Goodwyn Mills Cawood
11 North Water Street
Suite 15250
Mobile, Alabama 36602
T 251.460.4006
F 251.460.4423

FASCIMILE TRANSMITTAL COVER SHEET

DATE: **April 26, 2024**

TO: **Doris Furr**

FROM: **Planholder**

PROJECT: **NEW WORKFORCE DEVELOPMENT CENTER**
For ENTERPRISE STATE COMMUNITY COLLEGE
GMC PROJECT NO. AMOB220153

RE: **ADDENDUM NO. 1 AND ACKNOWLEDGEMENT OF RECEIPT OF ADDENDUM NO. 1**

ACKNOWLEDGEMENT OF RECEIPT:

PLEASE PRINT RECIPIENT'S NAME, FIRM, AND DATE RECEIVED.

THEN FAX BACK TO (251) 460-4423 or EMAIL doris.furr@gmcnetwork.com
FOR OUR RECORDS AND TO ACKNOWLEDGE YOUR RECEIPT OF THIS ADDENDUM.

_____
NAME *(PLEASE PRINT)*

_____
FIRM *(PLEASE PRINT)*

_____
DATE RECEIVED *(PLEASE PRINT)*

Pages to follow this page 117

ADDENDUM NUMBER 1 **April 26, 2024**

PROJECT: NEW WORKFORCE DEVELOPMENT CENTER
For ENTERPRISE STATE COMMUNITY COLLEGE
GMC PROJECT NO. AMOB220153

AD1-1 ADDITIONS:

A. Bidders shall acknowledge receipt of the Addendum in writing, as provided on the Acknowledgment Receipt.

B. A copy of the pre-bid meeting agenda/minutes as well as the sign in sheet are attached.

C. A copy of the Mechanical Comcheck is attached for your use.

D. Remove Owner Contingency Allowance No. 1 in its entirety. Replace Allowances Section 01 2100 in its entirety with attached Revised Section 01 2100.

E. Remove Section 05 5200 Handrails and Railings in its entirety; and, add Section 05 5213 Pipe and Tube Railings.

F. Remove Section 10 5113 Metal Lockers. There are no metal lockers in the project.

G. Replace Section 22 2000 Plumbing Fixtures and Equipment in its entirety with attached Revised Section 22 2000.

H. Regarding 'G' above, Double Pedal Valve ½" NPT Female Inlets and Outlet Cut Sheet is attached for additional information.

I. There are several spec sections that are duplicated in the specs. They appear to be the same specifications, but I wanted you to tell us which to delete.
- 05 1200, 05 2100, 05 3100
- Sections 27 & 28 are duplicated…pages 1195 – 1286.

RESPONSE: Replace all versions of Sections 05 1200, 05 2100 and 05 3100 with the attached versions. Replace all versions of Sections 27 & 28 with the attached versions.

J. There are specs for Planting Soil Preparation & Turf & Grasses. Will there be a Landscaping plan issued?
RESPONSE: Remove Specification Sections 329100 Planting Soils and Preparation & 329200 Turf and Grasses in their entirety. Landscape & Irrigation Plans will be issued under a separate contract in the near future project.

K. Sheet A1.13- Flex Lab, A1.14- Mechatronics Lab, A1.15- Welding, & A1.16- Automotive Lab all have the note "SEE ALLOWANCES SECTION 01020 3.1A FOR RESPONSIBLE PARTY FOR FABRICATION, FURNISHING, AND INSTALLING". Allowance #7 only covers "Specialty HVAC Training Equipment". Please clarify who provides and installs the equipment listed on these sheets.
RESPONSE: The note referenced above "SEE ALLOWANCES SECTION 01020 3.1A FOR RESPONSIBLE PARTY FOR FABRICATION, FURNISHING, AND INSTALLING" does not apply to A1.14- Mechatronics Lab, nor to A1.15- Welding, nor to A1.16- Automotive Lab. The equipment for A1.14- Mechatronics

Lab, A1.15- Welding, and A1.16- Automotive Lab will be OFOI except for the fume hood exhaust system and the vehicle lifts (for which clarification will be forthcoming via future addenda).

L. Welding booth fume extraction does not appear to be addressed on the plans or specs. Will this be OFOI?
RESPONSE: Yes.

M. It appears that from the file I'd downloaded from Skysite that we're missing Page A9.02 which appears that it would include a section of the site wall as we're currently missing the wall cap detail in what we have now.
RESPONSE: Drawing Sheet A9.02 is provided via this addendum (No. 1). Additional information for sleeves to be installed in the early site package to the top of the concrete retaining walls forthcoming via future addenda.

N. Wanted to confirm as from the meeting it sounds like the site wall will be in place, but will this also have waterproofing completed?
RESPONSE: Yes.

O. Just to confirm as I do not see anything in the specifications or drawings after review that confirmed, but all welding, automotive, and lab equipment will be purchased directly by the owner?
RESPONSE: See response to 'K" above.

P. In regards to the allowances, it's listed in 1.1›A›2 that these be included in the base bid. Within each allowance item it's written in more detail to include/exclude in a certain format. After reviewing the proposal form I do not see where these allowances are to be listed separately outside of the estimated sales tax, just wanted to confirm how the allowances would need to be included with the base bid.
RESPONSE: Each allowance, including its respective OH&P as noted in the allowances spec. Section, shall be included in the base bid total.

Q. Is there a brick that has been selected or will this match the brick being used for the ongoing building? South Alabama Brick Company is currently providing the brick for the ongoing project so I do have this information & pricing, but just wanted to confirm.
RESPONSE: See brick allowance as specified within Section 04 20 00 Unit Masonry, 2.6, B. 8. a. Mortar allowance is also specified within Section 04 20 00 Unit Masonry, 2.7, G. 3.

R. The section details show a double soldier course along the top, while the elevations portray a single soldier course. Please confirm which detail shall supersede, as we're currently assuming the double soldier course on our end.
RESPONSE: Double soldier is required along the top of the walls.

S. Drawing Sheet A5.41 is added via this addendum (No. 1).

T. Mock Up Wall requirements forthcoming via future addenda.

AD1-2 ISSUED SPECIFICATIONS:

A. Specification Section 01 2100 Allowances
B. Specification Section 05 1200 Structural Steel
C. Specification Section 05 2100 Steel Joists
D. Specification Section 05 3100 Steel Deck

E. Specification Section 05 5213 Pipe & Tube Railings
F. Specification Section 22 2000 Plumbing Fixtures
G. Specification Section 27 0500 Auxiliary System Cables, 0-50v
H. Specification 27 1000 Structured Cabling System
I. Specification 28 31 00 Fire Alarm System
J. Specification 28 78 00 Emergency Responder Radio Coverage System

AD1-3 ISSUED DRAWINGS:

N/A

AD1-4 ATTACHMENTS:

A. Addendum No. 1 Acknowledgement
B. Pre-Bid Conference Agenda/Minutes and Sign In Sheet
C. Mechanical Comcheck
D. Double Pedal Valve ½" NPT Female Inlets and Outlet Cut Sheet
E. Revised Specification Section 01 2100 Allowances
F. Specification Section 05 1200 Structural Steel
G. Specification Section 05 2100 Steel Joists
H. Specification Section 05 3100 Steel Deck
I. Specification Section 05 5213 Pipe & Tube Railings
J. Revised Specification Section 22 2000 Plumbing Fixtures
K. Specification Section 27 0500 Auxiliary System Cables, 0-50v
L. Specification 27 1000 Structured Cabling System
M. Specification 28 31 00 Fire Alarm System
N. Specification 28 78 00 Emergency Responder Radio Coverage System
O. New Drawing Addendum #1 A5.41 Railing Schedule & Details (Steel)
P. New Drawing Addendum #1 A9.02 Miscellaneous (Chiller Area Wall Sections)

-END OF ADDENDUM 1-

PREPARED BY

Goodwyn Mills Cawood, LLC
11 North Water Street
Suite 15250
Mobile, Alabama 36602
T 251.460.4006
F 251.460.4223

PRE-BID CONFERENCE MINUTES
THE NEW WORKFORCE DEVELOPMENT CENTER
ENTERPRISE STATE COMMUNITY COLLEGE
Multipurpose Room, Lurleen B. Wallace Student Center
600 Plaza Drive, Enterprise, AL
1:00 PM, Thursday, April 25, 2024

1. Welcoming remarks. Reminder to sign-in on sheet at front of room or being circulated.
    a. Items discussed will be issued by meeting minutes, along with the sign-in sheet through an addendum.

2. Introductions – names and relationship to job or personnel.

3. Client representatives involved:
    a. Daniel Long, President
    b. Michael Helms, Plant Supervisor
    c. David Bess, ACCS Regional Facilities Director
    d. Mark Salmon, ACCS Chief Facilities Director

4. Project Directory:
    a. Goodwyn Mills Cawood, LLC:
        i. Chris Lunsford – Project Manager
        ii. Jim Walker – Project Architect
        iii. Juan Gacha – Civil Engineer
        iv. Kevin Harp – Construction Administrator
        v. Doris Furr – Construction Coordinator
    b. White-Spunner Construction:
        i. Justin Thorpe – Construction Manager
        ii. John (JD) Hamilton – Assistant Construction Manager
        iii. Randy Green – Field Coordinator
        iv. Bill Lowe – Assistant Field Coordinator
        v. Mary Landrum – Cost Engineer

5. Scope of Work: Construction of new building and site improvements as indicated on the drawings and project manual including but not limited to connection to existing utilities, new utilities & drainage, sitework, drives and parking areas, sidewalks, BMP's, structural, architectural, mechanical, electrical & plumbing systems and all related work; as specified and indicated on the drawings, coordination and supervision of the entire project; and all related work as indicated in the Bid and Contract Documents.

6. Bid Documents available for review at Architect's Office.

7. Any questions shall be directed in writing to the Architect no later than 72 hours prior to the bid. Email all questions to Chris Lunsford at chris.lunsford@gmcnetwork.com; copy Doris Furr at doris.furr@gmcnetwork.com and JD Hamilton at john.hamilton@white-spunner.com.

8. The General Contractor and every Subcontractor should read and be familiar with all of the front-end documents and all of Division 1 of the Project Manual, in addition to the work they are bidding and other work they have to coordinate with.

9. **Bidding: Received before 2:00 PM on Tuesday, May 7, 2024**, at Enterprise State Community College, Community Room, Lurleen B. Wallace Student Center, 600 Plaza Drive, Enterprise, Alabama.
    a. Mailing bids is not advised.

10. Note of Advertisement and Instructions to Bidders should be read by each bidder. Bids will be held open for at least 60 days for review.

11. Proposal Form included in the Project Manual, and copies furnished to each bidder with Bid Documents.

12. Basis of Award – the award will be made to the lowest responsive and responsible bidder.

13. If ANY modification is made on the envelope of the Bid; as used in these Instructions to Bidders, "authorized representative" is defined as a person to whom the bidder has granted written authority to conduct business in the bidder's behalf by signing and/or modifying he bid. Such written authority shall be signed by the bidder (the individual proprietor, or a member of the Partnership, or an officer of the Corporation) and shall be attached to the Proposal Form.

14. **NO Addenda has been issued to Date**. It is the Bidder's responsibility to acknowledge any and all addenda that are issued on the proposal form. Contact GMC the day prior to the bid to ensure you have received all addenda, if required. Addenda are also posted to the ftp site for the project for your reference.

15. It is mandatory that the lowest responsible bidder shall submit a list of subcontractors/suppliers no later than 24 hours after the bid opening. (Attachment B to the Proposal Form). It is highly suggested that the second and third lowest bidder also submit their Attachment B within the 24 hours.

16. Insurance requirements should be read by each bidder and should be provided to each General Contractor's and Subcontractor's insurance carrier for review.
    a. Insurance requirements are indicated in General and Supplementary Conditions; AND Additional requirements are indicated in Section 01015 – Special Conditions and should be carefully reviewed and also sent to insurance carriers for review.

17. Section 010150 – Special Conditions – General Review:
    a. Construction Schedule Requirements:
        i. Verify existing Conditions of the Site
        ii. Completion dates as per the Proposal Form. **[390 Consecutive Calendar Days Following Notice to Proceed]**
            1. The Contractor shall include in base bid permitting and inspection fees required by the Authority having jurisdiction. Comply in strict accordance to Administrative Rule 170X-8 Collection of User Fees. The Permit Fee must be paid and receipt included with your Construction Contract. The Pre- Construction Conference CANNOT be scheduled until

the permit fee has been received.

iii. Working Hours are Daily 7am to 7pm. Weekend hours with 72 hours prior notice to the Owner. No work permitted during the school's testing and/or examination periods.

b. Liquidated damages – as indicated in Paragraph 1.2.A.1; For each calendar day of delay in completion of any part of the Work beyond the number of days or date specified, the sum of 6% annum of the total contract sum will be accessed against the Contractor until Substantial Completion is attained for the entire Project. If the Work of the project is not substantially complete ten days past the date specified for completion, an additional $200.00 per day will be assessed until substantial completion is achieved.
    i. The submittal of a Bid and/or Proposal by any Contractor and their Subcontractors shall be construed as, in part, acknowledgment and acceptance of these provisions.

c. Site restrictions – as indicated in Sections 01010 and 010150, and other locations on the Drawings and in the Project Manual.

d. Pre-Construction Conference – required for entire project and prior to beginning each major portion of the Work.

e. Contractor's schedule must coordinate the overall construction schedule of the project.
    i. Construction Schedule is due to the Architect for review within 15-days of Notice to Proceed.

f. Contractor's job meetings – coordination of the Work with all subcontractors and suppliers is required.

g. Requirements for stored materials – as indicated.
    i. Location of designated lay down yard/storage areas will be discussed during the site visit and agreed upon by the Owner.

h. Safety and Protection – Contractor's responsibility.

i. Work limits protection – the public, Owner's staff, worker's, etc.
    i. Work is being performed on property that is a tobacco free and alcohol free campus. No weapons are allowed on the site, including locked in a vehicle.

j. Testing – Paid by the Owner for Division 1-5 (except utility testing), otherwise paid by the Contractor – and other provisions and requirements as indicated.

k. Project Sign: Contractor to provide one sign as per Special Conditions 1.14 and details in Project Manual.
    i. NO subcontractor signs.

l. Submittal requirements indicated.
    i. Contractor is required to check, mark, stamp and approve and/or reject submittals, prior to

submittal to Architect. Refer to General Conditions for additional information and related requirements.

ii. All submittals are to be sent in Procore to **Doris Furr at doris.howard@gmcnetwork.com** and JD Hamilton at john.hamilton@white-spunner.com. Electronic submittals are acceptable for all items except those requiring a color selection. Hard copies of color selections are required.

m. Substitutions:
   i. 10-day minimum cut-off prior to original bid date for request for substitutions, additional manufacturers, and where listed in individual spec sections – for pre-approved subcontractors and suppliers. Longer for some products, as indicated.
   ii. Substitutions and additional manufacturers, suppliers, etc. will not be allowed after that date except in extraordinary circumstances.

n. Site Maintenance requirements indicated. Daily attention required.

o. Insurance and special provisions – in addition to other insurance requirements.

p. Accessibility requirements – as indicated and as otherwise required per approval of Owner.

q. Contractor Programs and Conduct of Personnel.
   i. All employees are expected to conduct themselves professionally and civilly in the workplace. This expectation applies to interactions with coworkers, supervisors, subordinates, vendors, Architect's representatives, Owner's representatives, inmates, and visitors. Employees are expected to treat others in a respectful manner at all times. Disrespectful behavior including but not limited to the use of profanity, yelling, insults, name calling, horseplay, harassment or personal attacks is not acceptable.

   ii. Intoxication from drugs, alcohol or any other debilitating substance in the workplace will not be tolerated. A person displaying this behavior will be removed from the project.

   iii. There is zero tolerance for sexual harassment.

   iv. Each employee is expected to present a personal appearance that demonstrates good grooming and neatness and maintain a professional appearance. Clothing must be clean, fit properly and be in good repair. All clothing must be free of profanity and offensive slogans.

   v. DO NOT interact with the College Students and personnel.

r. Work by others – as indicated.

s. Contractor's Daily Reports:
   i. General Contractor will provide a Daily Activity Log for activities performed during the work week. These logs shall be sent at the end of the week to the Owner's Representative and Architect. The Contractor shall include the following information: the workers on site, the activities occurring each day by all trades/subcontractors, any delivery of materials, the

weather for the day, as well as any delays incurred. Provide a detailed explanation and time impacted if a delay occurred during the day.

18. Section 010450: Cutting and Patching as indicated in this section.

19. Section 015000 – Temporary Facilities should be reviewed by each bidder. Owner will allow the Contractor to connect to existing power and water, for reasonable use, to the extent it is available on the site. Refer to Section 01500 for additional information, restrictions, and requirements.

20. Section 017000 – Project Close-Out and Section 017200 Project Record Documents should be reviewed by each bidder. Final payment will not be made until the requirements of these sections and General Conditions are completed. Project Record Documents have to be kept up-to-date on the project and will be checked periodically during the Work of the project.

21. Requirements for quality control, testing, and inspections are located throughout the project manual, and should be reviewed so that they are understood prior to bidding the project and prior to the low bidder entering into a contract for the project.

22. Section 024119 – Selective Demolition: Note requirements for scheduling and coordination with the other Work of the project, as well as the schedule for completing the Work of the project, which are generally indicated in this Section 02070 and in detail on the Drawings and other parts of the Project Manual.

23. Change Orders. It is the responsibility of the Contractor and Subcontractor to bring to the attention of the Architect immediately any discrepancies, prior to bid.

24. Superintendent:

    a. Superintendent resumes will be submitted to the Architect prior to Construction.

    b. The Superintendent must be on site for any work to be performed. If activity is being performed without the Superintendent on the site, the workers will be asked to leave for the day and return when the Superintendent ispresent.

25. This is a sales and use tax exempt project. The Contractor shall submit for a Certificate of Exemption directly after the execution of the Contract. The Owner will submit an application to the Alabama Department of Revenue once the contract is executed.

26. Questions:
    -
    -

27. Site tour.

28. Closing remarks.
    a. The contractor shall coordinate with the Performance Art Center general contractor for logistics and schedule.

Meeting Minutes - Agenda Read and Reviewed

- General Contingency allowance needs to be revised
- Temp Power will need to be reviewed
  - Current power feeds were installed and paid for by Wyatt Sasser for PAC
- Brick detail 8.902 Reference needed - RFI from Brian
- Trench in chiller yard, open from sitework?
- Advised all to review civil drawings
- FF&E will need to be reviewed
  - Allowances
  - FBO vs GC supplied

END OF PRE-BID CONFERENCE AGENDA

WHITE-SPUNNER CONSTRUCTION

Enterprise State Community College

Workforce Development Center PreBid Sign In

April 25, 2024 1:00PM

NAME	COMPANY	EMAIL	PHONE
ALEC REEVES	REEVES & SHAW	areeves@reevesandshawconstruction.com	334-718-8208
HUNTER KNIGHT	REEVES & SHAW	HKNIGHT@REEVESANDSHAWCONSTRUCTION.COM	334-718-0711
Michael Helms	ESCC	mhelms@escc.edu	334 447 6477
Timmy Walker	Walker Construction CS.	timmy@Walkercc.com	334.764.2262
Brian Ray	Wyatt Sasser Const.	brian@wyattsasserconstruction.com	334-504-0887
RUSTY DEEN	FIRST TEAM CONST.	BRANDONBELCHER@FIRSTTEAMCONSTRUCTION.COM	
Billy Love	White-Spunner	William.love@white-spunner.com	251-295-1728
Randy Green	White-Spunner	Randy.green@white-spunner.com	251-620-9687
Mary Landrum	White-Spunner	mary.landrum@white-spunner.com	251 3003845
Leigh Shiver	ESCC	lshiver@escc.edu	334-477-9827
MATTHEW REED	REED-HAYS CONST	mreed@reedhaysconstruction.com	251-586-2642
[illegible]	GMC		
Justin Thorpe	White-spunner	justin.thorpe@white-spunner.com	251 304 4461
Tim Dorow	GMC	TIM.DOROW@gmcNetwork.com	440-458-2261
Cody Hobbs	Smiths	chobbs@smiths-inc.com	334-379-5831
Chris Lunsford	GMC	chris.lunsford@gmcnetwork.com	251-281-6392

T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0502

Item No.

This Space for Architect/Engineer Approval

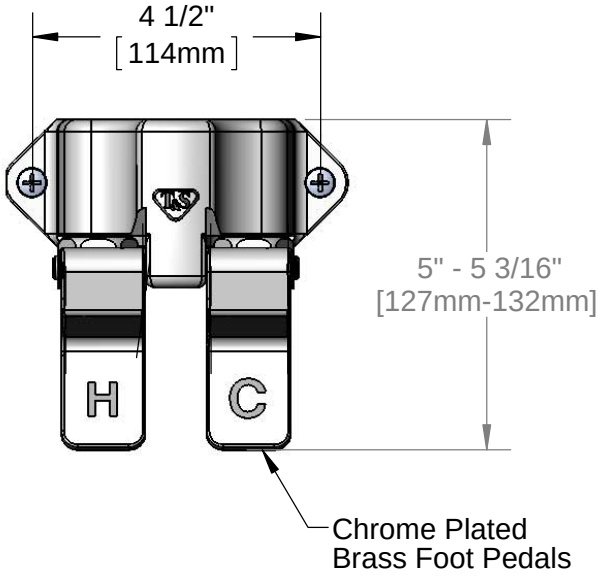
Job Name_____Date_____

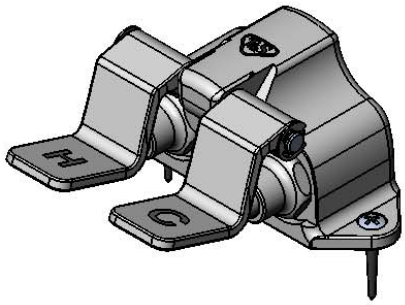
Model Specified_____ Quantity_____

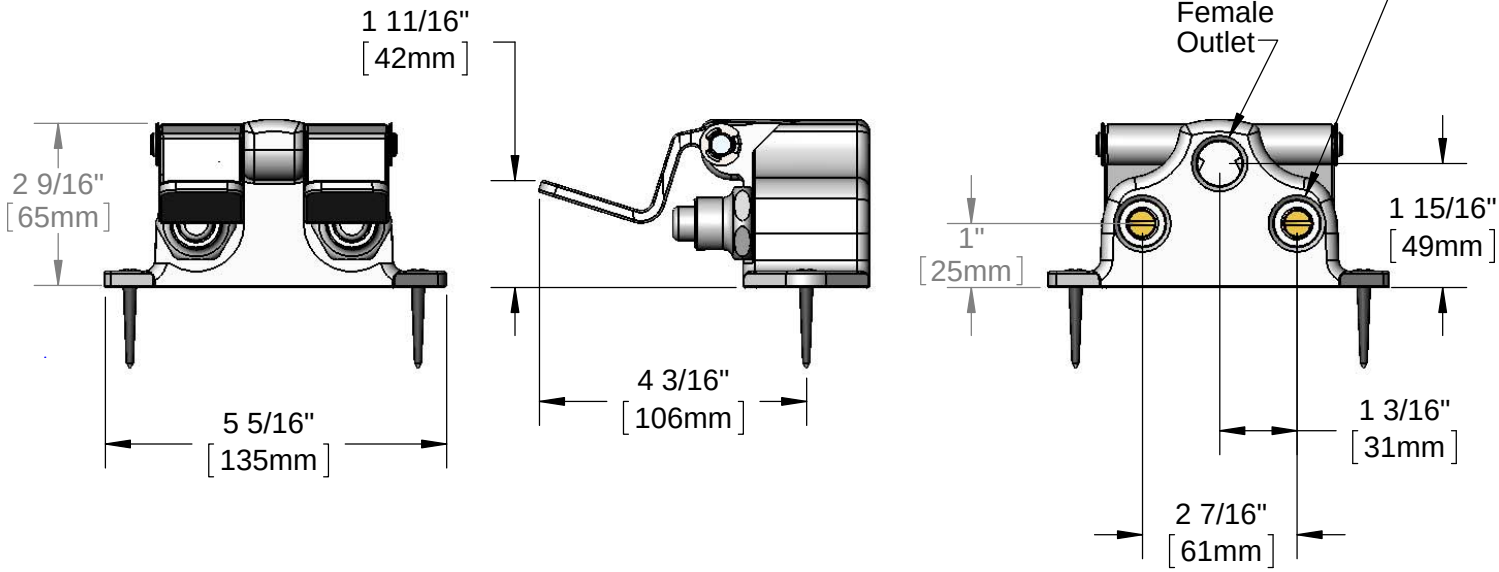
Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____







Product Specifications:

Double Pedal Valve
1/2" NPT Female Inlets & Outlet

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: KJG	Checked: JRM	Approved: JHB	Date: 04/11/14	Scale: 1:3	Sheet: 1 of 2

T&S BRASS AND BRONZE WORKS, INC.

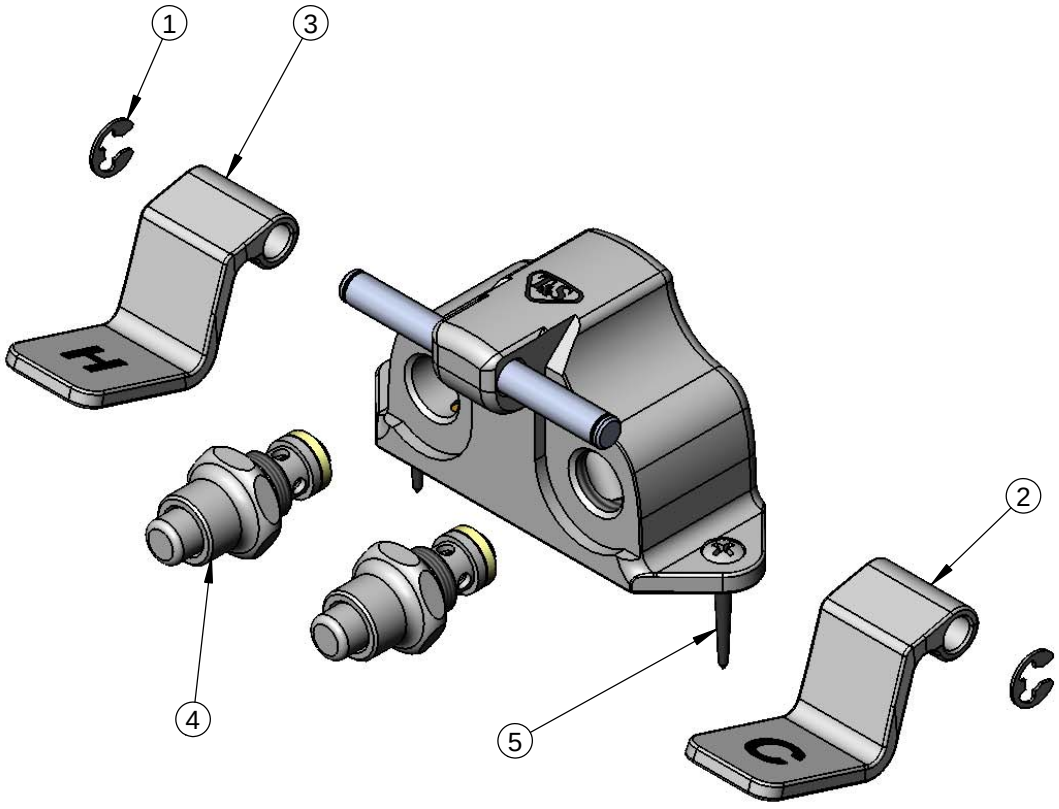
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0502

Item No.

ITEM NO.	SALES NO.	DESCRIPTION
1	012512-45	E-clip Retaining Ring
2	000091-25	Cold Pedal
3	000092-25	Hot Pedal
4	005312-40	Pedal Valve Bonnet Assembly
5	000915-45	Mounting Screw



Product Specifications:
Double Pedal Valve
1/2" NPT Female Inlets & Outlet

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: KJG	Checked: JRM	Approved: JHB	Date: 04/11/14	Scale: NTS	Sheet: 2 of 2

COM*check* Software Version COMcheckWeb
Mechanical Compliance Certificate

Project Information

Energy Code:	2021 IECC
Project Title:	222193.01 Enterprise St CC Workforce Redesign
Location:	Enterprise (Coffee), Alabama
Climate Zone:	2a
Project Type:	New Construction

Construction Site: Owner/Agent: Designer/Contractor:

Additional Efficiency Package(s)

Credits: 10.0 Required 0.0 Proposed

Mechanical Systems List

Quantity System Type & Description

1 AHU-SS (Single Zone):
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 15 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Hydronic Coil, Capacity = 74 kBtu/h, No Economizer, Economizer exception: High Efficiency Equipment
No minimum efficiency requirement applies
Fan System: FAN SYSTEM 1 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes

Fans:
FAN 1 Supply, Single-Zone VAV, 2550 CFM, 3.0 motor nameplate hp, 1.35 fan energy index

1 AHU-1 (Single Zone):
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 10 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Hydronic Coil, Capacity = 61 kBtu/h, Air Economizer
No minimum efficiency requirement applies
Fan System: FAN SYSTEM 2 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes

Fans:
FAN 2 Supply, Single-Zone VAV, 1800 CFM, 2.0 motor nameplate hp, 1.40 fan energy index

1 AHU-2 (Multiple-Zone):
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 24 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Hydronic Coil, Capacity = 127 kBtu/h, Air Economizer
No minimum efficiency requirement applies
Fan System: FAN SYSTEM 3 -- Compliance (Brake HP and fan efficiency method) : Passes

Fans:
FAN 3 Supply, Multi-Zone VAV, 3800 CFM, 7.5 motor nameplate hp, 3.5 design brake hp (3.5 max. BHP), 1.40 fan energy index

1 AHU-3 (Single Zone):
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 10 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Hydronic Coil, Capacity = 61 kBtu/h, Air Economizer
No minimum efficiency requirement applies
Fan System: FAN SYSTEM 2 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes

Fans:
FAN 2 Supply, Single-Zone VAV, 1800 CFM, 2.0 motor nameplate hp, 1.40 fan energy index

Quantity	System Type & Description
1	AHU-4 (Multiple-Zone): Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 54 kBtu/h No minimum efficiency requirement applies Cooling: 1 each - Hydronic Coil, Capacity = 333 kBtu/h, Air Economizer No minimum efficiency requirement applies Fan System: FAN SYSTEM 4 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes Fans: FAN 4 Supply, Multi-Zone VAV, 9600 CFM, 10.0 motor nameplate hp, 1.20 fan energy index
1	AHU-5 (Multiple-Zone): Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 43 kBtu/h No minimum efficiency requirement applies Cooling: 1 each - Hydronic Coil, Capacity = 243 kBtu/h, Air Economizer No minimum efficiency requirement applies Fan System: FAN SYSTEM 5 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes Fans: FAN 5 Supply, Multi-Zone VAV, 6900 CFM, 7.5 motor nameplate hp, 1.28 fan energy index
1	HV-1 (Single Zone): Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 519 kBtu/h No minimum efficiency requirement applies Fan System: FAN SYSTEM 6 -- Compliance (Brake HP and fan efficiency method) : Passes Fans: FAN 6 Supply, Single-Zone VAV, 12000 CFM, 15.0 motor nameplate hp, 10.4 design brake hp (10.4 max. BHP), 1.29 fan energy index
1	HV-2 (Single Zone): Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 216 kBtu/h No minimum efficiency requirement applies Fan System: FAN SYSTEM 7 -- Compliance (Motor nameplate HP and fan efficiency method) : Passes Fans: FAN 7 Supply, Single-Zone VAV, 5000 CFM, 5.0 motor nameplate hp, 1.35 fan energy index
1	CH-3: Cooling: Water Chiller, Capacity 52 tons, Condenser Air-Cooled, Rotary Screw or Scroll Chiller Proposed Efficiency: 10.84 EER-FL, Required Efficiency: 10.10 EER-FL Proposed Part Load Efficiency: 16.41 EER-IPLV, Required Part Load Efficiency: 13.70 EER-IPLV
1	CH-4: Cooling: Water Chiller, Capacity 52 tons, Condenser Air-Cooled, Rotary Screw or Scroll Chiller Proposed Efficiency: 10.84 EER-FL, Required Efficiency: 10.10 EER-FL Proposed Part Load Efficiency: 16.41 EER-IPLV, Required Part Load Efficiency: 13.70 EER-IPLV
1	EWH-1: Electric Storage Water Heater, Capacity: 30 gallons w/ Circulation Pump No minimum efficiency requirement applies
1	EWH-2: Electric Storage Water Heater, Capacity: 30 gallons w/ Circulation Pump No minimum efficiency requirement applies

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2021 IECC requirements in COM*check* Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

JAMES S DAVIS JR PE — 4.17.24

Name - Title | Signature | Date

COM*check* Software Version COMcheckWeb

Inspection Checklist

Energy Code: 2021 IECC

Requirements: 0.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical and service water heating systems and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks. Hot water system sized per manufacturer's sizing guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C406 [PR9][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C403.13.2, C403.13.3 [FO9][3]	Snow/ice melting system and freeze protection systems have sensors and controls configured to limit service for pavement temperature above 50F and outdoor temperature above 40F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.1, C404.6.2 [PL3][1]	Automatic time switches installed to automatically switch off the recirculating hot-water system or heat trace.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.1, C404.6.1.1 [PL8][3]	Demand recirculation water systems have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.2.6 [ME41][3]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.8.1 [ME65][3]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.8.2 [ME21][2]	HVAC fan motors not oversized beyond allowable limits.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.8.3 [ME117][2]	Fans have a fan energy index (FEI) >= 1.00. Variable volume fans will have an FEI >= 0.95.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.8.3 [ME117][2]	Fans have a fan energy index (FEI) >= 1.00. Variable volume fans will have an FEI >= 0.95.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.8.3 [ME117][2]	Fans have a fan energy index (FEI) >= 1.00. Variable volume fans will have an FEI >= 0.95.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.8.3 [ME117][2]	Fans have a fan energy index (FEI) >= 1.00. Variable volume fans will have an FEI >= 0.95.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.8.4 [ME142][2]	Motors for fans that are not less than 1/12 hp and less than 1 hp are electronically commutated motors or have a minimum motor efficiency of 70 percent. These motors have the means to adjust motor speed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.8.6 [ME143][2]	Each DX cooling system > 65 kBtu and chiller water/evaporative cooling system with fans > 1/4 hp are designed to vary the indoor fan airflow as a function of load and comply with detailed requirements of this section.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.9 [ME144][2]	Large diameter fans where installed shall be tested and labeled in accordance with AMCA 230.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.3 [ME55][2]	HVAC equipment efficiency verified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.1 [ME112][3]	Zone isolation devices and controls installed where applicable.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.5.5 [ME113][2]	Fault detection and diagnostics installed with air-cooled unitary DX units or VRF units having economizers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.2 [ME59][1]	Natural or mechanical ventilation is provided in accordance with International Mechanical Code Chapter 4. Mechanical ventilation has capability to reduce outdoor air supply to minimum per IMC Chapter 4.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.7.1 [ME59][1]	Demand control ventilation provided for spaces >500 ft2 and >15 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.7.2 [ME115][3]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.7.3 [ME140][3]	Units that provide ventilation air to multiple zones and operate in combination with zone heating and cooling systems do not use heating or heat recovery to warm supply air to a temperature greater than 60°F when representative building loads or outdoor air temperatures indicate that the majority of zones require cooling.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.7.6 [ME141][3]	HVAC systems serving guestrooms in Group R-1 buildings with > 50 guestrooms: Each guestroom is provided with controls that automatically manage temperature setpoint and ventilation (see sections C403.7.6.1 and C403.7.6.2).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.7.4 [ME57][1]	Exhaust air energy recovery on systems meeting Table C403.7.4(1) and C403.7.4(2).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.7.5 [ME116][3]	Kitchen exhaust systems comply with replacement air and conditioned supply air limitations, and satisfy hood rating requirements and maximum exhaust rate criteria.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.5, C403.5.1, C403.5.2 [ME62][1]	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.5.3.3 [ME124][1]	Air economizers automatically reduce outdoor air intake to the design minimum outdoor air quantity when outdoor air intake will not reduce cooling energy usage. See Table C403.5.3.3 for applicable device types and climate zones.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.5.3.4 [ME125][1]	System capable of relieving excess outdoor air during air economizer operation to prevent over pressurizing the building. The relief air outlet located to avoid recirculation into the building.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.5.3.5 [ME126][1]	Return, exhaust/relief and outdoor air dampers used in economizers have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Reference section C403.7.7 for details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.1 [ME75][2]	Hydronic and multizone HVAC system controls are VAV fans driven by mechanical or electrical variable speed drive per Table C403.4.1.1.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.9 [ME67][2]	VAV fans have static pressure sensors located so controller setpoint <=1.2 w.c..	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.1.3 [ME24][2]	Reset static pressure setpoint for DDC controlled VAV boxes reporting to central controller based on the zones requiring the most pressure.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.3 [ME69][3]	The heating of fluids in hydronic systems that have been previously mechanically cooled, and the cooling of fluids that have been previously mechanically heated are limited in accordance with Sections C403.4.3.1-C403.4.3.3. Single boiler systems >500,000 Btu/h have multistaged or modulating burner.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.3.1 [ME50][2]	Three-pipe hydronic systems using a common return for hot and chilled water are not used.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.5 [ME26][3]	Chilled water plants with multiple chillers have capability to reduce flow automatically through the chiller plant when a chiller is shut down. Boiler plants with multiple boilers have the capability to reduce flow automatically through the boiler plant when a boiler is shut down.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.1 [ME130][3]	Supply air systems serving multiple zones have VAV systems with controls configured to reduce the volume of air that is reheated, recooled or mixed in each zone. See section for details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.2 [ME131][3]	Single-duct VAV systems use terminal devices configured to reduce the supply of primary supply air before reheating or recooling takes place.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.3 [ME132][3]	Systems that have 1 warm air duct and 1 cool air duct use terminal devices configured to reduce the flow from one duct to a minimum before mixing of air from the other duct takes place.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.6.4 [ME133][3]	Individual dual-duct or mixing heating and cooling systems with a single fan and with total capacities > 90,000 Btu/h not equipped with air economizers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.5 [ME134][3]	Multiple zone HVAC systems have supply air temperature reset controls based on building loads or outside temperatures.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.7 [ME136][3]	Parallel-flow fan-powered VAV air terminals have automatic controls configured to 1) turn off the terminal fan except when space heating is required or where required for ventilation, 2) turn on the terminal fan as the first stage of heating before the heating coil is activated, and 3) during heating for warmup or setback temperature control, either operate the terminal fan and heating coil without primary air or, reverse the terminal damper logic and provide heating from the central air handler by primary air.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.8 [ME137][3]	Systems with DDC of individual zones reporting to the central control panel configured to reset the static pressure setpoint based on zone requiring the most pressure. The DDC is capable of monitoring zone damper positions or have an alternative method of indicating the need for static pressure. See section for details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.9 [ME138][3]	Static pressure sensors used to control VAV fans located such that the controller setpoint is <= 1.2 inches w.c.. Where this results in one or more sensors being located downstream of major duct splits, not less than one sensor located on each major branch.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.1.4 [ME63][2]	Heating for vestibules and air curtains with integral heating include automatic controls that shut off the heating system when outdoor air temperatures > 45F. Vestibule heating and cooling systems controlled by a thermostat in the vestibule with heating setpoint <= 60F and cooling setpoint >= 80F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.6.6 [ME135][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.10.5 [ME31][3]	Condenser heat recovery system that can heat water to 85 ºF or provide 60% of peak heat rejection is installed for preheating of service hot water.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.3.3 [ME35][1]	Hot gas bypass limited to: <=240 kBtu/h – 50% >240 kBtu/h – 25%	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C408.2.2.1 [ME53][3]	Air outlets and zone terminal devices have means for air balancing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.2.2 [ME54][3]	HVAC hydronic heating and cooling coils have means to balance and have pressure test connections.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.11.3, C403.11.3.1, C403.11.3.2 [ME123][3]	Refrigerated display cases, walk-in coolers or walk-in freezers served by remote compressors and remote condensers not located in a condensing unit, have fan-powered condensers that comply with Sections C403.11.3.1 and refrigeration compressor systems that comply with C403.11.3.2..	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.7 [EL26][2]	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.8 [EL27][2]	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.9.1, C405.9.2 [EL28][2]	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.10 [EL29][2]	Total voltage drop across the combination of feeders and branch circuits <= 5%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.1.1 [EL30][2]	At least 90% of dwelling unit permanently installed lighting shall have lamp efficacy >= 65 lm/W or luminaires with efficacy >= 45 lm/W or comply with C405.2.4 or C405.3.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.11, C405.11.1 [EL31][2]	50% of 15/20 amp receptacles installed in enclosed offices, conference rooms, copy rooms, break rooms, classrooms and workstations and > 25% of branch circuit feeders for modular furniture will have automatic receptacle control in accordance with C405.11.1.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.3 [FI8][3]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.3.1 [FI27][3]	HVAC systems and equipment capacity does not exceed calculated loads.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.1.2 [FI38][3]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.1.3 [FI20][3]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.2 [FI39][3]	Each zone equipped with setback controls using automatic time clock or programmable control system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.2.1, C403.4.2.2 [FI40][3]	Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.2.3 [FI41][3]	Systems include optimum start controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.3 [FI11][3]	Heat traps installed on supply and discharge piping of non-circulating systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.4 [FI25][2]	All piping insulated in accordance with section details and Table C403.12.3.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.1 [FI12][3]	Controls are installed that limit the operation of a recirculation pump installed to maintain temperature of a storage tank. System return pipe is a dedicated return pipe or a cold water supply pipe.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C408.1.1 [FI57][1]	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.1 [FI28][1]	Commissioning plan developed by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.1 [FI31][1]	HVAC equipment, systems and system-to-system relationships have been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.2 [FI10][1]	HVAC and service water heating control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.3 [FI32][1]	Economizers have been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.4 [FI29][1]	Preliminary commissioning report completed and certified by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.1 [FI43][1]	An air and/or hydronic system balancing report is provided for HVAC systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.2 [FI30][1]	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

SECTION 01 2100

REVISED ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General Conditions and Division-1 Specification sections, apply to work of this section.

1. Coordinate allowance work with related work to ensure that it is completely integrated and interfaced with related work.
2. **Include in Base Bid.**

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions and Explanations: Certain requirements of the work related to each allowance are shown and specified in contract documents. The allowance has been established in lieu of additional requirements for that work, and further requirements thereof (if any) will be issued by change order.

B. Types of allowances scheduled herein for the work included the following:

1. Quantity allowances.
2. Lump sum allowances.

C. Selection and Purchase:

1. At earliest feasible date after award of Contract, advise Architect/Engineer of scheduled date when final selection and purchase of each product or system described by each allowance must be accomplished in order to avoid delays in performance of the work.
2. As requested by the Architect/Engineer, obtain and submit proposals for the work of each allowance for use in making final selections; include recommendations for selection which are relevant to the proper performance of the work.
3. Purchase products and systems as specified, and as selected (in writing) by the Architect/Engineer.
4. Submit proposals and recommendations, for purchase of products or systems of allowances, in form specified for change orders.

D. Change Order Data: Include in each change order proposal both the quantities of products being purchased and unit costs, along with total amount of purchases to be made. Where requested, furnish survey-of-requirements data to substantiate quantities. Indicate applicable taxes, delivery charges, amounts of applicable trade discounts, and other relevant details as requested by the Architect.

1. Each change order amount for allowances shall be based on the unit price difference between the actual purchase amount and the allowance, multiplied by the final measure or count of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins.
2. When requested, prepare explanations and documentation to substantiate the quantities, costs, and margins as claimed.

E. Change Order Mark-Up:

1. Except as otherwise indicated, comply with provisions of General Conditions. For each allowance, Contractor's claims for increased costs (for either purchase amount or Contractor's handling, labor, installation, overhead, and profit), because of a change in scope or nature of the allowance work as described in contract documents, must be submitted within 60 days of initial change order authorizing work to proceed on that allowance; otherwise, such claims will be rejected.
2. Where it is not economically feasible to return unused material to the manufacturer/supplier for credit, prepare unused material for the Owner's storage, and deliver to the Owner's storage space as directed. Otherwise, disposal of excess material is the Contractor's responsibility.

F. Time and Allowance Amounts:

1. Nothing in the Bid or Contract Documents shall be so constructed or interpreted as to provide a Contract time extension, due to use or non-use of any Allowance amount.
2. Nothing in the Bid or Contract Documents shall be so constructed or interpreted as to allow unused Allowances or any portion thereof, nor any overhead and profit therefor to be retained by or paid to the Contractor.

    a. Amount of unused allowances to be returned shall include unused amount plus 10% overhead and profit.

PART 2 - PRODUCT

Not Applicable.

PART 3 – EXECUTION

3.1 SCHEDULE OF ALLOWANCES - INCLUDE IN BASE BID:

A. Allowance No. 1 - SIGNAGE:

1. Allow a unit price of $450.00 each for the purchase and installation of room signs for each door, and $800.00 for each emergency evacuation sign (minimum of 15 signs)

including purchase, all taxes, delivery to job site and all related costs, in accordance with Section 10 1400 – "Signage". Selections and copy will be furnished by Architect after bidding.

2. Installation and installation materials costs shall be included in Allowance, and not as part of the Base Bid.

3. Include overhead and profit in Base Bid, and not as part of Allowance.

B. Allowance No. 2 – DIMENSIONAL ALUMINUM LETTERS:

1. Allow a Lump Sum of $25,000.00 for the purchase and installation of dimensional letters, including purchase, all taxes, delivery to job site and all related costs, in accordance with Section 10 1400 – "Signage". Selections and copy will be furnished by Architect after bidding.

2. Installation and installation materials costs shall be included in Allowance, and not as part of the Base Bid.

3. Include overhead and profit in Base Bid, and not as part of Allowance.

C. Allowance No. 3 – BUILDING PLAQUE:

1. Allow a unit price of $7,500 for the purchase and installation of a 24" x 30" aluminum plaque. Reference Specification Section 10425 – "Signs" and "Project Sign Detail" for further information.

2. Project Sign to be in Base Bid and not as part of allowance. See "Project Sign Detail" located after the "Form of Advertisement for Completion."

D. Allowance No. 4 – EMERGENCY RESPONDER RADIO COVERAGE SYSTEM:

1. Allow a lump sum price of $90,000 for work associated with the purchase and installation of an Emergency Responder Radio Coverage System if found to be required after testing of the facility.

2. See Section 28 7800 - Emergency Radio Responder Coverage System for requirements. Costs associated with testing to identify if the system is required shall be included in the Base Bid, and NOT as part of Allowance.
3. Do NOT include overhead and profit in base bid. If the system is required, the General Contractor's overhead and profit shall be paid from the Allowance funds.

E. Allowance No. 5 – DIGITAL WALL COVERING:

1. Allow a unit price of $7,500 for the purchase and installation of two digital wall coverings. Reference Specification Section 097200 Wallcovering for further information.

2. Digital Wall coverings to be in Base Bid and not as part of allowance. See "Digital Wall Covering" located after the "Form of Advertisement for Completion."

A. Allowance No. 6 – SPECIALTY HVAC TRAINING EQUIPMENT FIT UP AND CONSTRUCTION:

1. Allow a lump sum of $400,000.00 for the installation of HVAC Training Systems, as directed by the CM and Owner, including purchasing, and applicable fees, and all related costs:

2. Include 10% overhead and profit in Base Bid, and not as part of Allowance.

3. Contact Electrical & Mechanical Services, LLC (EM), for installation of the following:

   a. Dual Fuel Lab - (2) Dual Fuel Heat Pump Systems
      i. Dual Fuel Heat Pump units are owner-furnished (OF) - **and** - specialty contractor (SC)-installed, including all specialty fit up and work indicated in 'g' below;
   b. Heat Pump Lab - (6) Heat Pump Systems
      i. Heat Pump units are OF - **and** - SC-installed, including all specialty fit up and work indicated in 'g' below;
   c. Simulation Lab - (4) Heat Pump Carts
      i. Heat Pumps and Condensing units for the carts are OF; **with**,
      ii. Fabrication of each cart, each with a heat pump and condensing unit mounted on the cart, are SC-installed, including all specialty fit up and work indicated in 'g' below;
   d. Brazing Lab / Duct Fab Lab - (4) Duct Fab Tables / (1) Bottle Rack / (5) Brazing Carts
      i. Brazing Lab carts are SC-fabricated - **and** - SC-installed;
      ii. Duct Fab tables are SC-fabricated and SC-installed, including all specialty fit up and work indicated in 'g' below; **and**,
      iii. Bottle Rack is SC-provided - **and** - SC-installed;
   e. HP Training Shed Heat Pumps and Linesets - (6) Heat Pump Condensing Units
      i. Heat Pump condensing units are OF - **and** - SC-installed, including all specialty fit up and work indicated in 'g' below;
   f. Eight (6) Future TEC Heat Pump Training Simulators
      i. Future TEC Heat Pump training simulator are suitcase- tabletop- type and are OF.
   g. EM (*Basis-of-Design Specialty Contractor*) or equal.
      P.O. Box 605

Sumiton, Alabama 35148
Office: (205) 235-7014 Fax: (205) 696-7877

i. Specialty Contractor (SC) providing and installing specialty HVAC training equipment fit up and construction shall have a minimum of five years demonstrable experience in designing, building, installing, and servicing HVAC training systems that include functions for instructors to demonstrate HVAC training topics and to introduce faults for troubleshooting training by having training specific wiring panels/boxes, access openings/hatches, see through windows, etc.
ii. See drawings for additional information for the complete fit up of Owner-Furnished (OF) equipment and for fabrication requirements for duct tables.
iii. Example construction (fit up) of all the equipment identified for this project can be observed at the BSCC HVAC Fast Track Training Facility in Mobile, AL.

END OF ALLOWANCES

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SECTION 05 1200

REVISED STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Structural steel work including schedules, notes and details showing size and location of members, typical connections, and type of steel required.
2. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
3. Related work specified elsewhere:
   a. Miscellaneous Metal Fabrications are specified elsewhere in Division 5
   b. Refer to Division 3 for anchor bolt installation in concrete, Division 4 for anchor bolt installation in masonry.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 05500, "Metal Fabrications": Loose steel bearing plates and miscellaneous steel framing.

1.2 PERFORMANCE REQUIREMENTS:

A. Structural Performance: Engineer structural steel members and connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Design of Members and Connections: Details shown are typical, similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

1.3 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

1. Submit all shop drawings on one reproducible print (sepia) and two blue line prints only. The reproducible print will be returned. All blue line prints required by the contractor are the responsibility of the Contractor and shall be made after reproducible is returned.

B. Product Data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards). This data is submitted for information only.

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. High-strength bolts (each type), including nuts and washers.
   a. Include Direct Tension Indicators if used.
3. Structural steel primer paint.
4. Shrinkage-resistant grout.
5. Welder's certificates
6. Submit evidence of fabricator and erector qualifications.

C. Shop Drawings prepared under the supervision of, signed and sealed by a Licensed Professional

Engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.

1. Include details of cuts, connections, camber, holes, and other pertinent data.
2. Welds: Indicate welds by standard AWS A2.1 and A2.4 symbols. Distinguishing between shop and field welds, and show size, length, and type of each weld.
3. Bolts: Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
4. Setting Drawings: Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorage's to be installed by others.
5. Erection Drawings: Prepare and furnish to the Architect for review, erection drawings, detailed shop drawings and connection design calculations for all structural steel. Manufacturing of any material or performing of any work before final review of shop drawings will be entirely at risk.
6. Contract documents shall not be used for shop drawing, including erection plans or details.
7. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.
8. Fabrication, assembly and erection shall conform to reviewed shop drawings.

D. Connection Calculations:

1. All structural steel connections not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor, under the direct supervision of a professional engineer registered in the State of Alabama.
2. Design calculations for the connections designed by the Contractor shall be submitted for the files of the Architect and Engineer. Calculations shall bear the seal of a professional engineer registered in the State of Alabama. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal.
3. For each connection, the following shall be noted on the shop drawings:
4. Required design reaction.
5. Calculation sheet number for design.
6. Capacity of detailed connection.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

1.4 QUALITY ASSURANCE:

A. Erector Qualifications: Engage an experienced Erector who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

C. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC's "Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design."
2. AISC's "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."
3. AISC "Specifications for Structural Steel Buildings, Section 10, Architecturally Exposed Structural Steel."
4. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
5. AISC's "Specification for Load and Resistance Factor Design of Single-Angle Members."
6. AISC's "Seismic Provisions for Structural Steel Buildings."
7. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges", dated June 10, 1992
   a. General:AISC "Code of Standard Practice" shall apply except to the extend that references are made to the responsibility of the Owner and/or Architect or Engineer in which event those references shall have no applicability. Where a conflict exists between the Code of Standard Practice and the Contract Documents, the Contract Documents shall govern.
   b. Paragraph 3.1:Add the following: "3.1.8 Include in the bid price for the work structural steel members shown on drawings, but not identified as to size, section, and material grade by assuming sizes, sections, and material grades shown for similarly loaded members having approximately the same overall length except on areas that are noted on the drawings as incomplete. Identify such members and their associated cost in the bid for the work".
   c. Paragraph 3.3:Delete the first sentence, "In case of discrepancies between plans and specifications for buildings, the specifications govern", and insert the following in its place, "In case of discrepancies between drawings and specifications for buildings, the drawings govern".
   d. Paragraph 3.4:In the first sentence, delete the phrase "and made to a scale not less than 1.8" to the foot".
   e. Paragraph 5.1:Delete the first sentence, "When the fabricator receives 'released for construction' plans and specifications, the fabricator may immediately place orders for the material necessary for fabrication". and insert the following in its place "when the fabricator receives 'issued for structural steel mill order of wide flange beams, girders and columns only' plans and specifications, the fabricator may immediately place orders for the material necessary for fabrication". Delete the second sentence, "The contract documents must note any materials or areas which should not be ordered due to a design which is incomplete or subject to revision".
8. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
9. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
10. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code—Steel."

E. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification in the past year.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 SEQUENCING:

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

1.7 TESTING SERVICES:

A. Provide the Testing Laboratory with the following:

1. A complete set of shop and erection drawings reviewed by the Architect.

2. Mill test reports, cutting lists, order sheets, material bills and welder's certificates.

3. Full and ample means and assistance for testing all material.

4. Proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the mills, shop and field.

B. Propose procedures, acceptable to the Architect, to correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements.

C. Provide additional tests, by the Quality Control Testing Laboratory, as may be necessary, to reconfirm any noncompliance of the original work, and as may be necessary to show compliance off corrected work.

PART 2 – PRODUCTS

2.1 STEEL MATERIALS:

A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

B. Structural Steel Shapes, Plates, and Bars: As follows:

1. Carbon Steel: ASTM A 36 (ASTM A 36M).

2. High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 572 (ASTM A 572M), Grade 50.

C. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

D. Hot-Formed Structural Steel Tubing: ASTM A 501.

E. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Finish: Black, except where indicated to be galvanized.

F. Connection Material: Unless noted otherwise on the drawings, stiffener plates, doubler plates, gusset plates and the connecting plates shall be the same grade of steel as members being connected.

1. Finish: Black, except where indicated to be galvanized.

G. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

H. Anchor Rods, Bolts, Nuts, and Washers: As follows:

1. Unheaded Rods: ASTM A 36 (ASTM A 36M).

2. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts.

3. Washers: ASTM A 36 (ASTM A 36M).

I. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain, uncoated.

J. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER:

A. Primer: SSPC-Paint 15, Type I, red oxide.

2.3 GROUT:

A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time. Subject to compliance with requirements, provide one of the following:

1. High Performance (Non-Metallic):
   a. “Masterflow 928”; Master Builders.
   b. “Crystex”; L & M Const. Chemical Co.

2. Construction Grade (Non-Metallic):
   a. “Set Grout”; Master Builders.
   b. “Euco-NS Grout”; Euclid Chemical Co.
   c. “Duragrout”; L & M Const. Chemical Co.
   d. “Horn Non-Corrosive Non-Shrink Grout”; A.C. Horn, Inc.
   e. “588 Grout”; W.R. Meadows, Inc.
   f. “Five Stair Grout”; Five Star Products, Inc.

2.4 FABRICATION:

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.

2. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.

3. Mark and match-mark materials for field assembly.

4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.

5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.

6. Comply with fabrication tolerance limits of AISC’s “Code of Standard Practice for Steel Buildings and Bridges” for structural steel.

7. Piping and/or cracks in flanges or webs of all rolled shapes or plates are to be removed and welded solid by AISC procedures.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

E. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

F. Welded Door Frames: Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.

G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

H. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

2.5 SHOP CONNECTIONS:

A. Simple Beam Connections: Standard double angle framed beam connections using bolts as specified.

1. Seated Beam Connections and Stiffened Seated Beam Connections shall not be used unless indicated on the drawings or unless Engineer approval is obtained to verify capacity of supporting member for the resulting eccentricity. The fabricator must verify and bear responsibility that the use of such connections does not interfere with architectural or MEP requirements.

B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

2.6 SHOP PRIMING:

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing, [unless otherwise specified].
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
   1. SSPC-SP 2 "Hand Tool Cleaning."

2.7 SOURCE QUALITY CONTROL:

A. Independent Testing and Inspecting Laboratory: Owner will engage an Independent Testing and Inspecting Laboratory to perform shop inspections and tests and to prepare test reports.
   1. Testing laboratory will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
   2. Provide testing laboratory with access to places where structural steel work is being fabricated or produced so required inspection and testing can be accomplished.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts".

E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing laboratory's option.
   1. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   2. Ultrasonic Inspection:ASTM E 164.

PART 3 –EXECUTION:

3.1 INSPECTION:

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete [and masonry bearing surfaces] and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

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.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

3.3 ERECTION:

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
   a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection.

H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS:

A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.

B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds ½ inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

3.5 FIELD QUALITY CONTROL:

A. Testing Laboratory Responsibility: The Owner's Testing Laboratory will perform field special inspections and tests on and to prepare test reports as follows:

1. Testing Laboratory shall also approve welding certificates. Contractor shall submit three (3) copies of welding certificates and procedures for each welder involved in the Work.
2. Testing Laboratory shall conduct and interpret tests, certificates and procedures and state in each report whether tested Work complies with or deviates from requirements.

B. Quantity of Required Inspections and Tests: Testing Laboratory shall perform inspections or tests in accordance with AISC specification:

1. Shop Bolted Connections: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
2. Shop Welded Connections: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
3. Field-Bolted Connections: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
4. Field Welding: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
5. Other Inspections as required by AISC and indicated on Special Inspection Schedule in Construction Documents.

C. Provide access for Testing Laboratory to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Deficiencies: Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

E. Field Inspections and Tests: check steel as received in the field for possible shipping damage workmanship, piece making and verification of required camber.

F. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.6 CLEANING

A. Touch up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).

B. Touch up Painting: Cleaning and touch up painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Section 09900, "Painting."

END OF STRUCTURAL STEEL

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SECTION 05 2100

STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:

1. K-series open-web steel joists.
2. LH-series long span steel joists.
3. Joist accessories.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 4100, "Testing and Inspection Services - General": Independent testing agency procedures and administrative requirements.
2. Section 03 3000," Concrete": Installing anchors set in concrete.
3. Section 04 2000, "Unit Masonry": Installing anchors set in unit masonry.
4. Section 05 1200, "Structural Steel": Field quality-control procedures
5. Section 05 5000, "Metal Fabrications": Loose, steel bearing plates and miscellaneous steel framing.
6. Section 09 9000, "Painting": Surface preparation and prime painting.

1.2 PERFORMANCE REQUIREMENTS:

A. Structural Performance: Engineer, fabricate, and erect joists and connections to withstand design loads within limits and under conditions required.

1. Design Loads: As indicated.
2. Design joists to withstand design loads without deflections greater than the following:
   a. Roof Joists: Vertical deflection of 1/360 of the span.

B. Engineering Responsibility: Engage a joist manufacturer who utilizes a qualified professional engineer to prepare design calculations, shop drawings, and other structural data for steel joists.

1.3 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of joist, accessory, and product specified.

C. Shop Drawings showing layout, mark, number, type, location, and spacing of joists. Include joining and anchorage details, bracing, bridging, accessories, splice and connection details, and attachment to other units of Work.

1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.
2. For joists indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Design calculations submit for record one copy of design calculations, sealed by an engineer registered in the state where the project is located, for joist and joist girders with cantilevers or concentrated loads or joist sizes for which standard load tables are not applicable.

E. Material certificates signed by joist manufacturer certifying that joists comply with SJI's "Specifications."

F. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.

G. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

I. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence joists' compliance with building code in effect for Project.

1.4 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Engage a firm experienced in manufacturing joists similar to those indicated for this Project and that have a record of successful in-service performance.

1. Manufacturer must be certified by SJI to manufacture joists conforming to SJI standard specifications and load tables.

B. SJI Design Standard: Comply with recommendations of SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders," applicable to types of joists indicated.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the 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 joists that are similar to those indicated for this Project in material, design, and extent.

E. Inspection: Inspect joists and girders in accordance with SJI "Specifications."

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.6 SEQUENCING:

A. Deliver steel bearing plates and other devices to be built into concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Steel: Comply with requirements of SJI's "Specifications" for chord and web section material.

B. Steel Bearing Plates: ASTM A 36 (ASTM A 36M).

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish:
   a. Plain, noncoated.

D. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish:
   a. Plain, noncoated.

E. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS:

A. Steel Prime Paint: Manufacturer's standard.

2.3 STEEL JOISTS:

A. Manufacture joists according to SJI's "Specifications," with steel angle top and bottom chord members, of joist types, end arrangements, and top chord arrangements indicated.

B. Manufacture joists according to SJI's "Specifications," with steel angle top and bottom chord members, and as follows:

1. Joist Type:
   a. K-series steel joists.
   b. LH-series steel joists.
2. End Arrangement:
   a. Underslung.
   b. Underslung with bottom chord extensions.
3. Top Chord Arrangement:
   a. Parallel.
   b. Top chord single pitched

C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

D. Provide holes in chord members where shown for securing other work to steel joists. However, deduct area of holes from the area of chord when calculating strength of member.

E. Extend top chords of joists with SJI Type S top chord extensions where indicated, complying with SJI's "Specifications" and load tables.

F. Extend bearing ends of joists with SJI Type R extended ends where indicated, complying with SJI's "Specifications" and load tables.

G. Camber K-series steel joists according to SJI's "Specifications."

H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes when joist slope exceeds 1/4 inch in 12 inches (1:48).

2.4 JOIST ACCESSORIES:

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.

1. Supply additional bridging to ensure stability of structure during construction period.

B. Fabricate steel bearing plates with integral anchorage's as indicated and finish as follows:

1. Finish: Shop prime paint.

C. Steel bearing plates with integral anchorages are specified in Section 05500, "Metal Fabrications."

D. Supply miscellaneous accessories, including splice plates and bolts required by the joist manufacturer to complete the joist installation.

2.5 SHOP PAINTING:

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed as follows:

1. Surface Preparation:
   a. Either hand tool cleaning, SSPC-SP 2, or power tool cleaning, SSPC-SP 3.

B. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film thickness of not less than 1 mil (0.025 mm).

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of joists. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's recommendations, and the requirements of this Section.

C. Before installation, splice joists delivered to Project site in more than one piece.

D. Space, adjust, and align joists accurately in location before permanently fastening.

E. Install temporary bracing and bridging, connections, and anchors to ensure joists are stabilized during construction.

F. Anchors: Furnish anchor bolts, steel bearing plates, and other devices to be built into concrete masonry construction.

G. Provide unfinished threaded fasteners for anchor bolts, unless high strength bolts indicated.

H. Field weld joists to supporting steel framework and steel bearing plates. Coordinate welding sequence and procedure with placing of joists.

I. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

J. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.

K. Comply with the Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

L. Comply with the Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

M. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

3.3 FIELD QUALITY CONTROL:

A. Testing Laboratory Responsibility: The Owner's Testing Laboratory will perform field special inspections and tests on and to prepare test reports as follows:

1. Testing Laboratory shall also approve welding certificates. Contractor shall submit three (3) copies of welding certificates and procedures for each welder involved in the Work.
2. Testing Laboratory shall conduct and interpret tests, certificates and procedures and state in each report whether tested Work complies with or deviates from requirements.

B. Testing and verification procedures will be required of high-strength bolted connections and field welds per Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.

C. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.

D. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.2 REPAIRS AND PROTECTION:

A. Touch Up Painting: Following installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by hand tool cleaning, SSPC-SP 2, or power tool cleaning, SSPC-SP 3.
2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at the time of Substantial Completion.

END OF STEEL JOISTS

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SECTION 05 3100

REVISED STEEL DECK

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Steel roof deck.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 03 3100, "Concrete":
2. Section 05 1200, "Structural Steel": Shop-welded shear connectors.
3. Section 05 5000, "Metal Fabrications": Framing openings with miscellaneous steel shapes.
4. Section 07 8150, "Sprayed-On Fireproofing".
5. Section 09 9000, "Painting":
   a. Touch-up and repair painting of deck.
   b. Touch-up and repair of special deck coatings.

1.2 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Submit all shop drawings on one reproducible print (sepia) and one blue line print only. The reproducible print will be returned. All blue line prints required by the Contractor will be the responsibility of the Contractor and shall be made after reproducible is returned.

C. Product data for each type of deck, accessory, and product specified.
1. Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.

D. Shop drawings showing layout and types of deck panels, anchorage details, reinforcing channels, pans, cut openings, closure strips, deck openings, special jointing, accessories, and attachments to other construction.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Product test reports from qualified independent testing agencies evidencing compliance with requirements of the following based on comprehensive testing:

1. Mechanical fasteners.

G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the Project.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following codes and standards, except

as otherwise indicated:

1. American Iron and Steel Institute (AISC), “Specification for the Design of Cold-Formed Steel Structural Members”.
2. American Welding Society (AWS), D1.3 “Structural Welding Code - Sheet Steel”.
3. Steel Deck Institute (SDI), “Design Manual for Composite Decks, Form Decks and Roof Decks”.

B. Installer Qualifications: Engage an experienced Installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

E. Fire-Test-Response Characteristics: Where indicated, provide steel deck panels identical to those tested as part of an assembly for fire resistance per ASTM E 119 by a testing and inspection agency performing testing and follow-up services, that is acceptable to authorities having jurisdiction.

F. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency.

G. Labeling: Identify steel deck with appropriate markings of applicable testing and inspecting agency.

H. Installation Tolerances: Conform to the installation tolerances specified in Part 3.

1.4 DELIVERY, STORAGE, AND HANDLING:

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.5 COORDINATION:

A. Coordinate installation of sound-absorbing insulation strips in acoustic deck ribs with related units of Work specified in other Sections to ensure that the insulation is protected against damage from effects of the weather and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Roof Deck:
   a. Bowman Metal Deck Armco, Inc.
   b. Epic Metals Corp.

c. Centria/Robertson.
d. Vulcraft Div. of Nucor Corp.
e. New Millenium.

2.2 ROOF DECK:

A. Steel Roof Deck: Fabricate panels without top-flange stiffening grooves conforming to SDI Publication No. 28 "Specifications and Commentary for Steel Roof Deck" and the following:

1. Galvanized-Steel Sheet: ASTM A 446, Grade A, G 60 (ASTM A 446M, Grade A, Z 180) zinc coated according to ASTM A 525 (ASTM A 525M).
2. Deck Profile:
   a. Type WR, wide rib. Vented deck at light gauge roof trusses.
3. Profile Depth:
   a. 1-1/2 inches.
4. Design Uncoated-Steel Thickness:
   a. 0.0295 inch.
5. Span Condition:
   a. Triple span or more.
6. Side Joints:
   a. Overlapped or interlocking seam at Contractor's option.

2.3 FABRICATION AND ACCESSORIES:

A. General: Form deck units in lengths of three or more spans, with flush, telescoped, or nested 2-inch laps at ends and interlocking or nested side laps, unless noted. End laps shall occur over a support.

B. Roof Deck Units: Provide deck configurations that comply with SDI “Specifications and Commentary for Steel Roof Deck”.

C. Cant Strips: Fabricate cant strips of not less than 20 gage galvanized sheet steel of same quality as the deck units. Bend cant strips to form a 45 degree cant not less than 5 inches wide with top and bottom flanges not less than 2 inches wide, unless noted. Provide cant strips in 10 foot lengths where possible.

D. Ridge and Valley Plates: Fabricate ridge and valley plates of not less than 20 gage galvanized sheet steel of the same quality as deck units. Bend to provide tight-fitting closure with deck units. Each leg of bend shall not be less than 3 inches. Provide plates in 10 foot lengths where possible.

E. Accessories: Provide accessory materials for steel deck that comply with requirements indicated and recommendations of the steel deck manufacturer.

F. Mechanical Fasteners: Manufacturer's standard, corrosion-resistant, low-velocity, powder-actuated or pneumatically driven carbon steel fasteners; or self-drilling, self-threading screws.

G. Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head; self-drilling, carbon steel screws, No. 10 (4.8 mm) minimum diameter.

H. Rib Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

I. Miscellaneous Roof Deck Accessories: Steel sheet, 0.0359-inch (0.91-mm) thick minimum

ridge and valley plates, finish strips, and reinforcing channels, of same material as roof deck.

J. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material and thickness as deck panels, unless otherwise indicated.

K. Weld Washers: Manufacturer's standard uncoated-steel sheet weld washers, shaped to fit deck rib, 0.0598 inch (1.5 mm) thick with 3/8-inch (9.5-mm) minimum diameter prepunched hole.

L. Recessed Sump Pans: Manufacturer's standard size, single piece steel sheet 0.071-inch- (1.8-mm-) thick minimum, of same material as deck panels, with 1-1/2-inch- (38-mm-) minimum deep level recessed pans and 3-inch- (76-mm-) wide flanges. Cut holes for drains in the field.

M. Flat Receiver Pan: Manufacturer's standard size, single-piece steel sheet, 0.071-inch- (1.8-mm-) thick minimum units, of same material as deck panels. Cut holes for drains in the field.

N. Shear Connectors: ASTM A 108, Grade 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B.

O. Steel Sheet Accessories: ASTM A 446, G 60 (ASTM A 446M, Z 180) coating class, galvanized according to ASTM A 525 (ASTM A 525M).

P. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of steel deck.

3.2 PREPARATION:

A. Do not place deck panels on concrete supporting structure until concrete has cured and is dry.

B. Locate decking bundles to prevent overloading of supporting members.

3.3 INSTALLATION, GENERAL:

A. Install deck panels and accessories according to applicable specifications and commentary of SDI Publication No. 28, manufacturer's recommendations, and requirements of this Section.

B. Install temporary shoring before placing deck panels when required to meet deflection limitations.

C. Place deck panels on supporting framing and adjust to final position with ends accurately aligned and bearing on supporting framing before being permanently fastened. Do not stretch or contract side lap interlocks.

1. Do not place deck units on concrete supporting structure until concrete has cured and is dry.

2. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

3. Do not use deck units for storage or working platforms until permanently secured.
4. Place deck panels flat and square and fasten to supporting framing without warp or deflection.
5. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to the decking.
6. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
7. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
8. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's instructions.

D. Deck Edge Tolerances: Perimeter deck edges shall be within =/- 1/2 inch of the indicated lines.

3.4 ROOF DECK INSTALLATION:

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches (38 mm) long, and as follows:
1. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
2. Weld Diameter:
a. 5/8 inch (16 mm), nominal.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.
5. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 36 inches (910 mm), using one of the following methods:
a. Mechanically fasten with self-drilling No. 10- (4.8-mm-) diameter or larger carbon steel screws.

B. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
1. End Joints:
a. Lapped 2 inches (51 mm) minimum.

C. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 psf at eave overhang and 30 psf for other roof areas.

D. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

E. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking, and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least one weld at each corner.

F. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's recommendations. Weld to substrate to provide a complete deck installation.

3.5 FIELD QUALITY CONTROL:

A. Testing Agency: A qualified independent testing agency employed and paid Owner will perform field quality-control testing.
   1. Field welds will be subject to inspection.

B. Testing Agency will report test results promptly and in writing to Contractor and Architect.

C. Remove and replace work that does not comply with specified requirements.

D. Additional testing will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION:

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.

END OF STEEL DECK

SECTION 05 5213

REVISED PIPE & TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Related work specified elsewhere includes:

1. Section 033000- "Cast In Place Concrete"
2. Section 055000 - "Metal Fabrications"
3. Section 079200 - "Joint Sealers" (at base of uprights in concrete slabs and paving)
4. Section 09900 - "Painting"

1.2 SUMMARY:

A. Extent of handrails and railings is indicated on drawings and includes miscellaneous handrails and railing systems, interior and exterior, not included in other sections of these specifications.

B. Types of handrails and railing system in this section include:

1. Interior galvanized steel pipe handrails and railing systems, with infill as indicated and shop applied high performance primers as specified.

2. Exterior handrails and railings shall be hot-dipped galvanized **with smooth finish**, after fabrication, with infill as indicated and shop applied high performance primers as specified.

C. Products furnished but not installed under this section include inserts and anchors preset in masonry and concrete for anchorage of handrails and railing systems.

D. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.3 SYSTEM PERFORMANCE:

A. Structural Performances:

1. Provide railing, guardrail and handrail assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

2. Handrail and guardrail assemblies, handrails, top rails and infill shall be designed so they are capable of withstanding the following minimum loads applied as indicated:

   a. Handrail assemblies and guards shall be designed to resist a load of 50 plf applied in any direction at the top and to transfer this load through the supports to the structure.

   b. Handrail assemblies and guards shall be able to resist a single concentrated load of 200-pounds applied in any direction at any point along the top, and have attachment devices and supporting structure to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the loads specified in the preceding paragraph.

   c. Components: Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed with those loads indicated in the two paragraphs above.

   d. Increase minimum loads indicated above, as required by applicable codes and/or authorities having jurisdiction.

1.4 QUALITY ASSURANCE:

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. Clearly mark units for reassembly and coordinated installation.

B. Comply with referenced standards and "Quality Assurance" article in Section 055000 - "Metal Fabrications".

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications and installation instructions for products and processes used in handrails and railings, including finishes and grout.

B. Shop Drawings: Submit shop drawings for fabrication and erection of handrails and railings. Include plans, elevations and details of fittings, connections, and anchorages to other work. Provide templates for anchor and bolt installation by others.

C. Samples: Submit samples for each type of metal finish indicated. Prepare samples on metal on same gage and alloy to be used in work. Where normal color and

texture variations are to be expected, provide "range" samples showing limits of such variations.

1. Include samples of fittings and brackets proposed for use.

2. Include sample of typical welded connection.

1.6 STORAGE:

A. Store handrails and railing systems in clean, dry location away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Metal Surfaces, General: For fabrication of railing and handrail components which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

B. Steel and Iron: Provide steel and iron in the from indicated complying with the following requirements:

1. Tubing: Cold-formed, ASTM A 500; or hot-rolled, ASTM A 501; at least 3/16-inch nominal finished wall thickness.

2. Steel Plates, Shapes and Bars: ASTM A 36.

3. Gray Iron Castings: ASTM A 48, Class 30.

4. Malleable Iron Castings: ASTM A 47, grade as recommended by fabricator for type of use indicated.

5. Steel Pipe: Schedule 40 (galvanized).

C. Aluminum (only if indicated): Provide alloy and temper recommended by aluminum producer of finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.

1. Drawn Seamless Tube: ASTM B 483, 6063-T832.
2. Plate and Sheet: ASTM B 209, 6061-T6.
3. Die and Hand Forgings: ASTM B 247, 6061-T6.
4. Castings: ASTM B 26, 356.0-T6.

5. Prefinished Guardrail and Railing Section: Schedule 40 aluminum.

2.2 MISCELLANEOUS MATERIALS:

A. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by produces of metal to be welded, complying with applicable AWS Specifications, and as required for color match, strength, and compatibility in fabricated items.

C. Fasteners:

1. Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do no use metals which are corrosive or incompatible with materials joined.

2. Provide concealed fasteners for interconnection of handrail and railing components where welding is not feasible and for their attachment to other work, except where otherwise indicated.

D. Anchors and Inserts: Provide anchors of proper type, size, and material for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

E. Painting:

1. All steel railings shall be shop primed as specified. All surface preparation work and paint application shall be done in accordance with paint manufacturer's recommendations.

2.3 FABRICATION:

A. General:

1. Fabricate handrails and railings to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting spots and brackets for size and spacing shown, but not less than required to support the design loadings indicated.

a. Provide handrail returns to wall at terminations, **whether or not indicated.**

b. Center handrails shall be continuous and without height changes, whether or not indicated.

2. Pits, grind marks and other depressions shall be filled and sanded smooth.

3. Field joints shall be completely concealed (weld, grind smooth, fill as required, then sand smooth).

4. Installed railings and handrails shall be perfectly straight, aligned, and equally spaced, and posts shall be plumb.

B. Welded Connections:

1. Fabricate railings by welding. Preassemble railing units in shop to maximum extent practicable and consistent with shipping and handling limitations. Perform welding to comply with applicable AWS specifications, using method appropriate for metal and finish indicated. Grind exposed welds perfectly smooth and flush to match and blend with adjoining surfaces.

2. Interconnect ferrous railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

a. At tee and cross intersections provide coped joints.

b. Form bends by use of prefabricated elbow fittings and radius bends, as applicable, of radiuses indicated, except where configuration indicated requires bending of railing members.

c. Where bending is required, form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, or otherwise deforming exposed surfaces of handrail and railing components.

3. Repair galvanized coatings with cold-process galvanizing repair paint.

C. For exterior handrails and railings and those exposed to moisture from condensation or other surfaces, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.

D. Fittings and Anchors: Provide manufacturer's standard miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated. Furnish inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate and space anchorage

devices as indicated and as required to provide adequate support. Coordinate anchorage devices with supporting structure.

2.4 METAL FINISHES, GENERAL:

A. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

2.5 STEEL FINISHES:

A. Surface Preparation: As recommended by paint manufacturer for galvanized substrate; non-destructive.

B. Primer: One coat of the following, shop applied or field applied over galvanized repair paint coating specified:

1. Tnemec "90-97 TNEME-ZINC" one package epoxy zinc-rich primer.

C. Intermediate Coat: One coat of the following, shop applied Tnemec "Series 66 HI-BUILD EPOXOLINE."

D. Finish Coats: Refer to Section 09900 - "Painting"; not the work of this Section 055213.

E. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with Military Specification MIL-P-21035 (Ships) or SSPC Paint 20.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete and masonry construction. Coordinate delivery of such items to project site.

B. Field Measurements: Take field measurements prior to fabrication.

3.2 INSTALLATION, GENERAL:

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Perform cutting, drilling and fitting required for installation of handrails and railings. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

C. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth, fill, sand, apply cold-process galvanizing repair paint, and touch-up shop paint coat.

D. Adjust handrails and railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by design loadings.

3.3 ANCHORING POSTS:

A. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.

B. Anchor posts in concrete and stone by core drilling holes not less than 5" deep (excluding depth of stone veneer), and 3/4" greater than outside dimensions of posts. Clean holes of all loose material, insert posts and fill annular space between post and concrete with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

1. Seal around rail penetration with pourable sealer, as per Section 07900 - "Joint Sealers."
2. Cover anchorage joint with flange or escutcheon plate attached to post after filling of annular space.

3.4 RAILING CONNECTIONS:

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100-percent contact or use manufacturer's standard fittings designed for this purpose.

3.5 ANCHORING RAILING ENDS:

A. Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.

B. Anchor railing ends to metal surfaces by welding using manufacturer's standard concealed fittings, unless otherwise indicated.

C. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40-feet. Provide slip-joint internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.

3.6 ATTACHMENT OF HANDRAILS TO WALLS:

A. General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.

B. For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.

C. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.

D. For stud partitions use lag bolts fastened to 2 x 12 treated wood blocking between studs. Coordinate with spacing of studs for accurate location of blocking members.

3.7 PROTECTION:

A. Protect finishes of railings and handrails from damage during construction period by use of temporary protection coverings approved by railing manufacturer. Remove protective covering at project completion or when directed by Architect.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

END OF PIPE & TUBE RAILINGS

SECTION 22 2000

REVISED PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE:

A. Section 22 0500 - "General Provisions - Plumbing" and Section 22 1000 - "Materials and Methods - Plumbing" shall apply to and become part of this Section.

PART 2 - PRODUCTS

2.1 DRAINS:

A. Mechanical Room Floor Drains (MFD): J.R. Smith 2330 with sediment bucket, deep seal trap, and trap primer connection where shown or required.

B. Roof Drain (RD): J.R. Smith 1010Y-C, complete with under-deck clamp, and cast iron or aluminum dome. Provide 4" high, 1/16" thick perforated stainless steel gravel stop around dome if ballasted roofing system is used. Provide sump receiver, suffix R in metal deck slabs.

C. Emergency Overflow Roof Drain (OD): J.R. Smith 1080 dome with exterior water dam, under-deck clamp, cast iron or aluminum dome, sump receiver in metal deck slabs.

D. Floor drain (FD): J.R. Smith 2005A with 6" nickel bronze grate. Select square top for tile floors. Provide primer connection where shown. Provide deep seal trap on all floor drains.

E. Floor Sink (FS): J.R. Smith 3413, 8" diameter, 6" deep porcelain enameled cast iron interior with full three quarter cast iron porcelain enameled grate and dome bottom strainer.

2.2 TRAP PRIMER:

A. Electronic Trap Primer (ETP): Precision Plumbing Products Model PT electronic with access door where multiple drains are served.

2.3 WALL HYDRANT:

A. J.R. Smith 5509-QT or Prier C-634, with integral backflow preventer, latching cover, freeze-proof and of proper length for wall in which installed, verify with Architect finish of stainless steel, polished bronze, nickel bronze or rough bronze box face. Valve must be on building side of exterior wall insulation. Install with center line 24" above finish grade. Provide Owner with one loose key for each wall hydrant. For pre-cast exterior walls use J.R. Smith 5609-QT.

2.4 HOSE BIBB:

A. T&S B-0736-P0L, chrome-plated with removable tee handle in finished areas, and Model No. B-0736-RGH rough bronze in unfinished areas complete with vacuum breaker. Provide to Owner one loose key for each loose key hose bibb.

2.5 ROOF HYDRANT:

A. J.R. Smith 5906 non-freeze roof hydrant, with flashing clamp and underdeck clamp. Pipe drain to janitor's sink or mechanical room floor drain.

2.6 CLEANOUTS:

A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angles, upper terminals and not over 50' apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk rectangular tapered slotted plugs. PVC or acid waste piping cleanouts shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, 8" and less.

B. Exposed Cleanouts: Cast brass plug type, J.R. Smith 4470T.

C. Wall type cleanout plug and access covers, J.R. Smith 4472T. Cleanout plug must be within 1" of finish wall and must be tapped for access cover. On PVC plastic and acid waste pipe in wall: Cleanout access cover J.R. Smith 4710.

D. Floor type cleanout access covers in unfinished areas: J.R. Smith 4239L/LXH-NB. Finished areas: J.R. Smith 4111L/LXH-NB. Plug must be within 3" of finished floor. Provide 4193L/LXH-NB covers where installed in terrazzo floors. Grout cleanout below access cover to seal watertight. Provide option 14 cleanout carpet markers where installed in carpeted floors.

E. **Coordinate the exact location of all cleanouts with the Architect.**

2.7 PLUMBING FIXTURES:

A. Unless otherwise specified, all fixtures complete as catalogued, white color, exposed metal trim chromium plated. Fixtures shall be without discoloration, chips or flaws and shall be free from cracks. Warped or otherwise imperfect fixtures will not be acceptable.

B. Clean all fixtures to a clean and sanitary condition.

C. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lag bolts, as recommended by the manufacturer. Single water closet carriers shall include J.R. Smith M-51 rear anchor foot support. Do not conceal until Architect has observed anchors.

D. Flush valve supports equal to Sloan "YJ" shall be installed 1" below vacuum breaker, on all flush valves. Flush valves on A.D.A. water closets must be set so that handle is to the wide side of the stall and handle is no more than 44" above finish floor. Urinal flush valves on A.D.A. urinals shall be no more than 44" above finish floor.

E. Seal wall hung fixtures at wall with white caulk. Seal countertop fixtures with clear silicone sealant. Seal floor mounted fixtures at floor with grout.

F. All fixtures noted to be A.D.A. approved must be set with great care to assure proper mounting height and proper distance from wall. Elevation of flush valves shall be coordinated with grab bars (see Architect). All shower control valves for ADA showers shall be set with centerline 44" above finish floor. Trip levers for tank type water closets shall be installed to the wide side of the stall.

G. All supplies, stops, faucets, etc. on fixtures that could be used for drinking water shall meet the Reduction of Lead in Drinking Water Act.

H. Contractor shall coordinate all sinks and faucets with casework/millwork shop drawings prior to purchase of sink/faucet. In particular, coordinate A.D.A. vs. non-A.D.A. fixtures with casework/millwork. Failure to do so will make contractor liable for incorrect fixtures.

I. All items complete as catalogued as follows:

WC-1 Water Closet: Kohler K-84325, Sloan Regal 111 flush valve with “YJ” pipe support and Church 295 NSSC white seat. Provide J.R. Smith carriers with appropriate arrangement for installation and use on siphon jet flushing water closet. Set with top of seat 17”-19” A.F.F. Install flush valve with handle on wide side of stall or room. Must meet A.D.A.

WC-2 Water Closet: Kohler K-84325, Sloan Regal 111 flush valve complete with “YJ” pipe support and Church 295 NSSC white open front seat. Provide J.R. Smith carriers with appropriate arrangement for installation and use on siphon jet flushing water closet. Set with rim 15” A.F.F.

WC-3 Water Closet: Kohler K-96057, 16-1/2" floor to rim, to meet A.D.A., Sloan Regal 111 flush valve complete with “YJ” pipe support and Church 295 NSSC white open front seat. Install flush valve with handle on wide side of stall or room. Must meet A.D.A.

UR-1 Urinal: Kohler K-5016-ET complete with Sloan Regal 186-0.5 flush valve with "YJ" pipe support, and J.R. Smith 637 carrier. Set with lip 17" A.F.F. and flush valve handle no more than 44" A.F.F. Must meet A.D.A.

UR-2 Urinal: Kohler K-5016-ET complete with Sloan Regal 186-0.5 flush valve with “YJ” pipe support, and J.R. Smith 637 carrier. Set with lip 24" A.F.F.

LV-1 Lavatory: Kohler K-2196-8, McGuire LF165 supplies with stops, 8872 P-trap, 155A strainer and tailpiece, T&S B-2990 faucet. Refer to Architect’s drawings for mounting height. Include ASSE 1070 point of use mixing valve equal to Wilkins ZW3870T for public lavatories. Provide trap wrap for exposed p-trap, supplies and stops.

LV-2 Lavatory: Kohler K-2006, wall hung, McGuire LF165 supplies with stops, 8872 P-trap, 155A strainer and tailpiece. T&S B-2990 faucet. Provide J.R. Smith 700 or 700D carrier and set with rim 31" A.F.F. Include ASSE 1070 point of use mixing valve equal to Wilkins ZW3870T for public lavatories. Provide trap wrap for exposed p-trap, supplies and stops.

SK-1 Sink: Elkay ECTSRA33229TBG dual mount, 18-gauge stainless steel with LK-35 waste strainers and tailpieces, continuous waste, McGuire LF165 supplies with stops and 8912 P-trap, Kohler Simplice K-597 pull down faucet with swing nozzle, laminar flow outlet with no aerator and 1.5 GPM flow rate. Include Badger 5XP food waste disposer, 3/4 HP, 115/1.

SK-2 Sink: Elkay ECTSRA33229TBG dual mount, 18-gauge stainless steel with LK-35 waste strainers and tailpieces, continuous waste, McGuire LF165 supplies with stops and 8912 P-trap, Kohler Simplice K-597 pull down faucet with swing nozzle, laminar flow outlet with no aerator and 1.5 GPM flow rate. Include Badger 5XP food waste disposer, 3/4 HP, 115/1.

SK-3 Utility Sink: Advance Tabco 93-41-24 single compartment, 16-gauge stainless steel, no drainboard, 24” x 24” x 12”. T&S Brass B-0526-5 wall mount spout, 12” swing nozzle, B-0502 foot pedal valves. Include McGuire drain,P-trap, and LF165 supplies and stops.

JR-1 Janitor’s Receptor: Stern Williams MTB-2424, 24" x 24" x 10" deep pre-cast terrazzo with aluminum guards on exposed sides and silicone sealant at walls. Provide splash catcher panels on adjacent walls. Provide T&S B-667-RGH faucet with spring checks. Set 42" above finish floor complete with 48" long heavy-duty hose.

EWC-1 Electric Water Cooler: Elkay EZSTLG8WSLK bi-level water cooler with bottle filler and filter. All stainless steel, J.R. Smith Carrier, McGuire LF165 supply with stop and 8872 P-trap.

ESEW Emergency Shower/Eye Wash: Guardian G1909 safety station with wide area eye/face wash, 11-1/2” stainless bowl, 10” shower head. Include McGuire 8872 P-trap.

EW Eye Wash: Wall mount, Guardian G1724 wide area eyeface wash, wall mount, stainless steel bowl, include tailpiece and trap.

2.8 PLUMBING EQUIPMENT:

A. **TMV Thermostatic Mixing Valve:** Lawler Series 801, set to 120°F. Minimum flow 1 gpm, up to 25 gpm at 10 psi drop.

B. **EWH-1 and EWH-2 Electric Water Heater:** A.O. Smith DEN/L, tank type. Install per detail.

C. **CP-1 Circulating Pump:** B&G PL all bronze.

2.9 EQUIVALENT MANUFACTURERS:

A. Where Kohler fixtures are listed above, Zurn, American Standard, or Toto may be utilized.

B. Where Sloan flush valves are listed above, Zurn or Delaney may be utilized.

C. Where Smith is listed above, Josam, Watts, Zurn or Wade may be utilized.

D. Where Elkay water coolers are mentioned above, Halsey Taylor, Sunroc, or Oasis may be utilized.

E. Where B&G is listed above, the equal of Armstrong, Taco, or Thrush may be utilized.

F. Where Elkay sinks are listed above, Just may be utilized.

G. Where Church water closet seats are listed above, Zurn, Beneke, Bemis, Centoco or Olsonite may be utilized.

H. Where Lawler combination pressure balanced and thermostatic mixing valves are listed above, Powers, Symmons, or Leonard may be utilized.

I. Where Kohler faucets are listed above, American Standard or Delta may be utilized.

J. Where T&S Brass is listed, Chicago or Zurn may be utilized.

K. Where A.O. Smith water heaters are listed above, Lochinvar, Rheem, State or Bradford White may be utilized.

L. Where Stern Williams is listed above, Fiat, or Zurn may be utilized.

M. Where McGuire is listed above, the equal of Zurn, Watts, Dearborn or Brasscraft may be utilized.

N. Where Guardian is listed, Haws or Acorn may be utilized.

O. Where Striem is listed, Highland Tank or approved equal.

P. Where Kaeser is listed, equal by approval prior to bid only.

PART 3 - EXECUTION:

3.1 MANUFACTURER'S INSTRUCTIONS:

A. Install all plumbing equipment and fixtures as recommended by the manufacturer's recommendations.

END OF PLUMBING FIXTURES AND EQUIPMENT

SECTION 27 05 00

AUXILIARY SYSTEM CABLES, 0-50V

PART 1 - GENERAL

1.1 DESCRIPTION

A. Cables rated for 0V-50V application

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless specified otherwise, all cables within the scope of this specification section shall:
1. Be rated for exposed cable tray installation.
2. Be plenum rated.
3. Be UL-rated for the proposed application.
4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
5. Utilize copper conductors.
6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

2.2 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:
1. Be rated for 600V.
2. Be industrial grade.
3. Have stranded conductors.
4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
5. Be manufactured by Belden, AlphaWire or General Cable.

2.3 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:
1. Be rated for 300V.

2. Be shielded if so recommended by the system supplier/integrator.
3. Have twisted conductors.
4. Have plenum-rated insulation/jacket with ripcord.
5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

2.4 NETWORK CABLING

A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Routing:
1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
   a. Cabling is plenum-rated, multi-conductor.
   b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
   c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
   d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
   e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.
2. End bushings shall be provided on both ends of all raceway terminations.
3. No splices shall be pulled into conduit.
4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Penetrations:
1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.
2. For cabling not installed in conduit:
   a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the

need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

3. For cabling installed within conduit from endpoint to endpoint:
   a. Fire/smoke barrier penetrations shall sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.
4. For cabling installed within cable trays:
   a. Fire/smoke barrier penetrations shall be sealed with one of the following methods:
      1) Continuous cable tray through the penetration, with a combination of large firestop pillows and small firestop pillows contained, supported and secured (to prevent unauthorized removal) on both sides by aluminum wire mesh and firestop putty. Firestop pillows shall be STI Series SSB or equal and Firestop putty shall be STI Spec Seal or equal.
      2) Cable tray broken at the penetration, with fire/smoke barrier penetrations sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

C. Excess Cabling:
1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

D. Terminations:
1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
2. Cabling shall be neatly formed, bundled and tied at all terminations.

3.2 SPLICES/CONNECTIONS/TERMINATIONS:

A. Network Cabling:
1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

B. Control Cabling:
1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

C. Shielded cabling:

1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

3.3 LABELING

A. Refer to Specification Section 26 05 53 for all labeling requirements.

END OF SECTION 27 05 00

SECTION 27 10 00

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 SCOPE:

A. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Backbone and Horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the structured cabling contractor as detailed in this document.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types are indicated on the plans. If the bid documents are in conflict, this specification shall take precedence.

D. Refer to Specification Section 26 05 53 (Electrical Identification) for additional identification requirements.

E. Refer to Specification Section 27 05 00 (Auxiliary System Cables, 0-50V) for additional material and installation requirements.

1.2 REGULATORY REFERENCES:

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the National Electrical Code, local ordinances and present manufacturing standards.

B. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. All modular jacks, patch cords, consolidation point, and patch cords shall be ETL Verified (not just tested) to be category 6 component and channel compliant.

D. The cabling system described in this specification is derived from the recommendations made in recognized telecommunications industry standards. The following documents are incorporated by reference:
1. ANSI/TIA/EIA - 568-B.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements, April, 2001

2. ANSI/TIA/EIA - 568-B.2, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components, April, 2001
3. ANSI/TIA/EIA - 568-B.2-1, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted Pair Cabling Components, Addendum 1 – Transmission Performance Specifications for 4-pair 100 Ω Category 6 Cabling
4. ANSI/TIA/EIA - 568-B.3, Commercial Building Telecommunications Cabling Standard Part 3: Optical Fiber Cabling Components, March, 2000
5. ANSI/TIA/EIA – 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces, February, 1998
6. ANSI/TIA/EIA – 606-A, Administration Standard for Telecommunications Infrastructure of Commercial Buildings, February, 2002
7. ANSI/TIA/EIA – 607-AJ, Commercial Building Grounding and Bonding Requirements for Telecommunications, August 1994
8. ANSI/ TIA/EIA – 758, Customer-Owned Outside Plant Telecommunications Cabling Standard, April 1999
9. BICSI - TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM) 10TH edition.
10. National Fire Protection Agency (NFPA – 70), National Electrical Code (NEC) –2002
11. ANSI/TIA/EIA – 45-B, Test Procedures for Fiber Optic Connections.
12. ANSI/TIA/EIA – 526-14, Power Test for Fiber Runs.
13. FCC 47 CFR 68
14. NEMA 250
15. NEC Articles 770 and 800
16. ADA, Americans with Disabilities Act

E. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release.

F. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project. All local State and federal codes are to be followed.

1.3 APPROVED CONTRACTOR:

A. The Structured Cabling Contractor must meet the following requirements:
1. Contractor must have a certified RCDD on staff. The project manager for this project shall have an RCDD certification, and RCDD shall be responsible for reviewing all aspects of the design, submittals and installation of all products.
2. All required submittal information shall be stamped by the RCDD.
3. Contractor must have a minimum of 3 years experience with projects of similar size and scope to this project.
4. The company performing the work must have been in business for a minimum of 3 years.

5. The company must have an office within 75 miles of the job site.

B. The Structured cabling contractor is responsible for workmanship and installation practices in accordance with the requirements of the standards described in these specifications and manufacturer's requirements.

1.4 WORK INCLUDED:

A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The structured cabling contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specifications or not.

B. The work shall include, but not be limited to the following:
1. Furnish and install a complete telecommunications wiring infrastructure.
2. Furnish, install, and terminate all UTP and Optical Fiber cable
3. Furnish and install all wall plates, jacks, patch panels, and patch cords at equipment racks and at work outlets (unless shown otherwise on plans).
4. Furnish and install all required cabinets and/or racks as required and as indicated.
5. Furnish any other material required to form a complete system.
6. Perform channel testing (100% of horizontal and/or backbone links/channels) and certification of all components.
7. Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.
8. Provide owner test results and documentation. (Testing documentation and As-built drawings)

1.5 SUBMITTALS:

A. Within thirty (30) days of notice to proceed the structured cabling contractor shall submit the following items:
1. Submit copies of the certification of the company and names of staff that will be performing the installation and termination of the installation to provide proof of compliance of this spec.
2. Submit proof from manufacturer of contractor's good standing in manufacturer's certification program.
3. Submit copy of contractor's RCDD certification.
4. Submit listing of five (5) projects of similar size and scope to this project that have been completed within the last five years. Include in this submittal owner's contact information for each project.
5. Submit letter from the manufacturer stating that the manufacturer will provide a twenty-five year (25) warranty in accordance with the requirements paragraph 1.03 (B) of these specifications.
6. Submit appropriate cut sheets and samples for all products, hardware and cabling.

7. Submit 1/8" = 1'-0" drawings of floor plans indicating all work outlets and the labeling designation for each jack.
8. Submit ½" = 1'-0" drawings of each MDF and each IDF showing all racks, patch panels, 110 blocks, etc.

B. Work shall not proceed without the engineer's approval of the submitted items.

C. The structured cabling contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

1.6 DRAWINGS:

A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the structured cabling contractor in bidding the job. The structured cabling contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The structured cabling contractor shall verify all dimensions at the site and be responsible for their accuracy.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS:

A. Due to the nature and type of communications all products, including but not limited to faceplates, jacks, patch panels, racks, 110 blocks, and patch cords, for the purpose of this document, shall be manufactured by Hubbell, Ortronix, Panduit, Amp or Systimax. See below for acceptable cable manufacturers.

2.2 WORK AREA OUTLETS:

A. Work area cables shall each be terminated at their designated work area location in the connector types described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.

B. The Telecommunications Outlet Assembly shall accommodate:
1. A minimum of two (2) modular jacks
2. Additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary
3. A blank filler will be installed when extra ports are not used.
4. A dust cap shall be provided on all modular jacks with the circuit number on the identifier strip.
5. Multiple jacks will be placed as documented on the plans.

6. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the structured cabling contractor shall submit the proposed configuration for each outlet assembly for review by the architect.
7. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA-606-A standard specifications. Labels shall be printed using a printer such as a Brady hand held printer. Hand printed labels shall not be accepted.

C. Faceplates: The faceplates shall:
1. be UL listed and CSA certified.
2. be constructed of stainless steel (except where noted otherwise). All faceplate colors/materials in public areas shall be approved by the architect. In all cases the material and color of the faceplate shall match the adjacent electrical faceplate.
3. (where plastic faceplates are specifically allowed by the architect/engineer) shall match the faceplate color used for other utilities in the building or match the color of the raceway if installed in surface raceway.
4. be compliant with the above requirements along with the following when incorporating optical fiber:
   a. be a low profile assembly,
   b. incorporate a mechanism for storage of cable and fiber slack needed for termination,
   c. position the fiber optic couplings to face downward or at a downward angle to prevent contamination and,
   d. incorporate a shroud that protects the optical couplings from impact damage.
5. be available as single-gang or dual-gang.
6. possess recessed designation windows to facilitate labeling and identification.
7. shall include a clear plastic cover to protect labels in the designation window.
8. have mounting screws located under recessed designation windows.
9. comply with ANSI/TIA/EIA–606-A work area labeling standard.
10. allow for the UTP modules to be inverted in place for termination purposes.
11. be manufactured by an ISO 9001 registered company.

D. Voice / Data Jacks
1. Voice/Data jacks shall be 8-position modular jacks and shall be Category 6 performance as defined by the references in this document including ANSI/TIA/EIA-568-B.2-1. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory including, but not limited to, ETL.
2. The wiring scheme shall be T568A or T568B as directed by the owner.
3. The modular jack shall use dual reactance modular contact array.
4. The modular jack shall have low emission IDC contacts.
5. The modular jack shall use standard termination practice using 110 impact tool
6. The modular jack shall be backwards compatible to Category 3 and 5.

7. The modular jack shall be center tuned to category 6 test specifications.
8. Dust cover shall be used on each termination.

2.3 110 COPPER TERMINATION BLOCK:

A. The voice cross connect shall be a passive connection between the horizontal termination blocks and the backbone termination blocks. The wall mount frames shall be field terminated kits including all blocks, connecting blocks, and designation strips. Management rings shall be mounted between vertical columns of blocks to provide management of cross-connect wire. Backbone and horizontal blocks shall use 4-pair connecting blocks. Blocks shall be oriented so that backbone terminations are located on the left and horizontal frames are located on the right of the termination field when facing the frame assembly.

B. 110 Block Kits shall
1. include both the wiring block and connecting block in a 50, 100 and 300 pair footprint as required
2. be manufactured using fire retardant molded plastic.
3. include 4-pair 110C connecting blocks for field termination.
4. support termination of 22-24 AWG solid conductor
5. wiring blocks shall contain back openings for the feed through of cable
6. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
7. have color-coded tips on the wiring block and color coding on the connector blocks for installation identification.
8. shall use standard termination practice requiring a single conductor 110 impact tool
9. Termination hardware shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
10. be backwards compatible to category 3 and 5.
11. be labeled in compliance with ANSI/TIA/EIA-606-A labeling specifications using permanent labels and label printer.
12. be manufactured by an ISO 9001 registered company.

2.4 MODULAR PATCH PANELS:

A. The Modular Patch Panels shall
1. be modular design.
2. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
3. use low emission IDC contacts
4. use dual reactance technology to enhance the signal-to-noise ratio
5. require standard termination practices using a 110 impact tool
6. use a single piece IDC housing designed to accept larger Category 6 conductors
7. support both T568B and T568A wiring
8. include easy to follow wiring labels
9. include label fields

10. allow for the use of icons
11. include full length metal rear cable management
12. be available in standard or high density
13. be backward compatible to category 3 and 5.
14. be center tuned to category 6 test specifications
15. be sized to accommodate number of data or data and phone cables (where phone cables are terminated on patch panels in lieu of 110 blocks) served by each equipment room plus 30% spare capacity.
16. be separated by horizontal cable management sections.

2.5 RACKS:

A. The equipment rack shall provide vertical cable management and support for the patch cords at the front of the rack and wire management, support, and protection for the horizontal cables inside the legs of the rack.

B. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Double-sided wire management shall also be mounted above each patch panel and/or piece of equipment on the rack. The rack shall include mounting brackets for cable tray ladder rack to mount to the top of the rack. Velcro cable ties shall be provided inside the rack channels to support the horizontal cable. Rack shall be black in color to match the patch panels and cable management.

C. Free-Standing Racks shall:
1. have the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
2. have top cable trough with waterfall and built in patch/horizontal cable distribution separator.
3. have horizontal front and rear cable management above, below and between each 48-port patch panel.
4. have a rack-mounted power strip.
5. have EIA hole pattern on front and rear.
6. be available with a 6.0” channel depth.
7. be available with hook and loop straps for securing bulk cables inside the vertical U-channels.
8. assemble as 19” (483 mm) or 23” (584 mm) with no additional hardware.
9. be available with three styles of vertical patch cord management: interbay with latches, cable management rings, or fingerduct with covers.
10. provide floor and ceiling access for cable management and distribution.
11. provide pre-drilled base for floor attachment of rack.
12. be available in standard color of black.
13. be manufactured by an ISO 9001 registered company.

D. Wall-Mounted Racks shall:
1. provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
2. have top cable trough with waterfall and built in patch/horizontal cable distribution separator.
3. have horizontal front and rear cable management above, below and between each 48-port patch panel.
4. have a rack-mounted power strip.
5. have EIA hole pattern on front and rear.
6. be available with a 6.0" channel depth.
7. be available with hook and loop straps for securing bulk cables inside the vertical U-channels.
8. assemble as 19" (483 mm) or 23" (584 mm) with no additional hardware.
9. provide usable depth as required for standard network ethernet switch and other equipment
10. be available with three styles of vertical patch cord management: interbay with latches, cable management rings, or fingerduct with covers.
11. provide floor and ceiling access for cable management and distribution.
12. provide pre-drilled base for wall attachment of rack.
13. be available in standard color of black.
14. be manufactured by an ISO 9001 registered company.
15. be constructed to swing-out from wall (for rear access) via heavy-duty hinged corner and configurable for either left or right opening.

2.6 HORIZONTAL DISTRIBUTION CABLE:

A. Horizontal Distribution Cabling shall meet the following requirements:
1. Shall be 100 Ohm Enhanced Category 6 Unshielded Twisted Pair (UTP) Cable.
2. Physical Characteristics:
   a. Unless directed otherwise by owner (contractor shall verify with owner), Cat6 cable coloring shall be based on system type as follows, unless specifically approved otherwise:
      1) Data (or IP Voice): Blue
      2) Analog Voice: Grey
      3) Lighting Control System: White
      4) Fire Alarm or other Life-Safety System: Red
      5) CCTV Surveillance Cameras: Yellow
      6) Other: As directed by owner
   b. Shall be plenum-rated.
   c. Shall meet applicable requirements of ANSI/ICEA S-80-576.
   d. The diameter of the insulated conductor shall be .023 in. maximum.
   e. Shall consist of (4) 22-26 AWG twisted pairs.
   f. The overall diameter of the cable shall be no larger than 0.240 inches.

g. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.
h. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.
i. Cable shall be third party verified to meet ANSI/TIA/EIA-568-B.2-1.
j. Where installed underground, within slab-on-grade or in exterior locations, be gel-filled and rated for wet locations.

3. Transmission Characteristics:
   a. DC resistance of any conductor shall not exceed 9.38 Ohms per 100m max. at 20° C. Measured in accordance with ASTM D 4566.
   b. The mutual capacitance of any pair at 1 kHz for 100m of cable shall not exceed 4.4 nF nominal.
   c. DC resistance unbalance any two conductors of any pair shall not exceed 5% when measured at or corrected to 20° C in accordance with ASTM D 4566.
   d. Structural return loss swept measurement for 100m or longer shall meet or exceed Category 6 requirements.
4. Shall be manufactured by Amp NetConnect, Berk-Tek, Leviton, General Cable, Mohawk or Superior Essex.

2.7 BACKBONE - FIBER:

A. Backbone Fiber Optic Cabling shall meet the following requirements:
1. All optical fiber shall be Indoor/Outdoor,Tight-Buffered, All-Dielectric, Plenum rated (unless specified otherwise on plans) with Singlemode OS2-rated 9/125 Optical Fibers.
2. Each Multimode Fiber shall:
   a. Comply with ANSI/EIA/TIA-492AAAC-A
   b. Have attenuation measured in accordance with ANSI/EIA/TIA-455-46, 53 or 61.
   c. Have information transmission capacity measured in accordance with ANSI/EIA/TIA-455-51 or 30.
   d. Have measurements performed at 23 degrees C +/- 5 degrees.
   e. Have 10 GB speed from 5-10kw at 1310nm and 40-40km at 1550n.
3. Each indoor/outdoor fiber optic cable shall:
   a. Be suitable for use in both outdoor and indoor applications without the use of a transition at the building entrance.
   b. Be suitable for use in risers, plenums and horizontal applications.
   c. Have a dry water blocking system for cable.
   d. Have a fiber strand count of 12 (unless shown otherwise on plans).
   e. Have a nominal 2.21 mm sub-unit diameter.
   f. Have and be marked with an UL-OFNP Flame Rating (unless engineer specified otherwise on plans).
   g. Comply with Bellcore GR-409 and GR20
   h. Be independently verified to comply with ICEA S-104-696
   i. Have strength members of FGE/Aramid yarn.
   j. Be suitable for underground or above ground conduits.

k. (Where applicable) Have Tight Buffered fibers color coded in accordance with EIA / TIA 598 with an overall black jacket.
l. Be suitable for operation between -40° to +70° C
m. Be UV resistant
n. Be of an all dielectric design

4. Shall be manufactured by Berk-Tek, Corning, General Cable or Superior Essex.

2.8 BACKBONE - COPPER:

A. Backbone Copper Cabling shall meet the following requirements:
1. Shall be Cat 3 rated.
2. Shall be RDUP PE-39 rated.
3. Where installed underground or in wet locations, shall include fully-flooded waterblocking compound to provide wet-location rating of cable.
4. Size of the backbone cables shall be determined by multiplying the number of horizontal voice cables to be terminated in each IDF by 200% and rounding up to the nearest 50 pair group. For Example if 94 horizontal voice cables are to be terminated in IDF1, install 94 x 1 pr x 200% = 188 pr rounded up to nearest 50 pr = 200 pr cable to IDF1.
5. Shall be manufactured by Berk-Tek, Corning, General Cable, Mohawk or Superior Essex.

2.9 COPPER CABLE SURGE PROTECTION DEVICES:

A. All copper circuits routed between or outside of buildings shall be provided with a surge protection device at each end. The surge protection device shall be labeled as meeting the requirements of the latest edition of UL 96A (exact requirements shall be coordinated with the lightning protection system supplier, where applicable).

B. The surge protection device shall be connected with a #6 AWG copper bonding conductor between the protector ground lug and the TC ground point.

2.10 PATCH CORDS:

A. The structured cabling contractor shall provide factory terminated and tested UTP and optical fiber patch cords and equipment cords for the complete cabling system. Patch cords shall be provided by the structured cabling contractor to connect patch panels to owner furnished electronics. The UTP patch cables shall meet the requirements of ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 for patch cord testing. Provide one set of optical fiber patch cables per fiber run that terminates on fiber patch panel and provide one category 6 patch cord for each category 6 work outlet that terminates on patch panel.

B. Copper (UTP) patch cords shall:
1. Be furnished to connect each patch panel jack to owner supplied electronics.
2. Be furnished for each work outlet jack.

3. Be a Category 6 patch cord manufactured by Panduit, Amp or Systimax.
4. Use 8 position connector with impedance matched contacts and designed using dual reactance.
5. Be constructed of 100 ohm, 4 pair, 24 AWG, stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2–1 standard.
6. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1 100% factory tested to meet category 6 performance and ETL or any other nationally recognized 3rd party verification
7. Be capable of universal T568A or T568B wiring schemes.
8. Have modular connector that shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
9. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
10. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
11. Have "snagless" protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief
12. Be available in three standard colors
13. Be available in 3 foot, 5 foot, 7 foot, 10 foot, and 14 foot standard lengths
14. Be backwards compatible to Category 3, 5 and 5e

C. Fiber Optic patch cords shall:
1. Be furnished in the quantity of two (2) per IDF in each IDF and two (2) per IDF in each MDF.
2. Be manufactured by Panduit, Amp or Systimax.
3. Be multimode OM4 type.
4. Have connector type as directed by owner.
5. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
6. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
7. Be available in three standard colors
8. Be available in 3 foot, 5 foot, 7 foot, 10 foot, and 14 foot standard lengths

2.11 GROUNDING AND BONDING:

A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA/EIA-607 Telecommunications Bonding and Grounding Standard.

B. The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each telecommunications room

shall be provided with a telecommunications ground bus bar (TGB). Each grounding bus shall be 12"W x 4"H x ¼"THK and be mounted to the backboard with porcelain isolators.

C. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.

2.12 FIRESTOP:

A. A firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an UL listed firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.

2.13 INNERDUCT:

A. Innerduct, shall be:
1. Non-metallic, corrugated with pre-installed pull tape.
2. Plenum-rated, where installed within buildings.
3. UL listed for the application.
4. Size as required by the application.
5. Orange in color in concealed areas or within telecommunications or electrical rooms. Color shall be custom as selected by owner in exposed areas (such as within cable trays overhead in areas without ceilings outside telecommunications/electrical rooms).

PART 3 - EXECUTION

3.1 PRE-INSTALLATION SITE SURVEY:

A. Prior to start of work, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial schedule completions of the equipment rooms and telecommunication closets.

B. Examine areas and conditions under which the system is to be installed. Do not proceed with work until satisfactory conditions have been achieved.

3.2 WORK AREA OUTLETS:

A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.

C. Pair untwist at the termination shall not exceed 12 mm (one-half inch).

D. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the cable.

E. The cable jacket shall be maintained to within 25mm (one inch) of the termination point.

F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).

G. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.3 HORIZONTAL DISTRIBUTION CABLE INSTALLATION:

A. All horizontal voice and data cabling shall be terminated on modular patch panels except for horizontal voice cables serving life safety related functions (fire alarm systems, security systems, elevator communications, etc.). All horizontal voice cabling serving life safety related functions shall be terminated on 110 blocks.

B. The voice and data cables shall be installed in separate patch panels.

C. All wiring above ceilings shall be installed in cable tray or open top cable hangers or in provided conduit.

D. Cable above accessible ceilings shall be supported 60" on center from cable support attached to building structure.

E. Do not untwist cable pairs more than 0.5 in. when terminating.

F. The Contractor shall be responsible for replacing all cables that do not pass Category 6 requirements for data and 5e for the voice applications.

G. Maximum horizontal cable length shall be 90 meters.

H. Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.

I. Install cable in neat and workmanlike manner. Neatly bundle and tie all cable in closets. Leave sufficient cable for 90° sweeps at all vertical drops.

J. Do not install Category 6 cable with more than 110N (25 lbs) pull force, as specified in ANSI/TIA/EIA and BICSI TDDM practices. Utilize appropriate cable lubricant in sufficient quantity to reduce pulling friction to acceptable levels on long pulls inside conduit, pulls of multiple cables into a single small bore conduit, on conduit runs greater than 100 lineal feet with bends of opposing directions, and in conduit runs that exceed 180 degrees of accumulated bends. Use of tensile rated cords (i.e. fishing line) should be used for difficult or questionable pulls - to judge to go/no-go condition of the conduit and pulling setup.

K. Cables jackets that are chaffed or burned exposing internal conductor insulation or have any bare copper ("shiners") shall be replaced.

L. Test, label and document as called for in contract documents.

M. Firestop all openings where cable is installed through a fire barrier.

3.4 HORIZONTAL CROSS CONNECT INSTALLATION:

A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).

C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

D. Cables shall be neatly bundled and dressed to their respective panels or blocks. 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.

E. The cable jacket shall be maintained as close as possible to the termination point.

F. 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. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.5 OPTICAL FIBER TERMINATION HARDWARE:

A. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

C. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

D. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

E. A maximum of 12 strands of fiber shall be spliced in each tray

F. All spare strands shall be installed into spare splice trays.

3.6 BACKBONE CABLE INSTALLATION:

A. Raceways:
1. All backbone cables shall be installed inside innerducts (see specification above) within conduits meeting specification requirements unless specifically noted otherwise.
2. Backbone cables shall be installed separately (in separate innerducts/conduits) from horizontal distribution cables.
3. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
4. Where backbone cables and distribution cables are specifically specified to be installed in a cable tray or wireway, backbone cables shall be installed first, within innerducts meeting specifications above, bundled separately from the horizontal distribution cables.

B. Support:
1. Within Telecommunications Rooms or at Telecommunications Backboards, all backbone cables shall be securely fastened to the backboards on the walls.
2. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
3. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
4. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

3.7 COPPER TERMINATION HARDWARE:

A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-A/B standard, manufacturer's recommendations and best industry practice.

B. Pair untwist at the termination shall not exceed 12 mm (one-half inch).

C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

D. Cables shall be neatly bundled and dressed to their respective panels or blocks. 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.

E. The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.

F. 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. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.8 RACKS:

A. Floor-mount racks shall be used unless specifically shown otherwise.

B. Floor-mount racks shall be securely attached to the concrete floor using a minimum 3/8" hardware or as required by local codes.

C. Racks shall be placed with a minimum of 36 inches clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.

D. All racks shall be grounded to the telecommunications ground bus bar in accordance with Section 3.11 of this document.

E. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

F. Wall mounted termination block fields shall be mounted on 4' x 8' x .75" void free plywood. The plywood shall be mounted vertically 12" above the finished floor. The plywood shall be painted with two coats of grey fire retardant paint.

G. Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.

H. Rack-mounted patch panels (and the associated horizontal cable management sections) furnished within the contract shall occupy no more than 40% of the available space within the associated racks (also furnished within the contract) unless specifically shown or specified otherwise. A minimum of 60% of available rack space shall be reserved for owner-furnished equipment. Where the number of patch panels and horizontal cable management sections would exceed 40% of the available rack space, an additional rack shall be installed.

3.9 EQUIPMENT TRAY FOR TELECOMMUNICATION ROOMS:

A. All equipment trays shall be 18" in width.

B. Furnish and install 18" equipment tray from each floor mount rack/server cabinet to wall. Furnish 18" equipment tray around wall as required to support cables. A minimum of two (2) walls shall be completely covered by equipment tray.

C. Furnish and install cable retaining posts on each side of tray every 4 feet as required to supports cables.

3.10 FIRESTOP SYSTEM:

A. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

3.11 GROUNDING SYSTEM:

A. The TMGB in the MDF shall be connected to the building electrical entrance grounding facility with a #6 AWG ground. Each TBB in each IDF shall be connected to a ground bus in the MDF with #4/0 AWG minimum ground. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.

B. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the TR or ER shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.

C. The TBB shall adhere to the recommendations of the ANSI/TIA/EIA-607 standard, and shall be installed in accordance with best industry practice.

D. Installation and termination of the main bonding conductor to the building service entrance ground shall be performed by the electrical contractor.

3.12 IDENTIFICATION AND LABELING:

A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful structured cabling contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.

B. All label printing will be machine generated by Panduit software (or other) using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.13 TESTING AND ACCEPTANCE:

A. General
1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Panduit Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Channel Testing
1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a Level III test unit for category 6 performance compliance, respectively.
2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B.1 Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
4. Category 6 Performance:
   a. Follow the Standards requirements established in:

1) ANSI/TIA/EIA-568-B .1, B.2 and B.2-1

b. A Level III test unit is required to verify category 6 performance.The basic tests required are:
   1) Wire Map
   2) Length
   3) Attenuation
   4) NEXT (Near end crosstalk)
   5) Return Loss
   6) ELFEXT Loss
   7) Propagation Delay
   8) Delay skew
   9) PSNEXT (Power sum near-end crosstalk loss)
   10) PSELFEXT (Power sum equal level far-end crosstalk loss)

C. Fiber Testing
   1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end to end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
   2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.
   3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.
   4. Where links are combined to complete a circuit between devices, the structured cabling contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The structured cabling contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.
   5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

3.14 SYSTEM DOCUMENTATION:

A. Upon completion of the installation, the structured cabling contractor shall provide three (3) full documentation sets to the owners for approval. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer,

the structured cabling contractor shall provide copies of the original test results.

C. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the structured cabling contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

3.15 TEST RESULTS:

A. Test documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

B. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-A/B including applicable TSB’s and amendments. The appropriate Level III tester shall be used to verify Category 6 cabling systems.

C. Test results generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The structured cabling contractor must furnish this information in electronic form (CD-ROM).

D. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

3.16 AS-BUILT DRAWINGS:

A. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD rel. 2002) formats on which as-built construction information can be added. These documents will be modified accordingly by the structured cabling contractor to denote as-built information as defined above and returned to the Owner.

B. The Contractors shall annotate the base drawings and return a hard copy (same plot size

as originals) and electronic (AutoCAD DWG) form.

3.17 WARRANTY:

A. The manufacturer shall provide a 25 year extended product warranty with a 25 year applications assurance warranty. Manufacturer shall provide the warranty directly to the end user.

B. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for 25 years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal copper and the backbone optical fiber portions of the cabling system.

C. The Application Assurance Warranty shall cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA–568-B.1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, and 155 Mb/s ATM.

D. The contractor shall provide a warranty on the physical installation.

3.18 FINAL ACCEPTANCE & SYSTEM CERTIFICATION:

A. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from the manufacturer, registering the installation.

END OF SECTION 27 10 00

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SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install a complete low voltage, automatic and manual fire alarm system as specified herein and indicated on the drawings.

B. The system shall include a central control panel, power supply, signal initiating devices, audible and visual alarm devices, a conduit and wiring system and all necessary accessories required to provide a complete operating system.

C. The system shall be completely addressable.

D. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 (National Fire Alarm Code) for fire alarm systems; N.E.C. Article 760; and meet all requirements of the local authorities having jurisdiction.

E. The system shall be provided by a local service organization located within 50 miles of the job site.

1.2 DESCRIPTION OF SYSTEM

A. Conduit, outlet boxes, cabinets, devices and wiring installation for complete fire detection and alarm system.

B. Each and every item of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriter's Laboratories, Inc. (UL), and shall bear the "UL" label. All control equipment shall be listed under UL category UOBZ as a single control unit. Partial listing shall not be acceptable. System controls shall be UL listed for Power Limited Applications per N.E.C. Article 760. All circuits shall be marked in accordance with N.E.C. 760-23.

C. Wiring shown is diagrammatic to define system and is not intended to show every wire. Review drawings prior to bidding and inform Contractor of any additional wiring necessary for installation of systems. Wiring shall comply with pathway survivability requirements defined in NFPA 72. Include cost of all wiring in bid.

D. Submit complete shop drawings of system for review including terminal to terminal connection diagrams for system components and associated equipment interfaces, conduit diagrams, complete descriptive information on each item of equipment including UL listing for all system components, and any other information required by Architect to describe system. Identify color code and terminal numbers on shop

drawings.

E. After completion of work, submit one set of record mylar sepias with items for Owner described above. Typical type drawings will not be accepted.

F. Manufacturer's trained technical representative shall supervise installation, connections and tests. The authority having jurisdiction shall be notified prior to installation or alteration of equipment or wiring. Before acceptance, manufacturer's representative will test and certify in writing that system is installed and functioning properly as intended by drawings and specifications. Test includes operation of all devices in entire system.

G. Guarantee entire system in writing for one year from date of acceptance by Owner. Guarantee will cover completely all components, equipment, wiring, etc. Repair any defects found in the system within the guarantee period without cost to owner.

H. Submit with bid a guaranteed price for complete maintenance and service of system for one year beginning at expiration of guarantee period. Price shall be guaranteed for acceptance by Owner until date of substantial completion of system.

1.3 SYSTEM OPERATION

A. Actuation of any alarm initiating device shall cause all audible alarm signals to sound, all visual indicating appliances to flash, activate an alarm LED and local tone-alert at control panel/annunciator, cause an LCD read-out of point in alarm including type of alarm (smoke detector, manual station, etc.), provide a signal to the mechanical controls to shut down or re-route air handling systems according to established plans. This shall include a suitable addressable relay at each air handling unit to shut down all air handlers in a given zone when system goes into alarm.

B. The general alarm devices may be silenced by authorized personnel only, by entering a locked cabinet and operating the proper silencing switch. A subsequent zone alarm shall reactivate the signals. Operation of the silencing switch shall be indicated by a trouble light and audible signal.

C. Operation of any sprinkler monitoring switch, power failure, opens, grounds, or any disarrangement of the system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble signal may be silenced; however, the trouble LED shall remain lit until the system has been returned to normal operating condition.

D. Analog Smoke Sensor Operation
1. The smoke sensor shall be a smoke density measuring device having no self contained alarm set-point. The alarm decision for each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to stored values.
2. The control panel shall maintain a moving average of the sensors smoke chamber value. Systems that do not automatically maintain a constant smoke obscuration

sensitivity for each sensor by compensating for environmental factors and are deemed unacceptable.

3. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "Dirty Sensor" trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location.
4. If a "Dirty Sensor" is left unattended, and its average value increases to a second predetermined value, an "Excessively Dirty Sensor" trouble condition shall be indicated at the control panel for the individual sensor.
5. The control panel shall automatically perform a daily self-test on each sensor. Checking the electronics in the sensor's base ensures the accuracy of the values being transmitted to the control panel. A sensor which fails the self-test will cause a "Self Test Abnormal" trouble condition at the control panel. A sensor self-test which must be manually initiated by the operator shall not be acceptable.

1.4 SYSTEM FEATURES

A. The fire alarm system shall include the following features as a minimum:
1. Supervision of all field wiring.
2. Microprocessor based solid state modular construction.
3. Ground fault detection and ground fault isolating & supervising circuitry.
4. 80 character LCD display to indicate alarms, supervisory service conditions and troubles.
5. Simultaneous test of all LED's and LCD's from a central point.
6. "Dead Front" design control panel/annunciator with field programmable LED alarm, status and trouble indicators, and all control switches located behind a locked tempered glass door.
7. Fully automatic battery charger and lead alkaline batteries. Batteries shall have capacity to maintain system operation for 24 hours in normal supervisory mode and shall have sufficient capacity remaining to operate in alarm mode for 15 minutes at conclusion of supervisory period. Batteries shall be supervised for connection to the system and for low voltage threshold. Ammeter and voltmeter shall be provided to indicate battery voltage and charging current.
8. Two (2) sets of 2 amp form C auxiliary alarm contacts fused with feedback.
9. One (1) set of 2 amp form C auxiliary trouble contacts.
10. Standard with 127 addressable points (expandable to 508 points) and four input/output (I/0) circuits (expandable to 20 circuits).
11. Basic four (4) amp power supply (expandable as required).
12. 600 event historical logging.
13. System shall be field programmable for offsite monitoring by remote station reverse polarity, local energy master box or shunt master box types.
14. System shall be field programmable for signal circuit type of operation; march time code, temporal code, selective code, zone code, general alarm, time limit cutout and alarm silence inhibit.

15. System shall be field programmable for waterflow/sprinkler supervisory operation on distinct zones as required.
16. Transient suppression protection shall be provided on the system power supply and on the municipal protection circuit to comply with UL 864 requirements. Additionally, surge suppression shall be provided within the control panel on all circuits that extend outside the building (including to roof-mounted HVAC units).
17. Supervised remote annunciator connection circuit.
18. System shall incorporate an alarm/trouble walk test.
19. Resident non-volatile programmable operating system memory for all operating requirements.

PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANELS/ANNUNCIATORS

A. Furnish and install EST 4 fire alarm control panel(s) with options and accessories as required.

2.2 MANUAL ALARM STATIONS

A. Manual alarm stations shall be addressable break glass (double-action). The station body shall be so constructed that chips and scratches will not expose metal. All stations shall be master keyed with the control equipment. When actuated, the "Pull Lever" shall remain at right angle to the station body until reset.

B. Boxes:
1. Recessed, two-gang outlet boxes with red, semi-flush trim plates shall be used where possible.
2. Where surface-mount outlet boxes are required, boxes shall be red, cast aluminum.

2.3 PHOTOELECTRIC SMOKE SENSOR

A. The smoke sensors shall be of the photoelectric addressable type and shall communicate actual smoke chamber values to the system control panel. The smoke sensors shall operate on the light scatter principle. For maximum maintenance free service and low power requirement, light source for detection chamber and visual alarm indication shall be solid state photodiode.

B. Each sensor base shall be visually and electrically supervised.

C. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.

D. Each sensor base shall contain integral addressable electronics and an LED that will flash each time it is scanned by the control panel (once every 4 seconds). The control panel

shall be responsible for drift compensation. When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Sensor bases shall be compatible with detachable photoelectric, ionization and heat sensors so that these various sensor types can be easily interchanged to meet specific location requirements. Sensor base shall be addressable type as required.

E. Where required, sensor bases shall be provided with a relay driver output and supervised relay, which are to be controlled either automatically or manually from the control panel.

F. Each sensor base shall be scanned by the control panel for its type identification to prevent inadvertent substitution of the wrong sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

G. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

H. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

I. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness, if field conditions so require.

J. Provide a U.L. listed sensor guard for sensors in areas subject to tampering. The guard shall be suitable for ceiling or sidewall mounting and hinged for easy access. The guard shall be securely mounted with tamper-proof screws.

2.4 PHOTOELECTRIC DUCT DETECTOR

A. The detector shall be an addressable, non-polarized 24VDC, which is compatible with the Fire Alarm Control Panel and obtains its operating power from the supervisory current in the fire alarm detection loop. It shall be of the same analog type as the ceiling smoke detectors. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.

B. The detector head shall be directly interchangeable with an ionization detector type. The 24VDC detector may be reset by actuating the control panel reset switch.

C. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contract

between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel.

D. Sampling tubes sized to match duct size as recommended by equipment manufacturer shall be provided with duct detectors as required.

E. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). It shall be possible to alarm the duct housing by using a test switch. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.

F. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as-well-as smoke signal verification circuit and an insect screen.

G. Separate auxiliary SPDT relays for fan shutdown shall be provided with each duct detector for fan shutdown, smoke evacuation or other purposes as indicated on plans.

H. Remote key operated test stations with LED alarm indicators shall be installed in an accessible, inconspicuous location for each duct detector.

I. Duct detectors shall be installed for the equipment as indicated on plans as follows (locations shown on plans are diagrammatical only):
   1. A minimum of six duct widths downstream from bends or inlets to avoid air turbulence.
   2. On the downstream side of filters to detect fires in the filters.
   3. In return ducts, ahead of mixing areas.
   4. Upstream of air humidifier and cooling coil.
   5. With accessibility for test and service.

J. The following duct detector locations shall be avoided:
   1. Where dampers closed for comfort control would interfere with airflow.
   2. Next to outside air inlets (unless the intent is to monitor smoke entry from that area).
   3. In return air damper branch ducts and mixing areas where airflow may be restricted.

K. Where duct detectors are installed in exterior or wet locations, weatherproof duct housing enclosures shall be provided to protect the detectors. Enclosures shall be located to be in shaded areas rather than direct sunlight. Entire installation shall be as directed by the equipment manufacturer.

2.5 HEAT SENSORS

A. Heat sensors shall be U.L. listed, addressable. They shall provide rate-of-rise temperature sensing, fixed temperature sensing (135 degrees F) and utility temperature sensing (32 degrees F to 155 degrees F range).

B. Each sensor base shall be visually and electrically supervised.

C. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.

D. Each sensor base shall contain integral addressable electronics and an LED that will flash each time it is scanned by the control panel (once every 4 seconds). The control panel shall be responsible for drift compensation. When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Sensor bases shall be compatible with detachable photoelectric, ionization and heat sensors so that these various sensor types can be easily interchanged to meet specific location requirements. Sensor base shall be addressable type as required.

E. Where required, sensor bases shall be provided with a relay driver output and supervised relay, which are to be controlled either automatically or manually from the control panel.

F. Each sensor base shall be scanned by the control panel for its type identification to prevent inadvertent substitution of the wrong sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

G. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

H. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

I. Heat sensor shall be automatically restorable.

2.6 MAGNETIC DOOR HOLDERS

A. Provide magnetic door holders as required where shown on plans.

2.7 ALARM SIGNALS (AUDIBLE)

A. Horns:
1. The horns shall be polarized and shall be operated by 24 VDC. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall NOT be accepted. Where horns are shown as a combination audio-visual assembly, they shall be mounted as a combination unit in a single back box (4903 series) . Horns shall be capable of producing 95 dB.

B. Devices required to be surface mounted shall be furnished with surface mounting box and adaptor plate.

C. Devices installed in areas subject to mechanical damage (ie. gymnasiums) shall be furnished with suitable wire guards as indicated on plans.

2.8 ALARM SIGNALS (VISUALS)

A. Visual Flashing Lamps (Xenon Strobe):
1. Furnish and install per plans and specs visible appliance for fire alarm system notification. The appliance shall be 1HZ synchronized (15cd, 30cd, 110cd) with polar distribution or 75 cd illumination as required by the Americans with Disabilities Act (ADA). The appliance shall be U.L. listed to Standard 1971 and have a circumpolar light output allowing mounting in either vertical or horizontal positions or on the ceiling.
2. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN. For optimized light distribution, the xenon flash tube shall be installed perpendicular to the appliance's back plane. A special compound reflector shall be utilized to maximize and best distribute the light pattern in key axis directions.
3. The effect of the illuminated visible appliance shall be observable in a circumpolar pattern. The visible appliance shall be labeled with the word "FIRE" in a contrasting color and the height of each character shall be a minimum of 5/8 inches. In its quiescent state, the word "FIRE" shall be visible.
4. Mounting heights of visual appliances shall in all respects comply with the Americans with Disabilities Act.
5. Visual indicating appliances shall be comprised of a Xenon flashtube and be entirely solid state. These devices shall be U.L. listed and be capable of either ceiling or wall mounting. The LEXAN lens shall be pyramidal in shape to allow better visibility. Visual units shall be of the stand alone type.

2.9 REMOTE ANNUNCIATOR

A. Where shown on the plans, provide and install an LCD annunciator. The annunciator(s) shall have a stainless steel finish and shall provide the same functionality as the main control panel front panel display. The annunciator shall communicate to the control panel over one twisted shielded pair of wire and operating power shall be 24VDC and be fused at the control panel. Point-wired annunciators will not be considered as equal.

B. The serial annunciator shall provide a common alarm and trouble circuit consisting of:
1. Control push-button switches – for alarm silence, trouble silence, system reset and manual evacuation duplicating the control panel switches. A key "enable" switch shall be provided to activate or deactivate the control switches.
2. Tone Alert – Duplicates the control panel tone alert during alarm and trouble conditions.
3. System trouble LED.
4. Power on LED.

C. To accommodate and facilitate job site changes the control switches shall have the capability to be programmed on site to provide for manual switch input operation other than their standard purpose.

2.10 SPRINKLER FLOW SWITCHES

A. Sprinkler flow switches and supervisory switches are provided under another section of these specifications. This contractor shall be responsible for electrical connection of these devices to the fire alarm system.

2.11 SMOKE DAMPERS

A. Smoke dampers are provided under another section. This contractor shall be responsible for supplying a source of power and connecting them to the fire alarm system to close on alarm.

2.12 SYSTEM RECORD DOCUMENT CABINET

A. Furnish and install a documentation cabinet at the system control unit or other approved location. All final record documentation shall be stored in the cabinet. Cabinet shall be labeled as "SYSTEM RECORD DOCUMENTS". Cabinet shall include a 4 gigabyte digital flash drive interface with USB connector loaded with a digital copy of all system documentation including shop drawings and product data.

2.13 OFF SITE MONITORING

A. Furnish all material and labor to accomplish and coordinate with local company or fire department as necessary for off site monitoring of the Fire Alarm System. Transmission method(s) shall be as required by applicable codes and Authority Having Jurisdiction (AHJ). Off site monitoring shall be in operation prior to final acceptance. Exact type of off site monitoring (basic reporting or advanced reporting as described below) shall be provided by the contractor per the owner's direction.

B. Furnish and install serial digital alarm communicating transmitter (DACT), capable of reporting specific alarm points to the central station. DACT shall be universal in that it can be utilized to either provide basic reporting (alarm, trouble, supervisory conditions) or more advanced reporting (point-to-point reporting of specific alarm conditions) DACT shall be mounted integral to or beside fire alarm control panel.

2.14 FIRE ALARM CABLING

1. All fire alarm cabling shall:
   a. Have red outer insulation/jacket with ripcord.
   b. Be listed and labeled for the intended use in Fire Alarm systems.
   c. Where Level 2 or Level 3 pathway survivability is required by NFPA 72, cabling shall be 2-hour fire rated circuit integrity (CI) type.
   d. Be manufactured by West Penn, Allied, Belden or Superior Essex.

2.15 FIRE ALARM SYSTEM MANUFACTURER

A. All equipment shall be listed by UL. All panels and peripheral devices shall be the standard equipment of a single manufacturer and shall display the manufacturer's name on each component. Manufacturer's numbers specified in this section are those of Simplex Time Recorder Company to denote type, quality, material and desired operating features to be furnished.

B. Equipment shall be as manufactured by EST or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations.

B. The contractor shall provide 120VAC power to all remote booster power supplies, control panels, transponder cabinets or other similar items as required. Where the project is provided with emergency power from an emergency generator, all power supplies shall be connected to an emergency source. Dedicated branch circuit(s) shall be provided to supply primary power to the fire alarm system. The associated branch circuit breakers shall be furnished with lock-on hardware and shall be identified with red marking as a fire alarm circuit. The location of the circuit disconnecting means shall be permanently identified at the fire alarm control unit.

C. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760 Parts I and III, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 Parts I and II.

D. All wiring shall be installed in strict compliance with pathway survivability requirements of applicable codes including NFPA 72.

E. Upon completion, the contractor shall so certify in writing to the owner and general contractor.

F. Front surface of all junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be sprayed red and labeled "Fire Alarm" or “F/A”. Covers in exposed areas shall be labeled “F/A” on interior of front cover. Wiring color code shall be maintained throughout the installation.

G. All fire alarm wiring shall be installed in conduit. Conduit shall be sized per manufacturer’s recommendations, but in no case shall conduit be smaller than 3/4”.

H. All fire alarm system conduit shall be red.

I. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

J. All raceways shall be concealed unless specifically shown or approved otherwise.

K. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

L. Install System Record Document cabinet adjacent to control panel unless alternate location is approved.

M. The manufacturer's authorized representative shall provide on-site supervision of installation and shall provide all system setup and programming services.

N. The manufacturer's authorized representative shall have as a minimum, a NICET LEVEL III certification. The fire alarm contractor shall have a technician with a minimum Nicet Level III certification working in a position of responsibility. All technicians working for the certified contractor shall have a minimum Nicet Level II certification. Any fire alarm contractor wishing to bid on the fire alarm work shall show evidence of certifications at the pre-bid conference.

O. The fire alarm contractor shall be licensed as a certified fire alarm contractor by the state in which the work is to be performed in compliance with all requirements of state fire marshall or other AHJ's as applicable.

P. The drawing/specifications included herein are to indicate contract intent only. The Fire Alarm contractor shall provide final design documents to include plans specifying exact device types/locations, circuitry, battery calculations, circuit/voltage drop calculations, etc. in accordance with all applicable code requirements. These final design documents shall be prepared under the supervision of an engineer licensed in the state where the work is to be performed, engaged/employed by the Fire Alarm contractor, and must bear the engineer's licensure seal with signature and date.

3.2 TESTING

A. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the owner's representative and the Local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor, and shall submit final testing results with O&M documentation..

B. The contractor shall test and demonstrate proper operation of all smoke detection equipment and associated HVAC controls to the satisfaction of the authority-having-jurisdiction and fire marshal.

3.3 WARRANTY

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

3.4 CERTIFICATION & ACCEPTANCE

A. A factory trained representative of the manufacturer shall supervise final testing of the system in accordance with N.F.P.A. Standard 72H-1984 in the presence of a representative of the authority having jurisdiction. Manufacturer's representative shall be NICET trained and shall have a level III NICET certificate. It shall be subject to the approval and acceptance of the responsible engineer. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.

B. The fire alarm system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.

C. The equipment manufacturer shall be represented by a local service organization, and the name of this organization shall be furnished to the Architect and Owner. The service organization shall be located within 50 miles of the job site. The service organization shall furnish, gratis to the Owner, a one year maintenance warranty contract, effective from the date of final acceptance.

END OF SECTION 28 31 00

SECTION 28 78 00

EMERGENCY RESPONDER RADIO COVERAGE SYSTEM

PART 1 - GENERAL

1.1 INITIAL RADIO SIGNAL SURVEY (INCLUDE IN BASE BID)

A. Include all costs in base bid for the Fire Alarm Contractor to conduct a radio signal survey immediately after building structure is complete, and prior to ceiling installation to determine signal coverage and strength of the municipality's emergency responder radio (public safety) system inside the project facility.

B. Conduct a survey using a RF Spectrum Analyzer, a calibrated, system-compatible radio or another suitable instrument with traceable certificate of calibration to analyze the RF signal strength. Both inbound and outbound signal strength shall be determined, measured, calculated and documented as required by code and AHJ. Survey shall be performed by FCC GROL certified technicians. Survey shall include measurements at a minimum of 20 readings per floor or 1,600SF if the floor area exceeds 32,000SF and in all critical areas or as otherwise directed by AHJ.

C. Survey report and drawing indicating measurements at each frequency band of interest shall be submitted to the AHJ for review. The report shall clearly indicate all areas that do not meet a minimum of -95dBm nominal uplink or downlink signal at 100% or a Delivered Audio Quality (DAQ) of 3.0.

D. If measured levels determined to be insufficient, a complete Emergency Responder Radio Coverage (ERRC) system shall be provided in accordance with these specifications below. Cost for the system and installation will be paid through allowance.

E. Contractor shall be responsible for scheduling survey so that all of the following is completed prior to the installation of ceilings:
   1. Conduct initial survey
   2. Submit survey results and report to the AHJ for review and determination of system requirements
   3. Provide system design and submit shop drawings to architect and AHJ for review

1.2 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2100 – Allowances, for cash allowances affecting this section.

B. All requirements of this Section shall be included in the Contract Sum/ Price except the specific items listed in the following enumerated paragraph(s).
   1. Allowance No. 05 – Emergency Responder Radio Coverage System: This Allowance includes furnishing and installing an Emergency Responder Radio Coverage System if required following testing of the completed facility. The cost for testing of the

facility to determine if the system will be required shall be included in the Contract Sum/ Price.

1.3 SCOPE (SEE ALLOWANCES)

A. The contractor shall design, furnish, install, and warranty a complete Emergency Responder Radio Coverage (ERRC) system. The installed system shall include all hardware, bi-directional amplifiers, band-pass filters, surge suppressors, lightning protection, UPS, transmission lines, power cabling, antennas, and other components necessary for a complete operational system as specified and as acceptable to the local authorities having jurisdiction.

B. Equipment manufacturer name and model numbers specified are provided to establish quality of equipment and system operational features. Any proposed substitution of equipment from that specified must be approved by the Architect within ten (10) days prior to bid date.

C. The entire system shall be guaranteed for a period of one (1) year from the date of final acceptance of the installation and the Contractor shall repair or replace defective equipment, during this period, at no cost to the owner.

D. Entire system shall be verified and approved by local AHJ to comply with all emergency responder radio network requirements including signal strength and frequency range.

1.4 DEFINITIONS

A. BDA: Bi-Directional Amplifier is a two-way signal booster that is used to amplify band-selective or multi-band RF signals in the uplink, to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage.

B. DAS: Distributed Antenna System is a network of separate antenna nodes connected to a common transport medium.

C. ERRC: Emergency Responder Radio Coverage System is a complete in-building radio communication system that brings wireless signals into a structure from outside, amplifies those signals with a signal booster (BDA), and then evenly distributes the amplified signals throughout a structure via a Distributed Antenna System (DAS). The system also amplifies signals originating inside the building and transmits them outside.

D. Donor Antenna: Antenna that receives and transmits signal to radio system outside of facility.

1.5 STANDARDS

A. The system shall comply with all requirements of the latest edition of each of the following codes and standards. The latest edition of these codes and standards form a

part of this specification:
1. U.L. Standard 2524.
2. International Fire Code Section 510
3. NFPA 1221
4. NFPA 72
5. All requirements of local Fire Department, Building Department and all other authorities having jurisdiction (AHJ)

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For headend and distribution system. Include plans, elevations, sections, details and attachments to other work.
1. Show fabrication and installation details for equipment.
2. Functional Block Diagram: Show single-line interconnections between components for headend and distribution system. Show cable types and sizes.
3. Dimensioned Plan and Elevations of Headend Equipment: Show access and workspace requirements.
4. Wiring Diagrams: For power, signal, and control wiring and transmission cable, include cross connects, taps, and other connections cords.

C. Design Calculations: Calculate signal attenuation budget and show calculated line and equipment losses for the system based on the functional block diagram, to show that proposed system layout can be expected to perform up to specification. Calculate signal strength from sources to endpoints. Allowable losses between components and user interface shall be used to determine size and type of cable.

D. Coordination Drawings: Include dimensioned plan and elevation views of components and enclosures. Show access and workspace requirements.

E. Equipment List: Include each piece of equipment and include model number, manufacturer, serial number, location, and date of original installation. Insert testing record of each piece of adjustable equipment, listing name of person testing, date of test, and description of as-left set points.

F. Field quality-control reports.

G. Operation and Maintenance Data: For headend and distribution system to include in emergency, operation, and maintenance manuals.

H. Contract shall submit set of all drawings and product data to permitting agencies as required. These final design documents shall be prepared under the supervision of an engineer licensed in the state where the work is to be performed, engaged/employed by the system vendor, and must bear the engineer's licensure seal with signature and date.

I. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included.

PART 2 - PRODUCTS

2.1 RADIO FREQUENCY (RF) BDA-BASED SIGNAL BOOSTER SYSTEMS

A. In-building signal booster systems shall receive and re-transmit the entire uplink/downlink frequency band utilized by the regional emergency service provider(s). The contractor shall confirm with the regional emergency service provider(s) as to the specific frequencies used by the various agencies. This system shall be state-of-the-art, operating bi-directionally and in full duplex. The system shall be fully compatible with and function on Locality's Public Safety Radio System.

B. BDA shall be capable of providing in building coverage for all the cellular networks as identified by the owner.

C. Signal boosters (BDA)
1. Shall have Nema Type 4 enclosure
2. Shall be UL2524 listed
3. Shall be FCC certification.
4. Provide standby battery system capable of maintaining the system operational for a minimum of 12 hours or 2 hours if supplied by emergency generator circuit. Batteries system shall be completely enclosed in Nema Type 4 enclosure.
5. Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. The oscillation suppression circuit shall not disable the system operation. Systems that automatically disable the signal booster upon oscillation detection shall not be allowed
6. Signal Boosters shall have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building).
7. Include relays as required for monitoring system with fire alarm system.

D. DAS Antennas shall be architectural, dome or flush type where located in public areas. Stick type antennas are acceptable where located in back-of-house spaces. Finish shall be white unless directed otherwise by architect in submittal review.

E. A dedicated supervised monitoring panel shall be provided next to the fire alarm panel / annunciator or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:
1. Normal AC power
2. Signal booster trouble
3. Antenna Failure
4. Loss of normal AC power

5. Failure of battery charger
6. Low battery capacity

F. Completed installations (including cabling) shall comply with all applicable codes and standards, including County Building and Electrical Codes, NFPA, ANSI, NEC, OSHA, EIA, IEEE, R-56, etc., as well as the FCC Rules and Regulations, as applicable. Equipment provided shall be UL listed and FCC type accepted for this specific application. Compliance to codes and standards shall extend to include proper grounding, bonding and surge.

G. All cabling shall be plenum rated.

2.2 DESIGN REQUIREMENTS:

A. The system shall provide digital signal strength coverage over 95% area on each floor/level of the equipped building, or in specific areas defined by Locality in a Scope of Work document for a particular building or site. Critical areas shall have 99% floor area coverage.

B. Systems shall provide a minimum digital and analog overage of Circuit Merit (CM) 3 and Delivered Audio Quality (DAQ) 3.0, with a reliability factor of 95%.

C. Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions

D. A Coverage Acceptance Test shall be executed prior to final acceptance of an installed system. Coverage acceptance testing shall be based on audio quality performance in evenly spaced test grids in the defined service areas. A minimum of 20 tests will be taken per floor/level. Total number of test grids will be determined by the Owner, based on the size of the space per floor/level.

E. Design and appearance will be of “finished” construction, i.e. shall be concealed and/or unobtrusive in finished areas. DAS antennas shall be located in back-of-house areas where possible. If required to be located in visible public aeras, antennas shall be architectural, low-profile type and located in corridors where possible. Unless indicated otherwise, wire mold and surface conduit installations will not be acceptable unless approved in writing by the Architect in advance.

2.3 MANUFACTURER

A. Equipment shall be as manufactured by Simplex, Notifier or EST or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring shall be in strict accordance with the National Electrical Code and all state and

local regulations. Wiring shall be installed in accordance with manufacturer's wiring diagrams and shall test free from ground, opens and short circuits.

B. All connections shall be made under the direct supervision of a qualified technician.

C. Contractor shall provide dedicated power circuits as required for system operation. Where an emergency distribution system is provided, radio coverage system power shall be connected to the emergency branch.

D. All vertical riser cabling shall be installed in conduit within a 2-hour fire rated enclosure.

E. All copper circuits routed between or outside of buildings shall be provided with a surge protection device at each end.

F. Securely mount donor antenna on roof and aim towards direction of public safety city repeater antenna. All mounting and penetrations shall be coordinated with roofing contractor.

G. Contractor shall provide all devices and cabling as required to monitor system with building Fire Alarm System in accordance with all applicable code requirements.

H. Refer to Specification Section 27 05 00 for additional installation requirements.

I. During initial installation, each system shall be optimized to perform in accordance with the specifications set forth in the system design, manufacturer's specifications and FCC regulations. The contractor shall ensure that uplink and downlink levels are properly set and consistent with design expectations. The contractor shall further ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications and FCC regulations. Prior to system acceptance, for each active BDA, booster amplifier, etc., the contractor shall submit a Proof of Performance certification, that lists the design expectations, actual measurements, and if applicable, FCC specifications for the followingparameters:
   1. Worst case BDA uplink input level, in dBm.
   2. Worst case BDA uplink output level, in dBm.
   3. BDA downlink input level, in dBm.
   4. BDA downlink output level, in dBm.
   5. Noise and spurious products, BDA uplink output, in dBc.
   6. Noise and spurious products, BDA downlink output, in dBc.

J. The original Proof of Performance report shall be submitted to Owner's project manager, and a copy of the Proof of Performance report shall be affixed to its associated equipment.

3.2 WARRANTY

A. The contractor shall provide a full one-year warranty to cover installation and all

equipment, software, and components; the warranty shall commence upon the Owner's final acceptance of the facility. Under warranty coverage, the successful contractor shall provide same business day response time for system malfunctions.

B. The contractor shall perform optimization of each system during the initial warranty period, sixty (60) to ninety (90) days prior to warranty expiration. This optimization task is separate from the initial optimization performed during system installation. The contractor shall include pricing for annual system optimization to be included as part of post-warranty maintenance. Actual scope of work for annual optimization and maintenance will vary on a case-by-case basis, but typically will consist of the following:
   1. Optimize the system to perform in accordance with the specifications set forth in the system design, manufacturer's specifications and FCC regulations.
   2. Ensure that uplink and downlink levels are properly set and are consistent with design specifications.
   3. Ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications and FCC regulations.

C. Update the Proof of Performance records for the system, listing the design expectations, actual measurements, and if applicable, FCC specifications for the following parameters:
   1. Worst case BDA uplink input level, in dBm.
   2. Worst case BDA uplink output level, in dBm.
   3. BDA downlink input level, in dBm.
   4. BDA downlink output level, in dBm.
   5. Noise and spurious products, BDA uplink output, in dBc.
   6. Noise and spurious products, BDA downlink output, in dBc.

D. The updated Proof of Performance report shall be submitted to the Owner, and a copy of the updated Proof of Performance report shall be affixed to its associated equipment.

E. Visually inspect outside antenna installation. Correct any issues found with the antenna mounting hardware, grounding system, or outside cabling.

F. Visually inspect inside BDA or booster amplifier equipment installation. Correct any issues found with RF cabling, electrical connection, or equipment mounting.

G. Clean equipment fans, filters and other ventilation system components.

H. Inspect and replace any defective indicator lights.

I. Test battery system performance for proper fallback to battery power and the duration of battery operation.

J. Test fault reporting system for proper operation and reporting of system faults.

K. Submit a written Preventive Maintenance Report to the Owner, listing the results of the optimization and preventive maintenance effort. The report shall include the Proof of

Performance report for active RF components, and details of any other discrepancies found and corrective actions taken.

L. All as-built drawings shall be submitted to the Owner at completion, which shall include antenna system layout and all associated hardware, along with specification sheets. Include RF measurements taken.

END OF SECTION 28 78 00

RAILING GENERAL NOTES

R.01. CODE COMPLIANCE: SEE GENERAL NOTES DIVISION 1 GENERAL REQUIREMENTS ITEM 1.09 FOR CODE COMPLIANCE.

R.02. MULTI-TRADE COORDINATION: SEE GENERAL NOTES DIVISION 1 GENERAL REQUIREMENTS ITEM 1.02 FOR MULTI-TRADE COORDINATION.

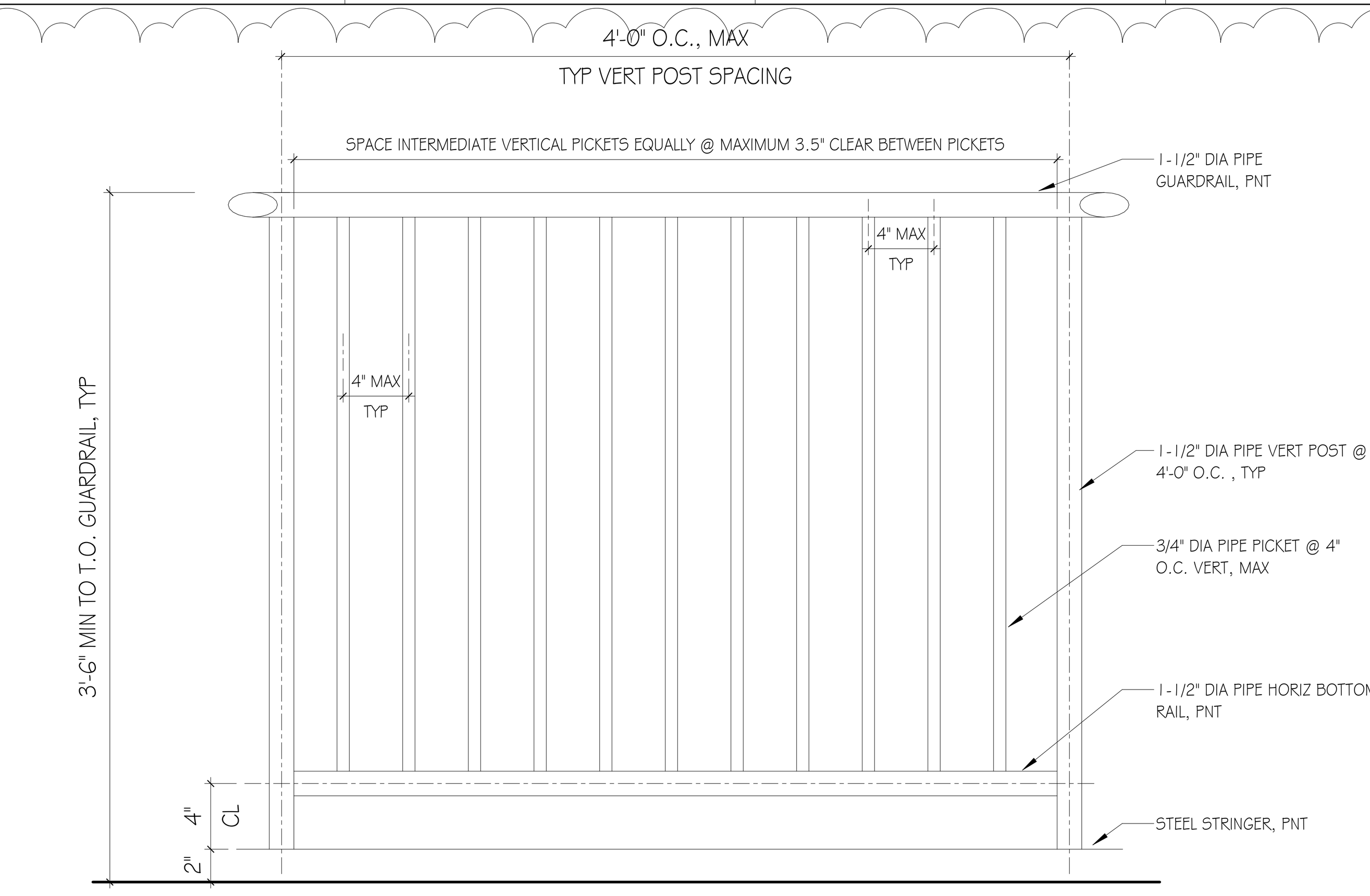
R.03. HANDRAIL DIMENSIONS: DIMENSIONS FOR HAND RAILINGS AS INDICATED IN CONTRACT DOCUMENTS. WIDTH BETWEEN HANDRAILS AT STAIRS AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL NOT BE LESS THAN 44 INCHES CLEAR. WIDTH BETWEEN HANDRAILS AT RAMPS AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL NOT BE LESS THAN 36 INCHES. HEIGHT OF HANDRAILS ABOVE STAIR TREAD NOSING OR FINISH SURFACES OF RAMPS AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL BE UNIFORM AND NOT LESS THAN 24 INCHES AND NOT MORE THAN 38 INCHES. DIAMETER OF HANDRAILS AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL NOT HAVE AN OUTSIDE DIAMETER OF LESS THAN 1-1/4 INCHES AND NOT GREATER THAN 2 INCHES. NON CIRCULAR HANDRAILS AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL HAVE A PERIMETER DIMENSION OF AT LEAST 4 INCHES AND NOT GREATER THAN 6-1/4 INCHES WITH A MAXIMUM CROSS-SECTION DIMENSION OF 2-1/4 INCHES. EDGES SHALL HAVE A MINIMUM RADIUS OF 0.01 INCHES. HANDRAIL EXTENSIONS AS INDICATED IN CONTRACT DOCUMENTS, BUT WHERE HANDRAILS ARE NOT CONTINUOUS BETWEEN FLIGHTS, THE HANDRAILS SHALL EXTEND HORIZONTALLY AT LEAST 12 INCHES BEYOND THE TOP RISER AND CONTINUE TO SLOPE FOR THE DEPTH OF ONE TREAD BEYOND THE BOTTOM RISER. AT RAMPS WHERE HANDRAILS ARE NOT CONTINUOUS BETWEEN RUNS, THE HANDRAILS SHALL EXTEND HORIZONTALLY ABOVE THE LANDING 12 INCHES MINIMUM BEYOND THE TOP AND BOTTOM OF RAMP RUNS. THE EXTENSIONS OF HANDRAILS SHALL BE IN THE SAME DIRECTION OF THE STAIR FLIGHT AS STAIRWAYS AND RAMP RUNS AT RAMPS. CLEAR SPACE BETWEEN HANDRAIL AND WALL OR OTHER SURFACE AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL BE A MINIMUM OF 1-1/2 INCHES.

R.04. GUARDRAIL DIMENSIONS: DIMENSIONS FOR GUARDRAILS AS INDICATED IN CONTRACT DOCUMENTS. HEIGHT OF GUARDRAILS ABOVE ADJACENT WALKING SURFACES, ADJACENT FIXED SEATING, OR THE LINE CONNECTING THE LEADING EDGE OF TREADS AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL NOT BE LESS THAN 42 INCHES. OPENINGS IN GUARDRAILS AS INDICATED IN CONTRACT DOCUMENTS BUT SHALL NOT ALLOW THE PASSAGE OF A SPHERE 4 INCHES IN DIAMETER FROM THE WALKING SURFACE TO THE REQUIRED GUARD HEIGHT (FOR ROOF ACCESS SHALL PREVENT THE PASSAGE OF A SPHERE 21 INCHES IN DIAMETER). FROM A HEIGHT OF 36 INCHES TO 42 INCHES GUARDS SHALL NOT HAVE OPENINGS WHICH ALLOW PASSAGE OF A SPHERE 4-3/8 INCHES IN DIAMETER. THE TRIANGULAR OPENINGS AT THE OPEN SIDES OF A STAIR FORMED BY THE RISER, TREAD, AND BOTTOM RAIL SHALL NOT ALLOW PASSAGE OF A SPHERE 6 INCHES IN DIAMETER.

RAILING ABBREVIATIONS

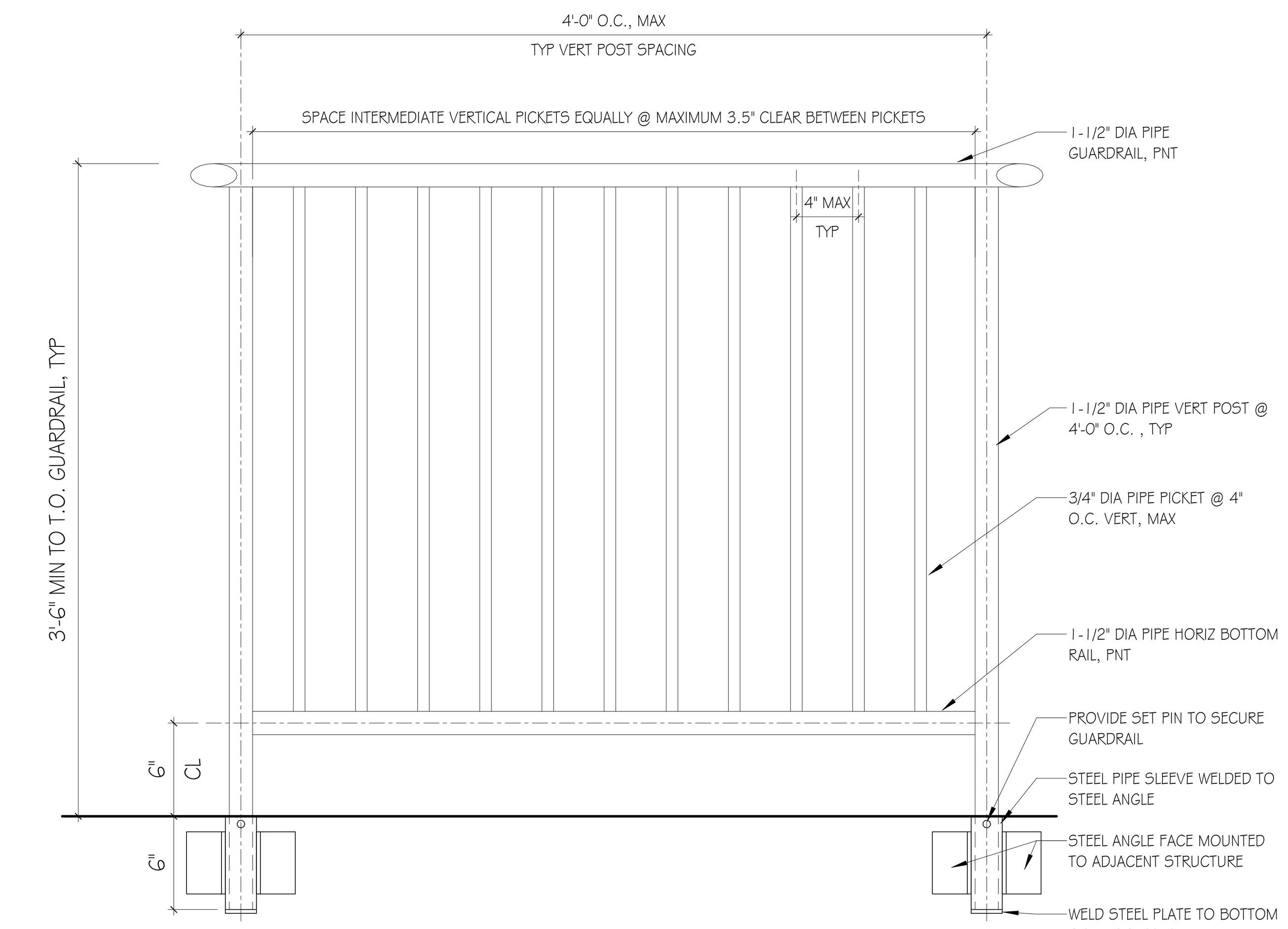
WM - WALL MOUNTED
FMW - FLOOR MOUNTED/WELDED TO EMBED
FMC - FLOOR (TREAD/LANDING) MOUNTED/CORED
PF - PREFINISHED
PNT - PAINTED FINISH
SST - STAINLESS STEEL
STL - STEEL
G - GLASS RAILING INFILL
HR-1 - HANDRAIL
HR-2 - DOUBLE SIDED HANDRAIL
GR - GUARDRAIL
SMW - STRINGER MOUNTED/WELDED
ALUM - ALUMINUM
CBL - CABLE RAILING INFILL
WD - WOOD
STN - STAINED FINISH
SL - SEALED FINISH
WI - WROUGHT IRON
SSM - SIDE STRINGER MOUNTED

RAILING SCHEDULE	
RAIL TYPE	DESCRIPTION
R1	FIXED GUARDRAIL
R1	FIXED GUARDRAIL
R2	REMOVABLE GUARDRAIL WITH FACE MOUNTED BRACKETS
R3	GATE WITH SELF-CLOSING SPRING HINGES
R4	RETAINING GUARDRAIL



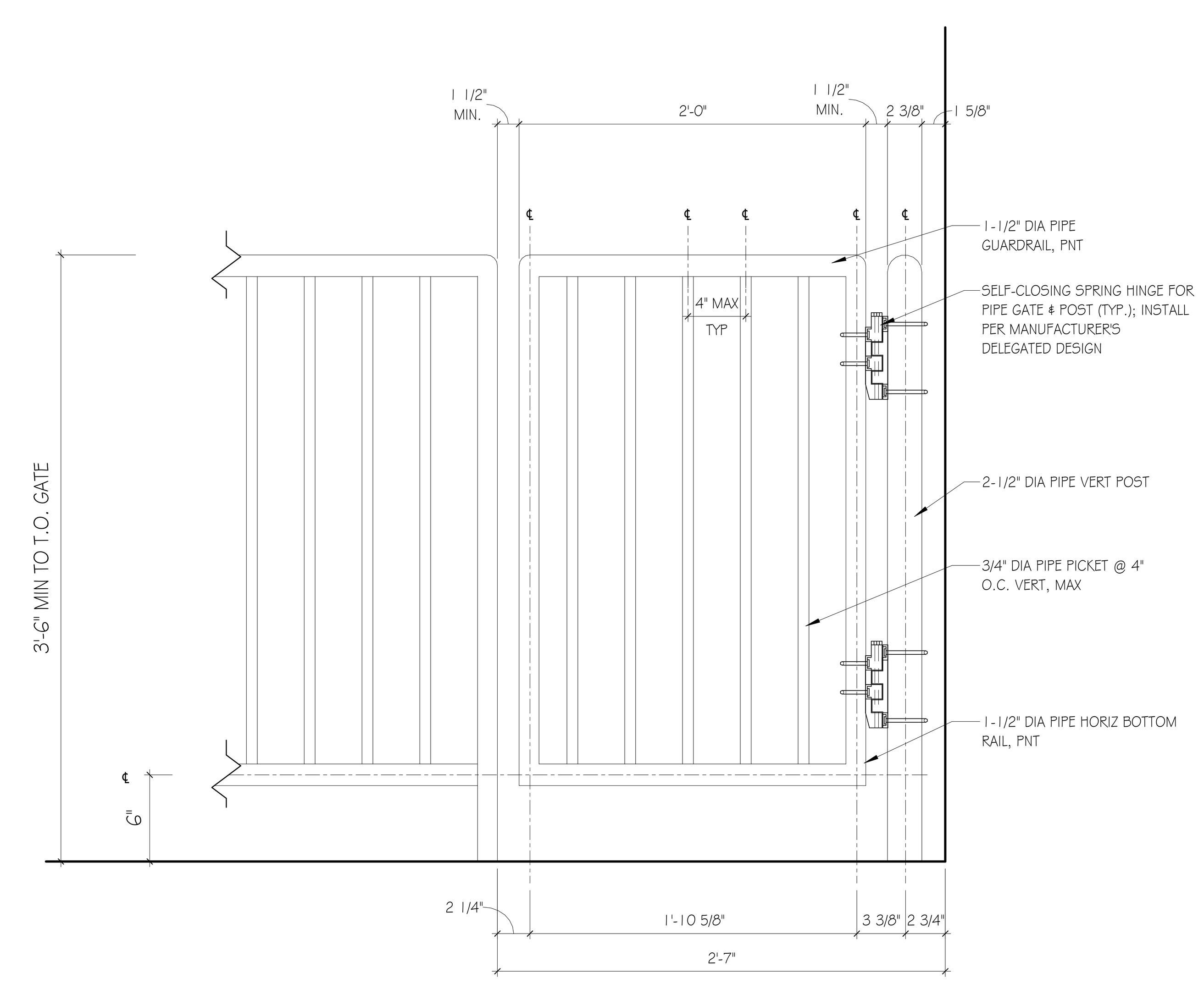
NOTE: SEE SPECIFICATION 05 52 13 PIPE & TUBING RAILINGS FOR DELEGATED DESIGN

R1 TYPICAL GUARDRAIL ELEVATION
SCALE: 1 1/2" = 1'-0"



NOTE: SEE SPECIFICATION 05 52 13 PIPE & TUBING RAILINGS FOR DELEGATED DESIGN

R2 TYPICAL REMOVABLE GUARDRAIL ELEVATION
SCALE: 1 1/2" = 1'-0"



NOTE: SEE SPECIFICATION 05 52 13 PIPE & TUBING RAILINGS FOR DELEGATED DESIGN

R3 TYPICAL GATE ELEVATION
SCALE: 1 1/2" = 1'-0"

GMC
11 North Water Street, Suite 15250
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GMCNETWORK.COM

ISSUE	DATE
ISSUED FOR BID	07.17.2023
ADDENDUM #1	04.26.2024

DRAWN BY: Author
CHECKED BY: Checker

NEW WORKFORCE DEVELOPMENT CENTER
ENTERPRISE STATE COMMUNITY COLLEGE
600 PLAZA DRIVE, ENTERPRISE, AL 36330
GMC # AMOB220153

RAILING SCHEDULE & DETAILS

A5.41

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3 WALL SECTION
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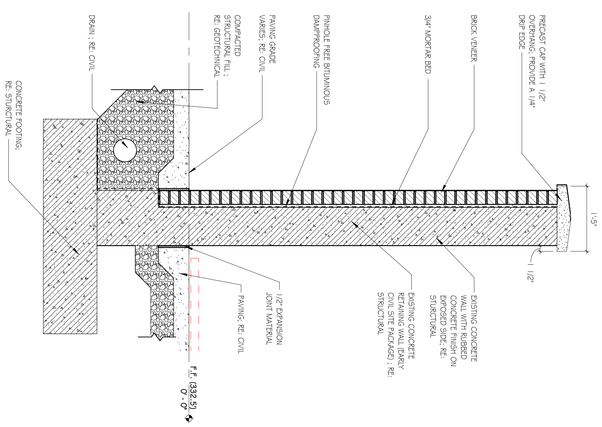

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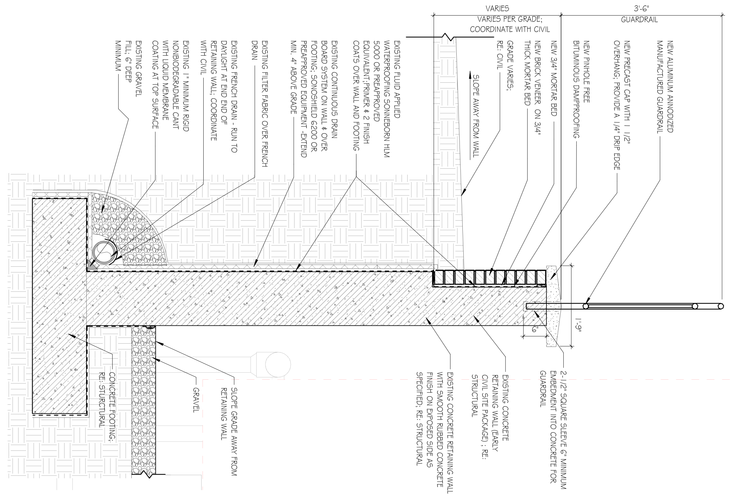

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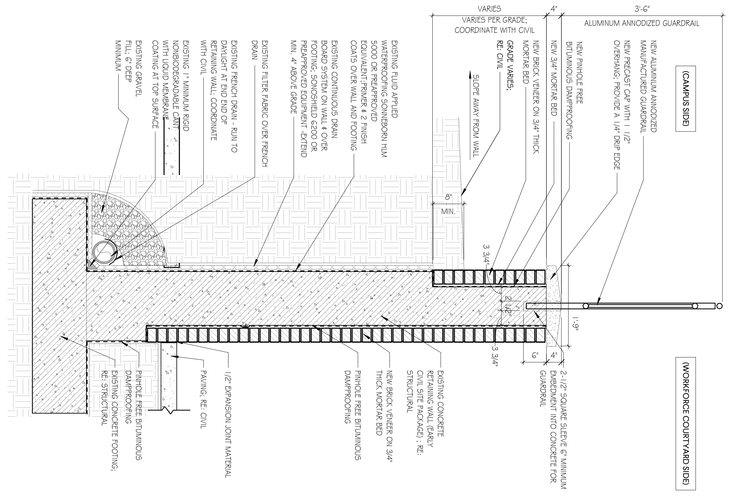

MISCELLANEOUS (CHILLER WALL SECTIONS)

A9.02

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SITEWORK PACKAGE FOR NEW WORKFORCE DEVELOPMENT CENTER
ENTERPRISE STATE COMMMUNITY COLLEGE
600 PLAZA DRIVE, ENTERPRISE, AL 36330
GMC# AMOB220153

ISSUE	DATE
BID SET	01.14.2024
1 ADDENDUM #1	04.26.2024
DRAWN BY:	EH
CHECKED BY:	CL

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