amount

3. Terminate any and all portions of this Contract for Trade Contractor's failure to perform in accordance with Contract requirements

3.03 GENERAL MEETING REQUIREMENTS

A. Project Pre-Construction Meeting: After Award of Order, Managing General Contractor will call for and administer a Pre-Construction Meeting in accordance with Division 1 Section 01200. Managing General Contractor and Owner's Authorized Representatives, Trade Contractor and all their sub-contractors shall attend Pre-Construction Meeting. Project Pre-Construction Meeting Agenda shall include the following:

- ❖ Introduction of Trade Contractor's authorized representative who shall be responsible for working and coordinating with Managing General Contractor's representative(s) relative to overall project
- ❖ Bill of materials, noting long lead-time items
- ❖ Preliminary draft of Bill of Materials, noting long lead-time items
- ❖ Preliminary Trade Contractor Schedule shall be based on Pre-Bid Schedule. Trade Contractor Schedule shall including all major Work components that materially affect any other Work on the project. Refer to Division 1, Section 01310 for more detail
- ❖ Personnel and vehicle permit procedures
- ❖ Use of premises
- ❖ Location of Trade Contractor's on-site offices
- ❖ AOA access
- ❖ Employee parking
- ❖ Security
- ❖ Housekeeping
- ❖ Safety Program
- ❖ Review of Preliminary Trade Contractor Schedule
- ❖ Clarifications of Project requirements

Contractor shall distribute copies of minutes to attendees. Attendees shall have 5 working days to submit comments or additions to the minutes.

- B. Progress / Coordination Meetings: Managing General Contractor will schedule and administer weekly on-site Progress Meetings throughout duration of the Work as defined in Division 1, Section 01200 of the Project Manual. Trade Contractor's Project representative and sub-contractors, Owner / Owner Authorized Representative, Design Professional and Managing General Contractor shall attend all Progress Meetings. Progress Meeting Agenda shall include, but not be limited to, following items as appropriate:
- ❖ Review of Work progress
 - ❖ Status of related Construction Work Schedules and dependencies

- ❖ Submittals
- ❖ Delivery schedules
- ❖ Quality Control
- ❖ Pending changes and/or substitutions
- ❖ Review of Trade Contractor's safety program activities and results, including report on all serious injury and/or damage accidents
- ❖ Other items affecting progress of Work

Trade Contractor shall distribute copies of minutes to attendees. Attendees shall have five (5) working days to submit comments or additions to meeting minutes.

C. Ad-hoc Meetings

Trade Contractor shall be required to attend meetings as may be called by any party by notifying all desired participants two (2) working days in advance, giving reason for meeting. In the event of emergency, Ad-hoc meetings may be held without advance notice.

Trade Contractor shall schedule and conduct meetings as necessary to coordinate responsibilities as described in the Project Manual. Trade Contractor shall maintain minutes of coordination meetings and ensure all attendees and interested parties receive a copy of the minutes resulting from coordination meetings with-in three (3) days from meeting date.

3.04 PRE-INSTALLATION SITE SURVEY

- A. Trade Contractor shall survey site to determine system-interfacing requirements. During walk through, Trade Contractor shall inspect site and survey the conditions to be encountered during the performance of the Work prior to starting Work. Failure of Trade Contractor to become familiar with site conditions shall not relieve Trade Contractor of responsibility for full completion of the Work in timeframe required.
- B. Trade Contractor shall review areas of potential interference and resolve conflicts before proceeding with Work.
- C. Trade Contractor shall examine areas and conditions under which Systems are to be installed and shall not proceed with Work until satisfactory conditions have been achieved.

3.05 INSTALLATION

- A. All installation activities shall be performed in a neat and professional manner in accordance with all applicable local and national codes. Additionally, Trade Contractor and their subcontractors shall obtain, or satisfy, (if applicable) the following prior to installation:
 1. All licenses and permits
 2. Employee and sub-contractors Access Badges
 3. All insurance and bonding as required

4. All other standards or requirements specified in this document
- B. Trade Contractor shall install, inspect and test all hardware required in this specification in accordance with manufacturers' instructions, the requirements stated herein including but not limited to Section 1.6 (Scope of Work) above.
- C. System installation and construction methods shall conform to requirements of Federal Communications Commission and Federal and State, County, and city ordinances. Where undefined by codes and standards, Trade Contractor shall apply a safety factor of at least two (2) times the rated load to all fastenings and supports of system components.
- D. Trade Contractor shall install all system components including Owner furnished equipment, and appurtenances in accordance with manufacturer's instructions, NFPA 70, and ANSI-C2. Trade Contractor shall furnish all cables, connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- E. All media shall be listed for application, marked and protected as per the NEC standards.
- F. Install all media in approved flexible conduits/or penetration according to design criteria and manufacturer's written instructions. Trade Contractor shall:
 1. Install transmission media without damaging conductors, shield, or jacket.
 2. Not bend cable, in handling or installation, to smaller radii than the minimum specified or recommended by cable manufacturer.
- G. Trade Contractor shall provide telecommunication bonding and grounding for CCTV and Intercom Systems as required to preclude ground loops, noise, and surges from adversely affecting system operation. Ground loops shall be avoided by making ground connections at only the control station. For 12V dc and 24V ac cameras, connect the control cable shields only at the monitor end.
- H. All device mounting shall be of a secure permanent nature. Double-sided foam tape shall not be used to secure any devices or components.
- I. Trade Contractor shall use tap connectors that are compatible with cable material. No splices are permitted unless specifically approved in writing by Owner.
- J. Trade Contractor shall bond shields and drain conductors to ground at only one point in each circuit.
- K. Trade Contractor shall connect components to wiring system and ground as indicated and instructed by manufacturer and according to ANSI/TIA/EIA-607.
- L. Trade Contractor shall tighten connectors and terminals, including screws and bolts, according to equipment manufacturer published torque-tightening values. Where manufacturer's torque requirements are not indicated, tighten connectors and

terminals according to tightening torque specified in UL Standard 486A.

M. Trade Contractor shall provide all cross-connect and jumper cables and all other connectors, cables, panels, equipment, etc., required to connect cameras and Intercoms to Owner furnished equipment for end to end Systems integration.

N. Camera Installation:

Trade Contractor shall follow manufacturers' installation requirements in addition to the following requirements:

1. Place and mount cameras as detailed by camera location drawings.
2. Aim and focus cameras to provide Field of View indicated on the drawings. Coordinate final camera aiming with Owner and Managing General Contractor being present.
3. Pendant Mounting: Secure the wall or corner plate to wall using four (4) fasteners that can each withstand 120 kg (265 lb) pullout force.
 - a. A minimum 0.64 cm (1/4 -inch) stud (maximum of 10 mm [3/8-inch] stud) or equivalent is required.
 - b. If using Corner or Mast plate, secure wall plate to this plate using four (4) 3/8" x 1" bolts.
4. Ceiling mounted cameras: Install 3/4" flexible conduit from the end of rigid conduit / J-box termination point to camera back box to provide for future camera repositioning. Flexible conduit shall not exceed 10 ft. in length.
5. Surge Protection: Provide line surge protection and coax patch cable from surge protector to exterior camera location. Surge Protection shall protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
6. Outdoor Mounting: Use only liquid-tight fittings or liquid-tight conduit fittings in the two (2) holes in the back of back/wall mounting plate, or bottom of the pendant arm. When using liquid tight fittings, it is important to use appropriate cable width for a snug fit.
7. Cameras mounted on building roof shall not penetrate roof or rooftop membrane unless absolutely necessary. If rooftop penetration is necessary, Trade Contractor shall coordinate and receive Owner's written approval for design and construction change prior to any roof penetration.
8. All video connectors exposed to the weather at camera locations shall be filled with inert silicon "grease" equal to Dow Corning C #5 compound before mating with opposite connector half. The connection shall them be completely covered with heat shrink tubing.

9. Trade Contractor shall closely coordinate installation with cable contractor. The following is example of Responsibilities required by each Trade.
 - a. Trade Contractor shall provide mounting bracket/kits needed for camera installation.
 - b. Trade Contractor shall provide flexible conduit between junction box and camera mount.
 - c. Trade contractor will provide power, signal and control wiring and install BNC Connector needed for the camera connection.
 - d. Trade contractor will terminate Signal and Control wiring at termination block in the Telecom Rooms.
 - e. Trade Contractor shall provide 24V Surge protectors at the Camera and 19" Rack Mount 16 position (BNC connector) Surge Protectors in the MSR.
 - f. Trade Contractor shall use two-pair power feed configuration when telecom room to camera distance exceeds 150 feet or when wiring voltage drop exceeds manufacturer's voltage range specified for proper camera operation.
 - g. Trade Contractor shall provide and terminate 18 AWG patch connection from termination block to Power Supply.
 - h. Trade Contractor shall provide ¾" conduit from Power Supply to the Junction Box. Trade Contractor shall provide Junction Box.
 - i. Unless otherwise noted, Head End Equipment currently exists and/or will be provided by Owner.

M. Intercom Installation:

As shown on the Typical Security Room Wiring Requirements Drawing for the Intercom, Trade Contractor shall:

- a. Provide Push-to-Call full duplex intercom and associated terminations. Conduit, wiring (4-pair, 18 gauge) and junction boxes will be provided by others. cable contractor will provide termination at existing termination block. All equipment shall be set level, properly aligned and bolted together where in sections. Secure all material and equipment firmly in place.
- b. Terminate from Intercom connection termination block to Emcom Mixer Interface Unit using Trade Contractor provided Telco standard 50 Pin Amphenol connectors, male- male (or Male to open leads punched down) CUSTOM made cables (distance varies from room to room).
- c. Terminate from front of Emcom Mixer to (existing) CENTAURI TX-4 or HAD Audio Interface using Trade Contractor provided DB-9 Male – Female Patch Cord (one per port).

- d. Terminate Emcom Mixer Interface Unit to (existing) Qognify ALI-24CCA Logger using Trade Contractor provided Telco Standard 50 Pin Amphenol Connectors, Male-Male.
 - e. Terminate Audio Interface Mixer Channel 1 – 24 to (existing) CellStack REU using Trade Contractor provided RJ-11 to RJ45 on CellStack I/O Unit.
 - f. Tag conductor at Mixers and identify major conduits in or at home runs, wire ways, pull boxes, cabinets and similar items to assist in future circuit tracing. Conductor tags shall be nonconducting. Identification shall correspond to the Contract Documents.
 - g. Circuit identification nameplates are required for each Intercom and Mixer Circuit.
- O. Materials damaged during installation shall be repaired to a new condition or shall be replaced. Equipment finishes that have been scratched or marred shall be touched up to match the original finish or shall be completely refinished. Matching shall be determined by inspecting Managing General Contractor.
 - P. Trade Contractor shall remove all installation debris from worksite immediately to minimize potential for Foreign Objects of Destruction (FOD) being introduced into Aircraft Operations Area (AOA). Trade Contractor shall exercise care to protect occupants and facility from any damage at all times.

3.06 PROGRAMMING INTEGRATION SERVICES

- A. Trade Contractor shall provide Programming Integration and System test all interfaces in accordance with manufacturers' instructions and requirements stated herein including but not limited to Section 1.6 (Scope of Work).
- B. Trade Contractor shall configure and program all PTZ cameras to the following minimum parameters:
 - 1. Communications Type: Shall be a minimum of 9600 Baud, Half Duplex.
 - 2. Camera Address: Coordinate camera address settings with work provided by Marconi / Ericsson. Set internal dome address selector to respond to ALL messages.
 - 3. Internal Titling: Set all internally generated titling to Off.
 - 4. If PTZ dome has password protection, capability for advanced menu access and other locked commands, the password shall be set to all zeros. If all zeros is not a valid password type for PTZ dome being installed, set password to all ones.
- C. Trade Contractor shall work with Matrix staff to ensure that real time and recorded history viewing of camera video and intercom audio is available via application software operating or accessible from access control workstations. In addition, Trade Contractor shall ensure Matrix Frontier Software interface and can perform proper sequence of operations an that Frontier originated alarm messages are

automatically presented with both video and audio from a camera and intercom from alarm area and can be processed from the Security Operation Workstation.

3.07 PRETESTING

- A. Trade Contractor shall provide testing, mounting and connection adjustments in coordination with Managing General Contractor/Owner to ensure a fully functional CCTV System.
- B. Trade Contractor shall prepare equipment for Phased Testing and Commissioning as follows:
 - 1. Align, adjust system and pretest components, wiring and functions to verify they comply with specified requirements.
 - 2. Conduct CCTV tests at varying lighting levels, including day and night scenes as applicable.
 - 3. Verify operation of auto-iris lenses.
 - 4. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
 - 5. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image.
 - 6. Pretest the essential features of Intercom System.
 - 7. Perform Pre-Functional Testing in accordance with Section 16997.

3.08 DOCUMENTATION. ALL DOCUMENTATION FOR SECURITY and CCTV SYSTEMS SHALL BE CONSIDERED AS SSI MATERIALS, and that is controlled under 49CFR parts 15 and 1520

- A. General Documentation required Phase Acceptance and Final Close-out:
 - 1. As-Built Drawings: Trade Contractor shall supply drawings that accurately depict all installed equipment and materials. Trade Contractor shall develop all shop drawings and all "as-built" drawings using AutoCAD format as further defined in Division 1 Section 01340.

Trade Contractor shall update Shop drawings / As-Built Drawing seven (7) times during the term of the Contract. Updated Drawings shall document all installed Intercoms and CCTV Camera locations along with each MSR Cabinet Layout.

MSR Cabinet Layout shall document Rack/Cabinet Number, depict location of each head-end device, along with serial number and asset number of each device associated with Intercoms, CCTV Cameras, and related UPS and Network devices. This is regardless if Head-end device were existing or new (installed

under this contract). Trade Contractor shall provide such drawings for MSR Room.

2. System Wiring Diagrams: Trade Contractor shall provide System Wiring Diagrams that show all power, signal and control wiring, all System components, wire numbers, color codes, pin numbers, component locations, grounding and connections, depicting the “as-built”, final configuration.

Wiring diagram shall also show Surge Protection Device wiring, bonding and grounding connections.

3. Functional Block Diagram: Trade Contractor shall provide functional block diagrams that show single-line interconnections between components for signal transmission and control.
4. System Block Diagram: Trade Contractors shall provide a System Block Diagram that show interconnection between System components and subsystems.
5. Program Settings: Trade Contractor shall document all program settings and pre-sets.
6. Updated Inventory Log – submitted monthly.
7. Warranty Documentation per Specification.

B. Project Record Documents:

1. For duration of Project, Trade Contractor shall maintain Project Records in accordance with Section 01720 of the Project Manual.
2. Trade Contractor shall provide all documentation as described in this Specification and Project Manual Division 1 Sections titled:
 - ❖ Shop Drawings, Product Data and Samples
 - ❖ Operating and Maintenance Data
 - ❖ Spare Parts and Maintenance Materials
 - ❖ Warranties and Bonds

3.9 FIELD QUALITY CONTROL

- A. Trade Contractor’s responsibility for Quality Control shall include, but is not limited to, inspections, tests, reports and record keeping.
- B. Trade Contractor’s Quality Control shall ensure conformance to applicable specifications and drawings with respect to workmanship, materials, installation, identification, testing requirements and ensuring compliance with technical performance and functional requirements.
- C. Trade Contractor shall not apply power to the Systems until after:
 1. Systems and components have been installed and inspected in accordance with manufacturer’s installation instructions;
 2. A visual inspection of system components has been conducted to ensure

- defective equipment items have not been installed and there are no loose connections, are set level and properly aligned;
- 3. System wiring has been tested and verified as correctly connected as indicated;
- 4. All System grounding and transient protection systems have been verified as properly installed and connected, as indicated; and
- 5. Power supplies connected to the system and equipment have been verified as the correct voltage, phasing, and frequency as indicated.
- D. Satisfaction of the above requirements shall not relieve Trade Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage due to Trade Contractor work/equipment.
- E. Set and test sensitivity of motion detection.
- F. Connect and verify responses to alarms.
- G. Verify operation of control-station equipment.
- H. All cabling identification is verified and complete.

3.10 LOSS – DAMAGE

Trade Contractor shall be responsible for any lost or damaged Cameras and Intercoms or other materials provided to Trade Contractor by Owner, or Trade Contractor provided material until time of Final Acceptance. This includes damage at time of installation. Trade Contractor shall be responsible to replace immediately all such loss or damaged to all Cameras or Intercoms and materials at Trade Contractor’s expense, including cost of labor.

3.11 TESTING AND COMMISSIONING

A. General Testing Requirement

1. Trade Contractor shall perform Pre-Functional Testing in full accordance with Division 16, Section 16997. Trade Contractor shall ensure all pre-functional checkouts are executed and documented. Owner, Managing General Contractor and/or Design Professional shall document pre-functional checkouts were completed according to approved plans. This may include Owner, Managing General Contractor and/or DP witnessing pre-functional checkout.
2. Individual Systems / Components that form an integral part of other systems shall require multiple testing to show that not only do they work on their own, but perform properly when integrated with other systems.
3. Trade Contractor shall develop a Functional Testing and Commissioning Plan in accordance with requirements stated in Division 16, Section 16998. The Test Plan including Procedure and Scripts shall:
 - ❖ Follow accepted industry testing practices and have a method of independent verification described.
 - ❖ Delineate responsibility of each trade affected and appropriate section of the Specification.

- ❖ Define requirements for documentation.
 - ❖ All test plans, procedures and scripts shall contain at a minimum the following elements:
 - a. Statements of purpose identifying the goals of the test
 - b. The methods used for testing
 - c. Test Procedure steps, expected results
 - d. Duration and schedule of tests
 - e. Procedure for documentation and recording test results
 - f. Procedure for handling test anomalies and failures
 - g. Calibration certificate of test equipment
3. Calibration: Test Equipment, used by Trade Contractor, shall be currently certified and calibrated by an independent test and calibration firm, to the manufacturer's specifications.
 4. MGC/Owner's approval of the Test plan, procedure, and scripts shall be required prior to execution of each Phased Test.
 5. Trade Contractor shall be present for all inspection, testing and commissioning and will be required to have applicable subcontractors present for inspections and commissioning related to their work.
 6. Each test result shall be fully documented by Trade Contractor and approved by Managing General Contractor/Owner.
 7. Trade Contractor shall submit detailed Testing Records complete with witness and approval signatures.
 8. MGC shall witness all testing.
 9. Owner or the Owner's agent shall witness all testing.
 10. Any specified item that does not satisfy the requirements of this specification shall be reinstalled, replaced, adjusted, or added by Trade Contractor as necessary to correct noted deficiencies at no additional cost.
 11. After correction of a noted deficiency, re-testing shall be performed to verify effectiveness of the corrective action.
 12. The acceptance of any material, workmanship or equipment by Managing General Contractor/Owner shall not preclude subsequent rejection of such items, should those items be later found defective.
 13. MGC/Owner reserves the right to have Trade Contractor repair or replace any defective items or damage incurred to existing facility, concrete, etc., at Trade Contractor's expense, if damage occurs due to actions directly attributed to Trade Contractor.
 14. In the event of any component of the System failing to meet part of its acceptance test, an observation shall be reported in writing detailing test failure

problems.

15. All acceptance test results, observations, calibration certificates and Certificates of Compliance for all system elements shall be compiled into a Testing and Commissioning Report, and supplied to Managing General Contractor/Owner for approval, no later than five (5) days after completion of subject test.
 17. The Pre-functional Checklist completed per 16997 shall form an integral part of Phased Testing and Commissioning Report and Project Close-Out.
 18. It shall be Trade Contractor's responsibility to facilitate the coordination of testing and commissioning activities in order to meet Work Schedule as defined in Division 1, Section 01310.
 19. All cost for testing and commissioning shall be included in total contract price.
 20. Trade Contractor shall ensure all subcontractors and vendors execute their testing and commissioning responsibilities.
 21. Trade Contractor shall be responsible for all cost associated with retesting.
 22. If any checklist item or test cannot be completed due to the project completion level, required occupancy condition or other deficiency, execution of such checklists items or testing may be delayed upon written approval of MGC. Such test shall be conducted prior to Final System Acceptance and Project Closeout.
- B. Camera and Intercom Testing: During the course of performing Phased Testing and Commissioning, Trade Contractor shall be responsible to demonstrate CCTV and Intercom Systems complies with all requirements. These requirements include but are not limited to the following requirements:
1. Camera Power: Camera power shall be tested at the camera end of each camera to confirm adequate voltage as indicated by camera manufacturer.
 2. Trade Contractor shall perform functional testing of Intercom System and camera video and control operation from the field locations back to the SOW.
 3. Test all cameras for Amplitude of the Video signal at Head-end Equipment Room (1.4 V Peak-to-Peak composite video output) using Oscilloscope.
 4. Verify Power Supply at camera location (12 VAC / 24 VDC +/- 10%) using a portable Digital Volt Meter.
 5. IP Camera must provide all functionality, as indicated on manufactures data sheet. Camera will be installed with current version of firmware installed and firmware version documented on the data sheet and inventory log.
 6. Cameras Fixed Position: Test for proper back-focus, confirm proper field of view adjustments.
 7. Pan/Tilt/Zoom Cameras: Test for proper pan/tilt/zoom operation, proper auto-homing feature functionality, and proper back-focus.
 8. Each video equalization amplifier shall be set to provide flat unity gain

- between camera output and equalization amplifier output.
9. Video waveform from each camera shall be demonstrated to the other on system waveform monitor. All video signals shall conform to EIA (Electronic Industries Association) standard RS-170.
 10. Link: Test total camera connection link for proper operation. Test for excessive cable and termination losses. Test from end camera device to demarcation point and connection to the System head-end equipment locations at MIA Security Rooms.
 11. Voltage Drop Test: Test drop of voltage at camera location.
 12. Test Video Signal with an Oscilloscope.
 13. Ensure tests are conducted such that daytime and nighttime conditions can be evaluated as applicable.
 14. Documentation must be provided listing camera ID, Cable ID, Surge Suppressor ID, Camera Type (Fixed/PTZ), 12 VAC / 24 VDC at camera location – both nominal and measured video at headend - Volt peak-to-peak, Serial Number, and Picture Quality – both daytime and nighttime.
 15. Conduct end-to-end testing for each Intercom cable pair/conductor for continuity, ground fault, proper termination, shorts and crossed pairs.
 16. Test Intercoms to ensure intercoms are free of audible hum, electronic noise, poor speech reproduction, and audio feedback.
- C. Solution Testing: Trade Contractor shall test end-to-end solution. Solution testing must be coordinated with ACS subcontractor. This involves video stream testing, local camera configuration verification, DVADTS, DVTS, and DVRS new camera integration testing. Fixed and PTZ Door Cameras test shall include test showing when ACS Alarm is generated, the video from appropriate camera is shown on the SOW and SOW is also capable of retrieve playback from storage for all newly installed cameras. When ACS Alarm is generated, the PTZ camera moves to show door. Solution Testing must test all alarms and presets.
- D. Functional Testing: Test Plan shall include performance testing of the dynamic functions and operations of CCTV and Intercom Systems using direct observation or monitoring methods. Functional testing is the dynamic testing of the Systems (rather than just components) under full operation. Functional Testing shall demonstrate CCTV and Intercom System programming are operating according to documented design intent and Project Manual.
- E. Problem Correction: Any problems encountered including damage to Airport owned equipment during this test shall be documented and brought to the attention of Owner/MGC and corrected at Trade Contractor's expense. Trade Contractor shall promptly correct all problems encountered in the installation or function of a component, piece of equipment, or system that is not in compliance with Contract Documents.

- F. Test Documentation: Trade Contractor shall supply forms to be used during these tests for authorization and initialing by Managing General Contractor/Owner and Trade Contractor. The forms shall clearly define items tested, leaving room for the date, CCTV /Intercom element designation, and initials. All CCTV and Intercom functions shall be demonstrated to ensure operation as required by specification and drawings.
- G. Phased Commissioning: Commissioning process shall ensure all cameras, Intercoms and integrated programming performs according to Project requirements. Commissioning shall verify:
1. Equipment meets Project Manual requirements
 2. Installation meets Project Manual requirements
 3. Integration Programming meets Project Manual requirements
 4. System Performance meets Project Manual requirements
 5. Documentation meets Project Manual requirements
 6. Training meets Project Manual requirements

At a minimum, documentation shall include the following verifications:

- ✓ Installation of CCTV and Intercom Systems are installed according to manufacturer's recommendations and successfully passed all pre-functional checklist and testing.
 - ✓ Proper performance of equipment and associated programming interfaces.
 - ✓ All required documentation is complete and approved.
 - ✓ All equipment and systems are properly installed, connected, and labeled according to manufacturer's recommendations and industry accepted minimum standards.
 - ✓ Interconnecting wires and terminals are identified.
 - ✓ All equipment and systems receive adequate operational checkout by installing contractors.
 - ✓ Operation and Maintenance documentation provided is complete.
 - ✓ If applicable, verification all project closeout documentation is complete and approved.
 - ✓ Field of View - photograph of each camera shall be stored on CD and made part of each Phased Commissioning Documentation.
 - ✓ Trade Contractor shall complete" – Data Sheets as part of each Prefunctional Test.
- H. Trade Contractor shall be responsible to coordinate Testing and Commissioning with Owner, Managing General Contractor and other subcontractors.
- I. The Testing and Commissioning process does not take away from or reduce the responsibility of Trade Contractor to provide a finished and fully functioning System.

3.12 MAINTENANCE AND SUPPORT

A. Occupancy Adjustments and Emergency Repair:

Anytime after successful commissioning and acceptance of cameras and before Final Project Close-Out, Trade Contractor agrees:

1. To provide on-site assistance to troubleshoot, check cable connections, check proper operation of cameras and lenses.
2. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust preset positions as requested by Managing General Contractor/Owner.
4. Provide written report of adjustments and recommendations, replacing cameras / devices and adjusting FOV / focus to suit actual occupied conditions and to optimize performance. The on-site assistance described in this provision is in addition to the Warranty requirements of the Contract.
5. In the event of camera or Intercom failure, Trade Contractor shall provide on-site support within two (4) hours of request.

3.13 TRAINING

A. Training shall be provided in accordance with the requirements in Project Manual Division 1, Section 01670 – Systems Demonstrations.

3.14 CLEANING

A. Trade Contractor shall comply with all requirements stated in Project Manual Division 1, Section 01710 – Final Cleaning and the following:

1. Clean installed items using methods and materials recommended in writing by manufacturer.
2. Clean intercom and video surveillance system components, including camera-housing windows, lenses, monitor screens and intercom faceplates.
3. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.
4. Touch-up paint as needed.
5. General cleaning and maintenance of the premises
6. Coordination and direction of the cleanup work of its employees

3.15 SPARE PARTS.....10 % ??

A. Trade Contractor shall comply with requirements shown in Division 1, Section 01732. Trade Contractor shall be required to provide (on-site) the following spare parts 180 days prior to final close out of the project (or sooner as may be requested by Owner).

3.16 PROJECT CLOSEOUT

Trade Contractor shall comply with the requirements stated in the Contract Documents and Specifications, including but not limited to Project Manual Division 1, Section 01700 – Project Closeout and Section 01720 Project Record Documents.

END OF SECTION

SECTION 28 23 01

ADVANCED VISUAL DOCKING GUIDANCE SYSTEM (A-VDGS)

PART 1 GENERAL

1.1 SUMMARY

- A. SAFEDOCK Advance Visual Docking Guidance System (A-VDGS).

1.2 RELATED SECTIONS

- A. Drawings, General Provisions of the Contract, including General and Special Conditions, as well as General electrical materials and methods of installation apply to work of this section.

1.3 REFERENCES

- A. The standards and codes applicable to only a portion of the work specified in this section are referenced in the relevant parts or clauses. Standards and codes which are generally applicable to the work of this section, are listed below. The latest applicable version shall apply.
 1. NFPA 70 National Electrical Code (NEC).
 2. International Civil Aviation Organization ICAO, Annex 14, Part 5.3.22.
 3. Institute of Electrical and Electronic Engineers (IEEE) 127 and 519.
 4. ICS 6-78 (NEMA) Enclosures for Industrial Control Devices and Systems.
 5. ICAO, Aerodrome Design Manual, Part 4, Visual Aids.

1.4 SUBMITTALS

- A. Bid-Submittals: The following submittals shall be included with bid.
 1. UL or ETL Certification
 2. Spare Parts List: Provide manufacturer's recommended spare parts list. Spare parts list shall include Owner applicable pricing. Spare parts pricing shall remain valid for two (2) years from the date of final completion.
- B. Product Data: Provide manufacturer's data indicating, as a minimum, input voltages and amperage, physical characteristics, dimensions, and enclosure details.
- C. Shop Drawings: Provide schematics and interconnection diagrams, indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements. Differentiate between manufacturer-installed wiring and field-installed connections.
- D. Mounting Location Chart: Provide manufacturer's data indicating the mounting location, in reference to the type of aircraft being serviced and distance from reference. Recommended bracket design shall be submitted for approval.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation Data: Include instructions for operating A-VDGS and describe operating limits that may result in hazardous or unsafe conditions.
- G. Maintenance Data: Include routine preventive maintenance schedule, recommended spare parts list, and required special tools. The contractor is responsible for project post-completion maintenance and adjustments of each A-VDGS installed system as needed for a period of three years from Substantial Completion.

- H. Operation and Maintenance Manuals: Include in ATA 101 format a general description, theory/sequence of operation and specification, schematics and wiring diagrams, check-out instructions, installation and maintenance procedures, parts list, recommended spare parts list, troubleshooting guides, controls and accessories information.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- J. UL certification per 1.4.B.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with demonstrated successful operation not less than five years of experience.
- B. Only equipment types that conform to and are in full compliance with the ICAO Annex 14 clause 5.3.22 and ICAO Aerodrome Design Manual, Part 4, Visual Aids will be acceptable.
- C. UL Compliance: Units shall be UL, or ETL approved and shall be labeled by a nationally recognized testing laboratory at the time of bid. Submit verification with bid submittals.
- D. Installer Qualifications: An experienced installer with a minimum of five-year equipment and systems installation experience similar to the work required by this section. The following contractors are listed as contractors with previous experience installing the type of equipment specified:
 1. DATO Electric – www.datoelectric.com. Point of Contact: Jay Joseph, P. (305) 216-1882
 2. AERO BRIDGEWORKS – www.theaerogroup.net Point of Contact: Jay Grantham, P. (919) 796-2168

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Handle carefully to avoid damage to components, enclosure, and finish.
- C. Deliver equipment as a factory-assembled unit with protective crating and covering.
- D. Store equipment and material in suitable facilities until delivery, installation, and acceptance by the Owner.
- E. Installing Contractor shall be responsible for coordinating the delivery acceptance of this equipment at the job site. Installing Contractor shall be responsible for receiving, offloading, storing and protecting this equipment until such time as it has been installed by him and accepted by the Owner.

1.7 WARRANTY

- A. Provide a warranty and an additional Service agreement for the new units and ancillaries. The Service agreement and warranty activities shall be performed by factory trained service technicians. SLA and associated warranty shall run two (2) years from

the Date of Beneficial Use. Date of Beneficial Use is defined as the date the system is turned over by the manufacturer, and accepted by the Owner, for normal operation. All warranty services shall be at the site of the installation. Provider shall be responsible for all travel and sustenance expenses necessary for warranty services.

- B. All service and warranty shall be performed by factory trained technicians. All A-VDGS warranty services shall be at the installation site. Manufacturer shall be responsible for all travel and sustenance expenses necessary to perform warranty services and repairs.

1.8 OPERATION AND MAINTENANCE MANUALS

- A. Provide six (6) bound copies and/or three (3) electronic copies (CD or DVD) of the approved, comprehensive Operation and Maintenance Manual to the Owner fourteen (14) days prior to Substantial Completion.
- B. The manuals shall fully describe each product, system, or subsystem numbered logically separated into sections and if hardcopies are requested contained in rigid plastic binders with identification inserted in clear plastic pockets on front and spine of each binder. Manuals shall be assembled in accordance with ATA 101
- C. The content of the manuals shall be limited to information and data that specifically apply to products provided and shall include routine normal and special operating instructions and sequences. Also included shall be routine maintenance procedures and guides for troubleshooting, disassembly and reassembly instructions, and recommended spare parts list consisting of current prices and sources.
- D. Wiring diagrams and schematics shall be incorporated into the manuals to clearly show features such as controls, switches, and indicators by name and location.
- E. Contractor is to coordinate training Airport personnel staff (MDAD) or designated representatives on all aspects of functionality of the system and operating manuals.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design - ADB Safegate Safedock version T-1 A-VDGS
 - 1. ADB SAFEGATE, 977 Gahanna Parkway, Columbus, OH 43230.
Point of Contact: Doug Woehler, P. 732.991.2837.

2.2 PROOF OF PERFORMANCE AND RELIABILITY

- A. Manufacture must provide at least five years of continuous operation of A-VDGS, with the technology and capabilities described in this document, to include both airport and airline customers.
- B. Provide evidence that systems with similar technique are operational at ten (10) international airports or more. Provide evidence that a minimum of two thousand (2,000) systems with similar technique are in operation.
- C. Manufacture must provide evidence of technical service support to include 24/7 and emergency response.
- D. Manufacture must provide evidence of experience where the proposed model A-VDGS has been used successfully to allow pilots to park aircraft at the gate during irregular operations and ramp closures.

- E. Manufacture must provide evidence of experience where the proposed A-VDGS and apron management system are successfully integrated with an airport operational database (AODB) to share real-time data among stakeholders.

2.3 A-VDGS COMPLIANCE

- A. The Advanced Visual Docking Guidance System (A-VDGS) shall be in full conformity with all the clauses of ICAO Annex 14, Volume I, Paragraphs 5.3.25 and 5.3.26 [Seventh Edition July 2016] and all other aeronautical standards and laws as appropriately applicable for the country of application shall also be considered in the design and construction of the required system.
- B. The A-VDGS shall provide active docking guidance information to the pilot and co-pilot to achieve precise positioning of an aircraft at the assigned stand in all weather conditions and will not fail to alert the pilot if it is unsafe to proceed.
- C. The system shall comply with eye safety regulations and be classified as Class 1 as per EN/IEC 60825-2 (2007), ANSI Z136.1, JIS C 6802-1997 with amendment 1-1998.
- D. The manufacture shall obtain the following documents and enclose them in the tender submission:
 - E. Assessment issued by 3rd party authorized test institute: ICAO Annex 14 A-VDGS compliance statement
 - F. Test certificates by independent laboratories for the following parameters:
 - G. Laser beam levels shall be in accordance with: EN/IEC 60825-2 (2007)
 - H. The equipment shall be in accordance with relevant requirements for EMC, immunity/emission as stated by EN 50081-1, EN 50082-2, EN 55024, EN 55022, EN 61000-4-2, EN 61000-4-4.
 - I. All installation works shall be carried out with the best workmanship and in accordance with local regulations and requirements.
- J. A-VDGS AND APRON MANAGEMENT SYSTEM COMPONENTS
 - a. Laser scanning unit with a three-dimensional scanning technique to capture, measure and track arriving aircraft enclosed in a suitable dust and weatherproof housing.
 - b. Display unit to display active docking guidance information for both the pilot and copilot, based on real measurement by the sensor.
 - c. Operator panel with emergency push-button for manual operation of the A-VDGS.
 - d. Control unit to control the various units such as scanning unit, display unit and operator panel and process data and transmit to the operator panel and apron management solution.
 - e. Supporting arrangement, cabling and accessories, which are required for the proper mounting of the A-VDGS.
 - f. Communication cabling to connect the A-VDGS and operator panels to the apron management solution.
 - g. The apron management system software operates on standard off-the-shelf-

Windows-based computers (server or workstation).

- h. The laser scanning unit, display unit and control unit are housed in the same cabinet.
- i. Optionally, the scanning unit shall be able to be mounted separately from the display unit if required based on installation design.

2.4 A-VDGS DISPLAY UNIT

- A. The display unit shall be able to display all necessary characters and symbols on a single easy-to-understand display to give parallax free and clearly visible active docking guidance information to the pilot and co-pilot during day and nighttime and during all visibility conditions.
- B. The displayed information shall be readable by pilots in direct sunlight, reflections and without dazzling at night. This shall be achieved through automatic adjustment of light intensity according to the surrounding light conditions. Further, the display unit shall be fitted with a sunshade.
- C. Docking guidance information shall be displayed by using a high intensity LED matrix with a high MTBF. Information and guidance shall be displayed in a yellow font. Errors and the STOP message shall be displayed in a red font.
- D. The A-VDGS display unit shall provide the following information:
 - Aircraft identification (type and series)
 - Azimuth centerline guidance to pilot and co-pilot
 - Aircraft actual position with reference to centerline
 - Apron pre scan
 - Closing rate indicator for the last 15 m / 45 ft to stop position
 - Digital countdown configurable for the last 30 m / 90 feet to stop position
 - Stop information
 - Correctly parked confirmation
 - Excessive speed information
 - Indication if the aircraft goes beyond the stop position
 - Ability to integrate with external systems such as but not limited to PBB and GSE
 - Automatic error indication
 - Free text (when connected to a central computer system)
- E. The alphanumeric text display shall display text messages (such as aircraft type, aircraft series, digital distance to stop position, etc.) on two (2) lines with at least seven (7) characters per line.
- F. The system shall provide active guidance in that the azimuth guidance indicator shall show the actual position of the aircraft in relation to the centerline of the aircraft stand and shall indicate the direction to steer. The azimuth guidance indicators shall be aligned for use by the pilots occupying both the left and right seats and shall provide unambiguous left/right guidance to enable the pilots to acquire and maintain the centerline without over-

controlling. The ability to maintain the centerline is critical to warning against potential wing tip accidents. Active azimuth guidance shall be provided based on actual position of the aircraft and not based on the pilot's position. The same guidance shall be identical to any stakeholder at the stand.

- G. The closing rate information shall be configurable in both feet and meters and shown both symbolically and numerically. A bar decreasing for the last fifty (50) feet (15 meters) to the designated stop position shall give the pilots an intuitive indication to decelerate. Digital countdown of the distance-to-go as per ICAO Annex 14 shall be provided for the last 30 m / 90 ft.
- H. When the aircraft reaches its designated stop position, a STOP message shall be displayed in red, as per ICAO Annex 14 recommendation.
- I. A warning to reduce speed shall be displayed as SLOW when the speed of the approaching aircraft is found to exceed the configured maximum speed.

2.5 SCANNING UNIT

- A. The A-VDGS laser scanning unit shall be designed based on a three-dimensional scanning technique to track both the lateral and longitudinal position of the approaching aircraft.
- B. The A-VDGS shall ensure aircraft/gate compatibility and safe docking by utilizing a three-dimensional scan to measure parts of the aircraft on either side of the centerline to accurately verify the aircraft type and subtype and match results against the expected aircraft type.
- C. The aircraft verification technique shall not require any sensor embedded in the apron or rely on any third-party system.
- D. The scanning unit shall operate safely and reliably in all weather, visibility, background lighting and pavement conditions, down to CAT IIIA conditions. The performance of the system shall not be dependent on the apron floodlights or any other external sources of illumination and all A-VDGS functionalities shall be executable regardless of the intensity level of ambient or artificial lighting or contrast of surrounding surfaces.

2.6 OPERATOR PANEL

- A. Each A-VDGS shall be provided with an operator panel to allow local start of the docking procedure. The operator panel shall be equipped with an emergency stop button. When the emergency stop push-button is activated, the display unit shall show the word STOP in red.
- B. The operator panel keyboard shall comprise of an alphanumeric LCD display to indicate the system's mode of operation and diagnostic/error information.
- C. The operator panel shall have a four-digit numeric password protection feature to prevent unauthorized use of the system.
- D. The A-VDGS shall be capable handling multiple operator panels and emergency stop buttons if required.

- E. The Operator Manual Panel shall be protected from the elements, including dust and humidity in accordance with IP65.
- F. The A-VDGS shall be provide a programmable 4-digit access code to prevent unauthorized system operation.
- G. The Operator Manual Panel shall be controlled by an internal microprocessor unit, connected to the apron management system.

2.7 A-VDGS SAFETY FEATURES & FUNCTIONALITY

- A. Safety of operation shall be of high concern. The A-VDGS shall be capable of verifying the physics of the aircraft type approaching the stand against the aircraft type the system is expected to receive. This is an essential safety feature required to avoid any risk of collision of the aircraft with the passenger boarding bridge or otherstand equipment. If the approaching aircraft does not match the physics of the type expected, the system shall automatically direct the pilot to stop the aircraft at least 15 m / 45 ft before the stop position.
- B. The A-VDGS shall have a built-in error detection program. If an error occurs in the system, the type and location of the error shall be shown on the screen of the operator panel. Simultaneously, the display unit shall show the word ERROR.
- C. The A-VDGS display shall show the word STOP in red (as per ICAO Annex 14 recommendation), if any of the errors below occur after the system has been started and while an aircraft is approaching the gate:
 - The scanning unit has stopped tracking the aircraft.
 - A software error has been detected.
 - Any critical hardware malfunctions
- D. The A-VDGS must be capable handling all commercially available aircraft types intended for contact stands.
- E. The A-VDGS shall be capable of interlocking with the passenger boarding bridge to disable the start of docking if the passenger boarding bridge is not in its park or safe position.
- F. The A-VDGS shall include a sunshade.
- G. Laser scanning A-VDGS shall include a calibration system to facilitate setting the laser guidance system.
- H. The A-VDGS shall be able to coordinate with the PBB and shall authorize PBB pre-position upon verification that the aircraft is parked in the correct location.
- I. The A-VDGS shall be able to communicate "X" "Y", and "Z" offset information to the PBB to accommodate aircraft mis-parking during PBB pre-position operations
- J. The A-VDGS must allow for gate docking during low visibility irregular operations, down to CAT IIIA conditions and during ramp closures.
- K. The A-VDGS shall be capable of providing guidance to aircraft on curved, multiple, or offset centerlines.
- L. The A-VDGS shall be capable of interfacing with stand equipment for interexchange of information regarding the incoming aircraft type and the final stop position.
- M. In idle mode, the A-VDGS shall be capable of displaying alphanumeric flight turn information

useful to ramp personnel or pilots while an aircraft is prepared for departure. The system shall display information on seven (7) rows in dual color (red and yellow) with at least seven (7) characters (fixed string) or twenty (20) characters (rolling string). In addition, it shall be possible to display information with double font size over two LED rows.

- N. The A-VDGS shall include a high-resolution IP camera for surveillance and logging purposes.
- O. The A-VDGS shall have an apron scan function to enhance normal A-VDGS stand safety verification and standard gate safety procedures. The A-VDGS will scan the gate area for unidentified or foreign objects in the way of the arriving aircraft. The function shall detect and locate objects before a docking is about to be initiated and an aircraft arrives at the stand. This automated functionality minimizes the risk of human error by ensuring that the stand is clear from objects before opening it for a docking procedure.

2.8 A-VDGS TECHNICAL DATA AND REQUIRED PERFORMANCES

- A. Stop position range (distance between A-VDGS and aircraft)
 - 1. The A-VDGS shall be able to accommodate a large range to comply with all installation requirements at the site. The A-VDGS shall operate safely and reliably for any distance between the A-VDGS and the aircraft nose in the range of 2-65 m / 6-195 ft.
- B. Accuracy: Stop position and azimuth guidance accuracy shall be +/- 10 cm / 4 inches.
- C. Readability: 80 meters
- D. Operating temperature
 - 1. The system shall operate with ambient temperature between -25°C and +55°C (-40°C to +55°C if operator panel is excluded) and relative humidity of up to:
 - 95% with a maximum temperature of +35°C
 - 60% with a temperature above +35°C
- E. Encapsulation: The system shall be designed to meet the following IP levels:
 - Display unit: IP 54
 - Scanning unit: IP 54
 - Operator panel: IP 65
- F. Power supply and consumption
 - Power supply: 115/230V AC, 50/60 Hz
 - Maximum power consumption: 1050 W
 - Typical power consumption during operation: 550W
- G. Dimension and weight:
 - The dimensions of the system shall be approximately: 1840 x 1094 x 724 + 80 mm / 72 x 43 x 28.5 inches (H x W x D) including sunshade cover.
 - Total weight of the system shall not exceed 140-155 kg / 308-342 lbs. depending on optional add-on hardware components used to ease handling and installation.

2.9 APRON MANAGEMENT SYSTEM FUNCTIONALITY

- A. The apron management system shall be a control and monitoring tool that can be used together with the A-VDGS. The apron management system shall act both as a service provider

for the A-VDGS and as a gateway to integration with other external systems that can benefit from data provided by the A-VDGS or provide information that is useful for the A-VDGS or gate operation.

- B. Through integration with the A-VDGS and airport systems, the apron management system shall provide real-time status views of the situation at each gate and allow automatic docking and remote operation of the A-VDGS.
- C. The apron management system shall be capable of interfacing to external airport and gate systems and equipment to allow advanced operational support and data deliveries, including A-CDM support.
- D. The apron management system shall be capable of integration with, but not limited to, flight information, airport operational database, gate management, resource management, flight and ground tracking systems.
- E. When the apron management system is interfaced with an airport operational database system (AODB), it shall be capable of displaying flight turn information on the A-VDGS that is useful to ramp personnel or pilots.
- F. The apron management system shall be capable of enforcing preprogrammed gate restrictions, including adjacent gate restrictions.
- G. The apron management system shall be capable of monitoring, tracking, and reporting the following information (but not limited to):
 - Estimated time of arrival or departure
 - Scheduled time of arrival or departure
 - Actual block on and block off information
 - Gate number
 - Aircraft type including series
 - Flight number
 - Airport of arrival or departure
 - Passenger boarding bridge status
 - GSE use (GPU on/off, PCA on/off)
- H. The apron management system should be capable of operating in a redundant configuration.
- I. The apron management system shall be able to handle stand adjacency ruling in real time to avoid conflicting occupancy at the stands to maintain wingtip clearance regulations.
- J. The apron management system shall be capable of controlling and monitoring a minimum of 125 aircraft gate docking positions.
- K. If required, the apron management system shall be connected to the Airport Traffic Information System (ATIS) to allow for transmission of aircraft and flight schedule information.
- L. If required, the apron management system shall be capable to integrate with the Owner's GSE monitoring and diagnostic system to provide necessary gate status and fault information.
- M. The system shall be capable of storing the last 100 error messages, including associated gate, date and time of occurrence.

- N. The system shall be capable of storing software data memory values for at least 150 types of aircraft.

2.10 ELECTRICAL RATINGS AND COMPONENTS A-VDGS

- A. Input Voltage Rating: 120 Volts (nominal), 60 Hertz, 1-phase, 2-wire plus ground.
- B. All fuses shall be miniature circuit breaker type.
- C. Total voltage harmonic distortion (THD) from the equipment, as measured from 3rd to 21st harmonic at all branch circuit connection, will not exceed 5%, and individual
- D. harmonic distortion will not exceed 3%, as defined by IEEE 519. If necessary, the equipment manufacturer shall provide harmonic filters to meet these conditions. This shall apply to all microprocessor-based components, equipment containing switch-mode power supplies and all non-linear equipment loads.
- E. Main Disconnect
 - 1. A suitably rated disconnect device shall be provided on the unit to allow maintenance personnel the capability of completely removing power from the unit for maintenance purposes.

2.11 CONTROLS AND OPERATIONS

- A. At a minimum, the system shall provide Pilot Display units and Operator Manual Control Panels to support all centerlines per the design plan, an apron management system, that will integrate with other applicable systems, to allow for Airport Operations to access the available information provided by the A-VDGS.
- B. The A-VDGS shall provide an accurate and convenient means to direct aircraft to its final docking/parking positions, providing both the pilot and the co-pilot with the required directions and information.
- C. The A-VDGS shall provide a simple and reliable visual aid to effectively position an aircraft on the designated aircraft stand, providing both azimuth guidance and the stopping position at the stand. All information needed by the pilot to position and park the aircraft shall be displayed on the Pilot's Display Unit to be located at the extension of the centerline on the building face. The A-VDGS shall be compatible with the aircraft fleet mix designated to park at a particular gate.
- D. System measurements used to detect aircraft position during docking shall not rely on sensors mounted to or embedded in the apron.
- E. The A-VDGS shall be designed to operate in all weather, lighting, and visibility conditions both day and night. The system shall allow for compensation for different mounting heights.
- F. If required, the system shall be capable of providing a "Clear of Taxi Lane" signal to indicate a docking aircraft's tail section is out of the taxi lane safety area. This signal shall be independent of block on/block off indications.
- G. The A-VDGS shall be able to be activated either automatically or manually. Automatic activation shall be carried out through a connection with the Airport Operational Database (AODB) / Flight Information Display System (FIDS) which monitors airline schedules and equipment. Manual activation is made from an Operator Panel, which is to be mounted on the PBB Rotunda column or from the A-VDGS central Control Workstation located within the terminal building.
- H. The A-VDGS shall be programmed with the stopping position data for the gate fleet mix. The Apron Management System shall allow changing or adding aircraft data into the A-VDGS

software; the Operator's Manual Control Panel shall allow for personnel to manually enter aircraft. The system shall enforce gate restrictions and limit the serviceable aircraft to those within the predetermined restrictions. Interlocks between dependent gates shall be provided to enforce gate restrictions.

2.12 ENVIRONMENTAL CONDITIONS

- A. The unit shall successfully operate under the following conditions:
- Ambient Temperature Range: 25 degrees F to 125 degrees F
 - Relative Humidity: up to 95%, including static cold or hot soak up to 48 hours within this range.
 - Wind: Up to 95 mph

PART 3 EXECUTION

3.1 ASSEMBLY MOUNTING

- A. The A-VDGS assembly shall be packaged in such a manner that no damage shall occur because of transportation.
- B. A-VDGS unit shall be installed per the manufacturer's published data and as indicated in contract drawings.

3.2 EXAMINATION

- A. Verify/perform the following items or tasks.
1. Verify the site is prepared for installation of Pilot Display Unit.
 2. Make a final check of the security of the power connections.
 3. Re-install any covers removed during installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. The units shall not hinder or restrict the boarding bridge or other ancillary equipment from operating within its full designed operating range.
- C. Arrange installation to provide adequate clearance for service and maintenance.
- D. The unit shall be properly aligned and adjusted before final acceptance.
- E. Commission equipment. Provide complete functional testing to the satisfaction of the Owner. Assign to installer all punch list items as required for a proper installation of the A-VDGS units

3.4 INTERFACE WITH OTHER WORK

- A. Installation of unit shall be coordinated with other trades associated with project.

3.5 FIELD QUALITY CONTROL

- A. Inspect for loose connections, proper grounding connections, and proper sequence of operation.

3.6 STARTING EQUIPMENT AND TRAINING

- A. Demonstrate proper operation of equipment to Owner. Operational checkout shall consist of the following:
1. Operator Manual Panel shall be checked for operation and sequence of control.
 2. Pilot Display Unit operation shall be verified by visual inspection.

- B. Contractor is to train Airport personnel staff (MDAD) or designated representatives on all aspects of functionality of the system.

3.7 CLEANING

- A. Clean unit from all construction dust and debris prior to start-up.
- B. Touch up scratched or marred surfaces to match original finish.
- C. Protect the installed unit from subsequent construction operations.

3.8 DEMONSTRATION

- A. Confirm full and partial operational design conditions, including the following:
 - 1. Simulation of designed operational limits (i.e., Detection Range) for each type of aircraft designed to use the gate.
 - 2. Aircraft type/class database
 - 3. Error message library
 - 4. Gate restriction enforcement including adjacent gate interlocks
 - 5. PBB interlocks
 - 6. Identification of tail clear from taxi lane
 - 7. PBB pre-position operations, including corrections for mis-parked aircraft
- B. Confirm each A-VDGS unit provides correct operations, including:
 - 1. Range Resolution
 - 2. Tolerance Limits
 - 3. Diagnostics
 - 4. Communications Interface
 - 5. Aircraft Recognition/Database
 - 6. Graphics Interface
 - 7. Emergency Stop Button
 - 8. Alarms
 - 9. Internal Power supplies and DC Status (PDU)
 - 10. Display unit LCD-pixel test
 - 11. Manual Control panel functionality
 - 12. Central Control Unit functionality
 - 13. Display Configuration Mode
- C. After confirming individual unit functions, the system shall have at least 10 hours of operation followed by a complete system inspection for necessary configuration changes or adjustments. Actual operating conditions shall be based on those of typical peak period projections.

END OF SECTION

SECTION 28 31 00

FIRE ALARM DETECTION AND ANNUNCIATION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods sections apply to work specified in this section.
- C. The requirements of Section 260000 is hereby made part of this section of the Specifications.
- D. Materials to bear Underwriter's Laboratories labels and be FM approved.

1.02 SUMMARY

- A. Miami International Airport has an existing Central Fire Alarm System which is controlled and monitored through the existing Building Management System. This fire alarm system consists of Fire Alarm Panels (FAP) which address the individual initiation devices and output controllers via programmable addressing. The FAP's are in turn monitored and controlled by a central network and monitored by the Operations Control Room (OCR).
- B. The FAP must be used to interface with the existing system and can operate as a stand-alone panels. This contributes to the overall system reliability by maintaining local operation in the event of communications failure to the central computer. New fire alarm system FAP's shall be microprocessor-based, multiplexed, 4-wire Class A systems compatible with the existing BMS via the Fire and Security Bus, and permit individual device identification, interrogation and management.
- C. All buildings are to be annunciated at the Operations Control Room (OCR) located on the second floor near the passenger entrance to the "E" Concourse via the existing BMS. Reset capability at the sensor and panel level from the Central Computer in the OCR is to be provided.
- D. The work required in this specification consists of all labor, materials, equipment and services necessary and required to complete and test the automatic fire detection and alarm system. Any material or device not specifically mentioned in this specification or not shown on drawings, but required for proper performance and operation, shall be furnished and installed.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Manufacturer: Subject to compliance with requirements, provide fire alarm and detection systems components that match and are compatible with the existing Honeywell fire alarm XLS/XB51 systems.
- B. Material and Equipment: Provide basic wiring materials which comply with Division 26, "Basic Materials and Methods", "Raceways", "Wires and Cables", and "Electrical Boxes and Fittings"; types to be selected by Installer.

2.02 QUALITY ASSURANCE

- A. Manufacturer: Honeywell.
- B. NEC Compliance: Comply with similar NEC as applicable to construction and installation of fire alarm and detection system components and accessories.
- C. UL Compliance and Labeling: Provide fire alarm and detection system components which are UL-Listed and labeled.

2.03 SUBMITTALS

- A. Product Data: Submit manufacturer's data on fire alarm and detection system components including, but not limited to, roughing-in diagrams and instructions for installation, operation and maintenance, suitable for inclusion in maintenance manuals. Also, include riser and wiring diagrams.
- B. Shop Drawings: Provide shop drawings showing equipment/ device locations and connecting wiring of the entire fire alarm and detection system additions. Include wiring diagrams (point to point) and riser diagrams.

2.04 SYSTEM DESCRIPTION

- A. Fire alarm system shall be an intelligent loop system capable of monitoring status information from fire alarm sensors and displaying their conditions individually at the fire alarm control unit as specified herein. System shall be loop supervised (Class "A") and shall have a loop trouble indication signal. System shall interface with and transmit all trouble conditions specified herein to the Honeywell XLS/XB51 System.

- B. Manual actuation of a fire alarm station or automatic activation of any smoke detector, thermal detector or flow switch shall cause an alarm signal to be transmitted instantaneously to fire alarm control panel and annunciator panel to display alarm zone, identify individual sensor(s) in alarm and initiate appropriate signaling and control sequence. The interface control unit shall send appropriate alarm or trouble signal to the existing Honeywell XLS/XB51 System.
- C. Signaling devices shall be combination horn and light strobe type in finished areas, and a siren with a separate strobe light in equipment areas.
- D. Air handling units in areas where an automatic signal originates shall automatically enter into smoke evacuation mode. Fire alarm panel shall be capable of activating extra sets of normally closed and normally open contacts for each alarm zone/point for required sequences. Coordinate with mechanical drawings for required smoke evacuation mode sequence of operations.
- E. Tamper switches shall annunciate per device, but shall not activate fire alarm.
- F. Flow switches shall annunciate per device, all other devices shall annunciate by floor or zone. Any alarm shall activate all signals.
- G. All new fire alarm circuits shall be looped and piped meeting Class "A" system requirements per NFPA 72.

2.05 EQUIPMENT DESCRIPTION

- A. Fire Alarm Control Unit (Fire Alarm Panel)
 - 1. The FAP shall serve as a communications interface between the existing fire alarm network and the sensors and controlled devices. It shall be of modular design containing microprocessor and memory, and plug-in circuit boards capable of intermixing fire zones and security zones within the same panel, in any combination.
 - 2. FAP electronics shall be protected in a covered enclosure made of minimum 16-gauge steel. Access to all electronics shall be via key lock; no other tools shall be required.
 - 3. The FAP shall provide power to all initiating and indicating devices and shall supervise the following:
 - a. Communications with the CPU, indicated by red Transmit and Receive LED's which follow the data stream.
 - b. The normal operation of the FAP microprocessor, memory contents, and

communication with every plug-in board that all boards have the proper type in the proper position. Systems that supervise the presence of a plug-in board but that do not assure that board positions have not been exchanged shall provide equivalent means for such assurance, beyond that provided by the locked cover.

- c. All initiating and indicating circuits.
 - d. All fan and damper circuits.
 - e. All relays shall be supervised against removal from the FAP.
 - f. The key-locked cover shall have a tamper switch to indicate opening of the cover to the CPU.
 - g. Primary power, indicated by a green POWER LED.
4. Upon actuation of a fire alarm initiating device, the control panel shall initiate an alarm sequence providing non-coded alarm signaling.
5. Secure/Access switching for each security zone shall be accomplished by command from the system's input/output devices or by key switch from the protected area. Switching shall be accomplished within the control panel with feedback on status reported automatically to applicable system input/output devices. Wiring to movable protection shall be supervised when the zone is placed in the access mode. Tampering with the lines shall be reported automatically as an alarm.
6. Zone command mode operation shall be initiated manually from appropriate input/output devices and initiated automatically by time program or specific event. These command mode outputs shall be programmable to perform the following applications:
- a. Activate and de-activate on command.
 - b. Activate momentarily when commanded.
 - c. Activate the output from the corresponding input alarm and remain activated until commanded "off". Output shall not de-activate until the input alarm is normal and the "off" command issued.
 - d. Activate the output from the corresponding input alarm and de-activate when the alarm condition has cleared.
 - e. Activate the output from the corresponding input alarm or "on" command from the control panel. Output shall remain activated until commanded "off" or, if not alarm is present, output shall remain activated seven to nine seconds.
7. It shall be possible to command test, reset, and alarm silence from the system's main control panel.

8. Each FAP shall be provided with the following:
- a. All hardware and software to allow the panel configuration and operation to be changed at the panel. Systems that require offsite programming are not acceptable. The memory data for panel configuration and operation shall reside in non-volatile memory. If non-volatile memory is provided by battery-backed RAM, removal of the board shall not cause loss of memory contents.
 - b. Switches for Panel Setup, Test, Reset, Manual Evacuation Alarm, Silence and Acknowledge, accessible only behind the key-locked cover.
 - c. Individual supervisory LED's shall be provided for Power, Run, Alarm, Trouble, Disconnect, Low Battery and Ground fault visible without opening the key-locked cover.
 - d. Each zone shall have a unique system address with zone descriptor (fire, smoke, water flow, intrusion, etc.) programmable from the central location. Systems which require off-site programming or editing are not acceptable.
 - e. Initiating Zones; Each zone containing smoke detectors shall provide power and monitoring for up to twenty (20) smoke detectors and, for increased reliability, shall be provided with alarm verification with field-adjustable time from 0 to 60 seconds. Only a verified alarm shall initiate the alarm sequence for the zone. All hardware and software shall be provided to facilitate selection of circuit performance per NFPA 72D Style B or C on-site. Each zone shall have a red LED to indicate alarm and a yellow or amber LED to indicate as a trouble condition; not an alarm condition. Each zone shall be provided with a disconnect switch to prevent alarms in the

zone from initiating the alarm sequence. For trouble-shooting, it shall allow the alarm LED to indicate an alarm condition in the zone. When disconnected, a trouble condition will be indicated as well as a disconnect. Security zones shall monitor normally-open or normally-closed security devices and shall provide UL Grade A line supervision. When the zone supervisory current increases or decreases by more than 50%, an alarm signal shall be initiated.
 - f. Indicating Zones: Each circuit shall provide power for polarized alarm signaling devices. Each circuit shall provide 4-wire, fault-tolerant operation where the alarm signaling devices shall operate even in the presence of a single ground or open fault in the circuit wiring. A red LED to indicate the energized state of the circuit and a yellow or amber LED to indicate a trouble condition shall be provided for each circuit. A disconnect switch for each circuit shall be provided to allow the FAP to be tested without sounding alarm signals. When disconnected, the FAP shall indicate both a trouble condition and a disconnect.

- g. Provide separate and distinct supervised outputs for each zone alarm or trouble condition to perform the annunciation and control functions as described herein. Each output shall have a red LED to indicate when the output is energized and a yellow or amber LED to indicate trouble in the circuit. Outputs shall be capable of operating remote annunciator lamp, relay or applicable low voltage load.
 - h. Power sufficient for the FAP and initiating and indicating devices shall be provided. An automatic battery charger shall continuously apply the proper voltage to panel-mounted batteries in order to maintain a fully-charged state. Battery charger circuit shall be designed to operate with FAP manufacturer- recommended batteries.
 - i. Standby batteries of sufficient capacity to provide the indicated operation shall be FAP-mounted. Batteries shall be maintenance-free, sealed lead-acid type. Battery connections to the power supply/battery charger shall be fused or provided with equivalent protection.
9. Provide an intelligent loop interface for the fire alarm control unit that shall:
- a. Monitor analog information from photo-electronic smoke sensors and from thermal sensors.
- Monitor condition of fire alarm and security devices.
- Provide addressable control or indicating output Isolate short circuit faults from rest of loop. Recognize varying levels of sensor conditions: below normal (trouble), normal, above normal (pre-alarm or maintenance), and alarm.
- Provide two classes of alarm.
- Perform alarm verification on selected, individual sensors.
- Provide local numeric and LED display of device address and condition.
- Provide up to 198 Logical Point Groups (LPG's) and 255 Time and Event Programs (TEP's).
- Enable operator or TEP to change normal secure/access status of individual security points.
- b. The Intelligent Interface shall consist of Intelligent Loop Interface Boards and Communication/Display Boards. Each Intelligent Loop Interface Board provides two 2-wire circuits or one fault-tolerant loop. The Communication/

Display Board displays the address and condition of fire alarm sensors and security points at the control panel.

- c. The Intelligent Interface continually monitors the status of all fire alarm points by address. An operator at the fire alarm panel can read the status of all fire alarm devices. At the Fire Alarm Panel, an authorized operator can adjust alarm and pre-alarm thresholds as well as operational parameters within UL limits.
- d. Each fire alarm sensor is assigned a point address from 01 to 99 by means of two-digit decade switches in the sensor head.
- e. The Intelligent Interface shall enable scan rates that ensure responses to alarm information in less than one second regardless of the number of Modules scanned.
- f. During the scan cycle, the system shall monitor sensor's detected smoke or heat level and compare the reading to the alarm threshold for that sensor. When the threshold is reached, the system shall identify the sensor type and location by the assigned address (e.g., Smoke Sensor in Room #####) and command individual relays to respond to the alarm.
- g. In addition to recognizing normal and alarm conditions, the Intelligent Interface shall recognize below-normal sensor values that reveal a trouble condition and above-normal values that indicate either a pre-alarm condition or the need for maintenance. Sensor address and conditions shall be displayed at the fire alarm control panel. Authorized operators shall be able to adjust alarm and pre-alarm thresholds and other parameters within UL limits and local code constraints.
- h. The Intelligent Interface shall provide two classes of alarm that enable critical alarms to override less critical alarms. Alarms that are overridden remain in the System and display after all first-class alarms are acknowledged.
- i. The Intelligent Interface shall enable the fire alarm control panel to perform alarm verification on individual sensors without operator command and to monitor the alarm verification activity of individual sensors.

B. Initiating Devices

1. Fire Alarm Pull Station

- a. Fire alarm pull station shall be Honeywell Model XLS-278 or equal, non-coded, open, pull lever type.
- b. A single downward action is required to break glass rod and actuate switch initiating the audible and visual alarm.
- c. Fire alarm pull stations shall be semi-flush mounted.
- d. Fire alarm pull station fronts shall be hinged and must be opened to reset station and replace glass rod.
- e. Fire alarm pull stations shall be provided with two normally open contacts.

2. Smoke and Thermal Sensors

- a. Smoke sensors shall be Honeywell Model XLS-PS-B or equal, photoelectric type factory set at a nominal 2.3%/foot obscuration, or field adjustable from control panel.
- b. Maximum recommended coverage for smoke sensors shall be 900 square feet.
- c. Thermal sensors shall be Honeywell Model XLS-HFS or equal, factory set at 135 degrees F.
- d. Maximum recommended coverage for thermal sensors shall be 625 square feet.
- e. Provide all sensors with the following:
 - 1. Detachable mounting base.
 - 2. Built-in test switch.
 - 3. Remote test capability.
 - 4. Two (2) LED indicators on opposite sides of the head for 360-degree viewing angle.
- f. Duct mounting housings shall be provided for smoke sensors which are to be provided and mounted on all supply and return air ducts of all units.

3. Monitor Modules

- a. Monitor modules shall be Honeywell Model SIGA-CTI or equal, and shall be provided for all contact closure initiating devices, i.e. fire alarm pull stations, water flow switches, and tamper switches.
- b. Monitor modules shall be provided with a LED indicator and two (2) decade switches for setting intelligent loop module address.

4. Control Modules

- a. Control modules shall be Honeywell Model SIGA-CR or equal, and shall be provided with an integral relay which energizes when commanded on. The relay shall be rated for 2A at 28 VDC.

- b. Control modules shall be provided with a LED indicator and two (2) decade switches for setting intelligent loop module address.
 - 5. Water Flow and Tamper Switches, and Water Flow Control Valves:
 - a. All water flow and tamper switches, and water flow control valves shall be furnished and installed by Division 21.
 - b. All water flow and tamper switches shall be provided with two (2) switches.
- C. Signaling Devices
 - 1. Audio-Visual Signal Unit
 - a. Audio-visual signal unit shall be ADA approved, Honeywell Model P24110/S24110 or equal, semi-flush mounted in walls and under one cover plate.
 - b. Audio component shall be ADA approved, horn type with a minimum output of 85 dB at 10 feet.
 - c. Visual component shall have a light intensity level of 75/117 candela and a flash rate of 1.0 time per second.
 - d. Visual unit shall have the word "FIRE" visible from three sides with half inch red letters.

PART 3 - EXECUTION

3.01 FIRE ALARM SYSTEM EXECUTION

- A. Fire alarm system shall be installed in accordance with the latest adopted editions of all applicable codes. Final connections of equipment, testing of system, setting of compensating resistance and any other necessary adjustments shall be performed under supervision of a manufacturer's representative.
- B. Number and size of wire shall be in strict accordance with manufacturer's wiring diagram, as required for proper operation of fire alarm system. All wiring shall be installed in conduit, properly identified by color code.
- C. Coordinate with mechanical, plumbing and fire protection drawings to provide all devices, equipment, wiring, connections and appurtenances required for proper operation, monitoring, control or supervision of devices furnished and/or installed by other trades. Field coordinate location of such devices and connections required with Subcontractors and systems shop drawings prior to rough-in.
- D. Equipment components comprising the fire alarm system shall be installed in a neat and

workmanlike manner in accordance with recommendations of National Fire Protection Association and Standard Fire Alarm Practice to end that they shall operate cooperatively, one with the other as a complete system.

- E. Entire system shall be furnished and installed in accordance with approved shop drawing of equipment and wiring diagrams.
- F. Detectors shall not be installed until construction is completed and should be stored in bags during construction to avoid contamination.
- G. Smoke detectors shall not be installed within three feet of any air supply register. Offset as required to comply with this requirement.
- H. Upon completion of installation, entire system shall be tested in presence of Engineer and a MDAD representative.

3.02 FIELD QUALITY CONTROL

- A. Examination:
 - 1. Examine areas and conditions under which fire alarm components are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.03 CONNECTION AND SUPERVISION

- A. Make connections to Honeywell panels under manufacturer's supervision. Prior to starting work, establish that the existing system is in proper working order. If conditions exist which prevents normal operation of specified additions and extensions bring this fact to the attention of the Engineer prior to doing work affecting the existing system. Where work is done without such notification, it is assumed that connections have been made to a working system and assumed that connections have been made to a working system and performance requirements and guarantee will apply to entire system.
- B. Inspect relays and signals for malfunctioning, and where necessary, adjust units for proper operation to fulfill project requirements.
- C. Connection of additional fire alarm circuit(s) to the existing system shall be in accordance with the following procedure.

Contractor Scheduled Fire Alarm System Shut Down

Review with Contractor, MDAD Fire Department, and MDAD Maintenance Engineering Group:

1. Area to be affected
 2. Approved drawings and permits
 3. Daily start time (Fire Technicians open panel)
 4. Daily finish time (Fire Technicians close panel)
 5. Fire Technicians to maintain daily file, recording, Subcontractor, area of work performed, completion date
 6. Subcontractor to label zones to comply with MDAD F.A. Zoning Requirements.
- D. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of fire alarm and detection system equipment.

END OF SECTION