File ID: 2025-00727 3/25/2025

Budgetary Adjustments for Old Sac Revitalization and Improvement Project (C15002100) [Published for 10-Day Review 03/14/2025]

File ID: 2025-00727

Location: 1110 Front Street, District 4

Recommendation: Adopt a **Resolution**: 1) authorizing the Interim City Manager or designee to execute Contract Supplement No. 1 to City Agreement No. 2023-0918 with Triamid Construction of Central California, Inc. increasing the not-to-exceed amount by $2,893,424 for a new total not-to exceed amount of $3,073,352; and increasing the Interim City Manager's change order authority to six percent ($187,757) of the new not-to-exceed amount of $3,073,352 for the construction phase of the Deck Repair Project; and 2) authorizing the Interim City Manager to execute all necessary budget adjustments to the Deck Repair Project at 1110 Front Street (B18119000).

Contact: Kevin Love, Program Manager, (916) 808-5592, klove@cityofsacramento.org; James Christensen, Facilities Manager, (916) 808-5863, jechristensen@cityofsacramento.org; Department of Public Works

Presenter: James Christensen, Facilities Manager, (916) 808-5863, jechristensen@cityofsacramento.org; Department of Public Works

Attachments:
1-Description/Analysis
2-Contract Supplement- Triamid Construction of Central California, Inc.
3-Resolution

Description/Analysis
Issue Detail: The outdoor dining deck overlooking the Sacramento River, located at 1110 Front Street in Old Sacramento (formerly leased to the Rio City Café), was deemed unsafe and in need of replacement. A local Engineering firm, Lionakis, was retained to evaluate the deck in 2019. Based on the results of their study, they recommended a complete deck replacement using wood timber and structural steel. In August of 2022, the City Council approved Motion No. 2022-0288 suspending competitive bidding to allow the use of a design-assist approach to construction based on the complexity of removing and replacing the deck located over the Sacramento River.

A Request for Qualifications, Q22014541002, was issued on September 14, 2022, soliciting Design Assist Contractors for the demolition and construction of a new deck. Only one contractor, Traimid Construction of Central California, Inc. (Triamid), submitted a proposal. After reviewing the proposal, and an interview, they were chosen as the Design Assist Contractor. Lionakis in collaboration with Triamid have completed the design and are prepared to enter the construction phase. Because the work must be completed over the Sacramento River, the allowable construction window is from May 1 to October 31 of each calendar year. Staff is targeting May of 2025 to begin work and complete it by the end of October 2025.

Policy Considerations: The recommendations in this report are in accordance with the provisions of City Code Chapter 3.56.090 requiring City Council approval for agreements equal to or greater than $250,000.

Sacramento City Code Section 4.04.020 and the City Council Rules of Procedure (Chapter 7, Section E.2.d) require that unless waived by 2/3 vote of the City Council, all contracts and labor agreements great than $1,000,000 shall be made available to the public at least ten (10) days prior to Council action. This item was published for 10-day review on March 14, 2025, in compliance with the City Code.

Economic Impacts: The recommended contract is expected to create 21.41 jobs (13.60 direct jobs and 7.81 jobs through indirect and induced activities) and create $2,825,492 in total economic output ($1,811,214 of direct output and another $1,014,278 of output in indirect and induced activities).

The indicated economic impacts are estimates calculated using a calculation tool developed by the Center for Strategic Economic Research (CSER). CSER utilized the IMPLAN input-output model (2009 coefficients) to quantify the economic impacts of a hypothetical $1 million of spending in various construction categories within the City of Sacramento in an average one-year period. Actual impact could differ significantly from the estimates and neither the City of Sacramento nor CSER shall be held responsible for consequences resulting from such differences.

Environmental Considerations: California Environmental Quality Act (CEQA): The action is exempt from review under the California Environmental Quality Act (CEQA) pursuant to CEQA Guidelines section 15301. Required maintenance and rehabilitation of existing serviceable deck and structure and part of existing building with no expansion of existing use.

Sustainability: Not applicable

Commission/Committee Action: Not applicable

Rationale for Recommendation: Lionakis in collaboration with Triamid have completed the design for a new deck. Triamid has developed a Guaranteed Maximum Price (GMP) based on the final deck

design. Staff recommend accepting the GMP and executing Contract Supplement No. 1 to City Agreement No. 2023-0918 with Triamid in the not-to-exceed amount by $2,893,424 for a new total not-to-exceed amount of $3,073,352; and increasing the City Manager's change order authority to six percent ($184,401) of the new not-to-exceed amount of $3,073,352 for the construction of the deck.

Financial Considerations: The costs for reconstruction of the new deck are estimated at $3,073,352 in contract costs. In addition, the City may incur construction management and other administrative costs as the project progresses.

The City has been awarded approximately $4.6 million in grant funds from the State of California for Riverfront safety and pedestrian improvements. These funds will be allocated to the Old Sac Revitalization and Improvement Project (C15002100) to restore the deck, and these improvements will create a safer environment for the community.

Local Business Enterprise (LBE): Trimid Construction of Central California, Inc. is an LBE.

CONTRACT SUPPLEMENT

Project Title: Rio City Café Deck Rebuild Date: 07/20/2023
Purchase Order #:73679
Contract Supplement No.: 1

The City of Sacramento ("City") and Triamid Construction of Central California ("Contractor"), as parties to that certain Design-Assist Contract designated as Contract Number 2023-0918, including any and all prior contract supplements modifying said contract (the contract and contract supplements are hereafter collectively referred to as the "Contract"), hereby supplement and modify the Contract as follows:

1. The Contract is amended as follows:

A. Guaranteed Maximum Price (GMP). The City hereby accepts the GMP Proposal as revised as of February 26, 2025 (incorporated herein by reference) pursuant to Sections 6 of the Contract. The GMP Proposal includes the GMP amount, Schedule of Values, Allowances, General Conditions, and Assumptions that are outlined in Attachment 1, which is attached hereto and incorporated herein.

B. Construction Phase Scope of Work. Section 3 (B) of the Contract is amended to reflect that the Construction Phase work shall be completed in accordance with the following construction documents:

(1) Drawings: 100% DD, Dated January 26, 2024, prepared by Lionakis.
(2) Specifications: 100% DD set Dated January 26, 2024, prepared by Lionakis.
(3) Structural Calculations: Dated January 26, 2024, prepared by Lionakis
(4) Proposal Schedule dated February 25, 2025, prepared by Triamid.

C. Time of Performance. Section 4(A)(2) of the Contract is amended to reflect that the Construction Phase shall be completed between May 1, 2025 and October 31, 2025. Preparation for construction, including shop drawings and pre-ordering of material shall begin within fifteen (15) working days after City's issuance of the Notice to Proceed. Post construction activities may continue after the October 31, 2025 construction completion date. Thus, the "Completion Date – Construction Phase" referenced in Section 4(A)(2) will be October 31, 2025.

D. Contract Amount. Section 5(B)(2) is amended to reflect that the GMP will not exceed $3,129,757.00.

E. Change Orders. Any Change Orders requested by Contractor or any of its subcontractors shall be initiated using the EZ-PCO form included in the specifications: "Contract Modification Procedures" 012600.

F. Bonds. Contractor shall provide the bonds required under Section 6(4)(B) and Section 24 of the Contract to City within 14 calendar days following City Council approval of this contract supplement.

G. Insurance. Contractor shall provide insurance documentation demonstrating its satisfaction of all insurance requirements specified in Section 23 of the Contract to City within 14 calendar days following City Council approval of this contract supplement.

H. Contract Documents. To be clear, all documents attached to this contract supplement or incorporated by reference into this contract supplement shall be considered part of the "Contract Documents" defined in Section 2 of the Contract.

2. In consideration of the additional and/or revised work described in section 1, above, the amount specified in Section 6 for performance of the Construction The maximum not-to-exceed amount of the Contract is **increased** by $2,949,829.00. The Contract's maximum not- to-exceed amount is thus amended as follows:

Contract's original not-to-exceed amount:	$ 179,928.00
Net change by previous contract supplements:	$ 0.00
Not-to-exceed amount prior to this contract supplement:	$ 179,928.00
Increase by this contract supplement:	$2,949,829.00
New not-to exceed amount including all contract supplements:	$3,129,757.00

3. Contractor understands and agrees that the new not-to-exceed amount specified in section 2, above, shall constitute full compensation for the additional and/or revised work specified in section 1, above, and shall fully compensate Contractor for any and all direct and indirect costs that may be incurred by Contractor in connection with such additional and/or revised work, including costs associated with any changes and/or delays in work schedules or work by Contractor and costs associated with the completion of the plans, specifications, cost estimate, bid documents, permitting and preparation of the GMP and as defined in the daily communications and meetings.

4. Contractor warrants and represents that the person or persons executing this contract supplement on behalf of Contractor has or have been duly authorized by Contractor to sign this contract supplement and bind Contractor to the terms hereof.

5. Except as specifically revised herein, all terms and conditions of the Contract shall remain in full force and effect, and Contractor shall perform all of the services, duties, obligations, and conditions required under the Contract, as supplemented and modified by this contract supplement. In the event of any conflict between terms of the Contract and terms of this contract supplement (including attachments), the terms of this contract supplement shall prevail.

6. Capitalized terms used in this contract supplement but not otherwise defined herein shall have the meanings ascribed to such terms in the Contract.

Approval Recommended By:

_____
Project Manager

Approved By:

_____
Contractor

Approved By:

_____
City of Sacramento

Approved As To Form By:

_____
City Attorney

Attested To By:

_____
City Clerk

Attachment 1

GUARANTEED MAXIMUM PRICE AND FEE

1. Guaranteed Maximum Price. The **Guaranteed Maximum Price** as of the date of execution of the Contract is ($ 3,129,757.00). The GMP is comprised of the following.

Professional Services:	**$ 179,928.00**
Construction:	**$ 2,588,705.00**
Bonds:	**$ 25,887.00**
Insurance:	**$ 38,831.00**
General Contractor Fee:	**$ 166,971.00**
Construction Contingency[1]:	**$ 129,435.00**
Design and Construction Project Sub Total:	**$ 3,129,757.00**

Notes:

1. Contingency funds are owned and controlled by the City of Sacramento. Only the City has the authority to allocate use of contingency funds (Contract Section 6. (A) (2)).

Schedule of Values

Client: City of Sacramento
Description: Replace Existing Exterior Deck
Location: 1110 Front Street
Date: February 26, 2025

Code	Description	2025 Proposal
	Direct Construction Costs	
01-00-00	General Conditions	$46,500
01-00-00	On Site Supervsion & PM	$284,600
01-00-00	Scaffolding First Four Months of Project	$376,100
02-21-00	Demolition	$91,000
02-21-00	Rebuild Office	$11,000
04-00-00	Concrete	$5,000
06-06-00	Wood Framing Labor and Materials	$381,000
07-00-00	Repace Rotted Siding and Office	$12,000
08-00-00	Sheetmetal & Flashings	$5,000
08-00-00	Testing Piers	$48,900
08-00-00	Steel Guard Rail	$65,075
05-00-00	Barge Crane Mobilization	$220,099
08-00-00	Steel and Galvanizing (Subject to Price Increase)	$155,566
22-00-00	Crane, Barges, & Tugboat	$177,500
23-00-00	Fabrication, Trucking, Erection Labor	$491,703
08-00-00	Roof	$149,500
09-00-00	Painting Canopy and Touch Up Building	$20,000
11-00-00	Fire Protection	$15,190
11-00-00	HVAC	$14,972
26-00-00	Electrical	$12,000
11-00-00	Fire Alarm	$6,000
	Project Sub Total	$2,588,705
	Net Costs Subtotal	$2,588,705
	Liability Insurance	$38,831
	Bond	$25,887
	Contingency 5%	$129,435
	Contractors Fee 6%	$166,971
	Total Estimate	$2,949,829

GMP Qualifications

Description: Replace Existing Wood Deck at 1110 Front Street

Scope of Work:

- Install and maintain scaffolding underneath the entire wood deck May Through August 2025.
- Demo existing gas, electrical, fire sprinklers, and plumbing in deck area under the canopy. Page AD121
- Remove HVAC Condensers from roof of office and store offsite or inside restaurant.
- Demo existing wood deck, including canopy, office above existing decking, wood floor, and wood framing Page SD111, SD132, AD111, AD121, AD1332
- Off haul deck debris, recycle all materials possible.
- Scan the ends of the concrete Girders to locate existing rebar for anchor locations.
- Use tugboat to locate barge crane, and material barge where the Hornblower is currently located.
- Perform Dynamic load test for (2) two existing steel piers with barge crane onsite Page SD111. Coordinate testing with the City of Sacramento Special Inspector.
- Install new wide flange steel framing Page S111.
- Install new 4”X 8” Redwood decking Page S111.
- Install new wood canopy over large dining area Page S132.
- Install new powder coated steel guardrail and Pressure Treated 6x16 base rail around exterior edge of new deck page S-111.
- Paint underside of wood canopy and touch up building where siding is replaced.
- Install Tremco 60 mil TPA roof over canopy with gutters and downspout page A551, A552.
- Install new fire sprinklers, and electrical to meet minimum code requirements under the new canopy.
- Build new wall and parapet for the remaining office area at the edge of the new deck.
- Remove and replace first two courses of building siding and flashing above new decking.

Clarifications:

- Updated proposal is based on 100% CD drawings dated 01/26/2-24, provided on to Triamid on 02/07/2025, 49 pages.
- The Hornblower will have to be relocated while the barge crane is needed onsite.
- The floating dock in front of the deck area and ramp/stairs north and south of the deck will be closed to pedestrians during construction hours while the barge crane is in operation. Fencing and signage will direct pedestrians around the work area. The dock will be open to pedestrians during off hours.
- Triamid plans to use a portion of the closed restaurant as a temporary office during construction.
- The deck area will be completed with minimum MEP and finishes to meet code. Lionakis will update the drawings to reflect the final requirements.
- Existing gas piping and heaters will not be re-installed under the new canopy as shown on page P111.
- Vertical and horizontal parts of the canopy, and building siding that was replaced will be painted, the deck surface and steel below will not be painted per Note on page A311.
- The office extension over the wood deck will be demolished and not be rebuilt, minimal shoring will be used to support the remaining office. Condensers on the demoed part of the office roof will be removed. A wall at the edge of the deck will be built to close in the remaining office. If required the Condensers removed from the office roof can be relocated on the new deck. The condensers are old, the GC will not be responsible if the units do not function after relocating. Main pages to be revised A111, S111, P111, EL111

- A crane may be required to be located on the boardwalk east of the restaurant building to load canopy materials on the new deck. This will be for a limited time and duration to be determined and coordinated with the city.
- Prevailing Wage included in this proposal.
- This project is subject to the City's Work force Training Agreement (CWTA).
- Includes installing ConHart Redwood decking, Cedar is similar in price.
- Steel detailing is expected to take 6 weeks, fabrication & Galvanizing will take 5 weeks, and steel erection will take 5 weeks.
- Steel and metal pricing is fluctuating every day due to the current steel/metals conditions in US based on Federal directives and Tariffs. As of this date suppliers/mills are only holding a quoted price for 24 hours without full payment. The fabricator has several steel suppliers and mills they draw from and shop for the most favorable pricing. These market conditions could affect the final price of steel.

Excludes:

Off hours premium time work. Any and all work not identified above. Excludes all building permits, Special Inspections, and hot work permits unless specifically noted above. Insulation above new canopy framing, added fire protection and bird deterrent measures under the new wood deck, new gas piping and heaters, new electrical and fire alarm except what is needed to meet code requirements, new plumbing, new casework and equipment, rebuilding the office over the wood deck.

1110 Front Street Deck Subcontractor List

1. Sweetwater Construction Inc. – provide, fabricate and install all structural steel, including perimeter guardrail, provide barge crane.

2. Skyline Scaffold Inc. - scaffolding under the deck.

3. Lawson Mechanical – remove existing condensing units on the roof of the office to be demolished.

4. Marquee Fire Protection – demo existing fire sprinkler system under the deck canopy, install new fire sprinkler system.

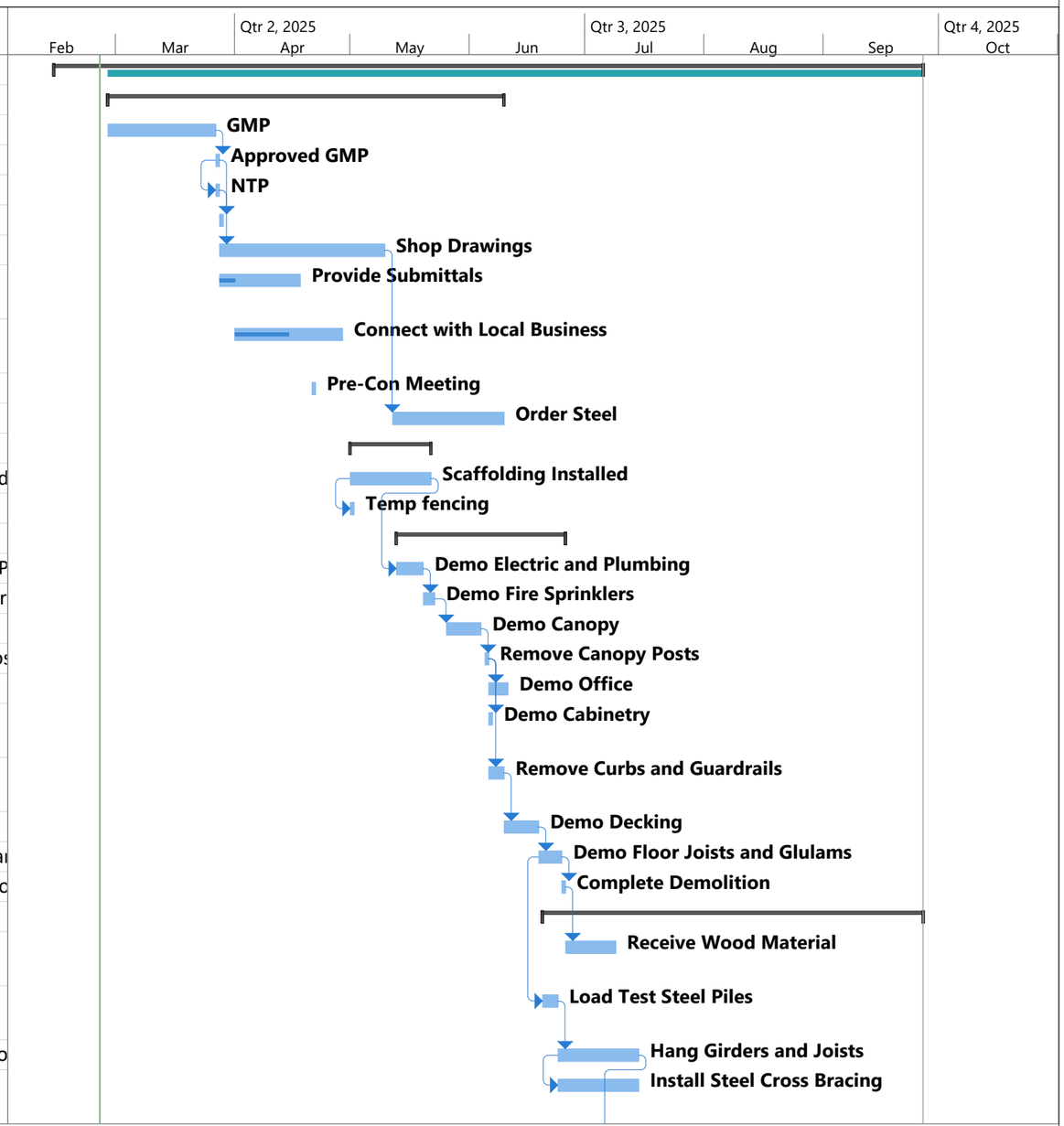
5. Tecta America Sacramento Inc. – provide and install Tremco roof, metal gutters and downspouts.

6. Shane Brown Electric - provide new electrical services.

7. Triamid Construction – demo the canopy and deck, install new wood decking and canopy.

1110 Front Street Deck Schedule 2.25.2025

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		**Rio City Café Deck Rebuild**	**162 days**	**Thu 2/13/25**	**Fri 9/26/25**		
2		**Pre Con Tasks**	**73 days**	**Thu 2/27/25**	**Mon 6/9/25**		
3		Submit GMP to City	20 days	Thu 2/27/25	Wed 3/26/25		GMP
4		City Approved Triamid GMP	1 day	Thu 3/27/25	Thu 3/27/25	3	Approved GMP
5		Notice To Proceed From City	1 day	Thu 3/27/25	Thu 3/27/25	4SS	NTP
6		Order Wood	1 day	Fri 3/28/25	Fri 3/28/25	5	
7		Steel Detail and Shop Drawings	31 days	Fri 3/28/25	Fri 5/9/25	4	Shop Drawings
8		Provide submittals to Engineer and City	15 days	Fri 3/28/25	Thu 4/17/25		Provide Submittals
9		Connect with affected business in the area	20 days	Tue 4/1/25	Mon 4/28/25		Connect with Local Business
10		Pre Constrcution Meeting	1 day	Mon 4/21/25	Mon 4/21/25		Pre-Con Meeting
11		Fabricate and Galvanize Steel	21 days	Mon 5/12/25	Mon 6/9/25	7	Order Steel
12		**Mobilization**	**15 days**	**Thu 5/1/25**	**Wed 5/21/25**		
13		Scaffolding Installed	15 days	Thu 5/1/25	Wed 5/21/25		Scaffolding Installed
14		Temporary Fencing	1 day	Thu 5/1/25	Thu 5/1/25	13SS	Temp fencing
15		**Demo Deck**	**32 days**	**Tue 5/13/25**	**Wed 6/25/25**		
16		Demo Electrical and Plumbing	5 days	Tue 5/13/25	Mon 5/19/25	13FS-7 days	Demo Electric and P
17		Demo Fire Sprinklers	3 days	Tue 5/20/25	Thu 5/22/25	16	Demo Fire Sprinkler
18		Demo Wood Canopy Structure	7 days	Mon 5/26/25	Tue 6/3/25	17FS+1 day	Demo Canopy
19		Remove Canopy Posts	1 day	Thu 6/5/25	Thu 6/5/25	18FS+1 day	Remove Canopy Pos
20		Install Shoring in Office	3 days	Fri 6/6/25	Tue 6/10/25	19	Demo Office
21		Demo Deck Service Area Cabinetry	1 day	Fri 6/6/25	Fri 6/6/25	19	Demo Cabinetry
22		Remove all Wood Curbs and Guardrails	2 days	Fri 6/6/25	Mon 6/9/25	19	Remove Curbs and Guardrails
23		Demo Decking	7 days	Tue 6/10/25	Wed 6/18/25	22	Demo Decking
24		Demo Floor Joists and Glulams	4 days	Thu 6/19/25	Tue 6/24/25	23	Demo Floor Joists a
25		Complete Demolition	1 day	Wed 6/25/25	Wed 6/25/25	24	Complete Demolitio
26		**Construcion Phase**	**71 days**	**Fri 6/20/25**	**Fri 9/26/25**		
27		Receive and Shake Out Wood Deck Framing Material	9 days	Thu 6/26/25	Tue 7/8/25	25	Receive Wood Material
28		Load Test Two Existing Steel Piles	2 days	Fri 6/20/25	Mon 6/23/25	24SS+1 day	Load Test Steel Piles
29		Hang Steel Girders and Joists	15 days	Tue 6/24/25	Mon 7/14/25	28	Hang Girders and Jo
30		Install Steel Cross Bracing at Floor Joists	15 days	Tue 6/24/25	Mon 7/14/25	29SS	Install Steel Cross Bracing

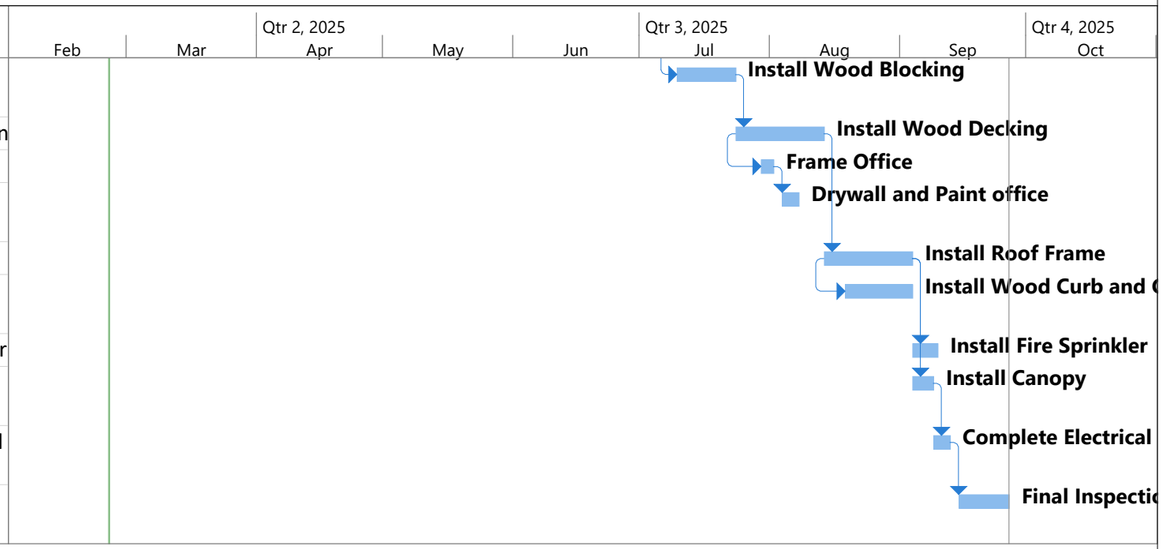


Project: Triamid Construction S
Date: Tue 2/25/25

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone

1110 Front Street Deck Schedule 2.25.2025

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
31		Install Wood Blocking to Steel Joists for Flooring	10 days	Thu 7/10/25	Wed 7/23/25	29FS-3 days	Install Wood Blocking
32		Install 4X8 Wood Decking	15 days	Thu 7/24/25	Wed 8/13/25	31	Install Wood Deckin
33		Frame Office	3 days	Wed 7/30/25	Fri 8/1/25	32SS+4 days	Frame Office
34		Drywall, Tape, texture and Paint Office	4 days	Mon 8/4/25	Thu 8/7/25	33	Drywall and Paint office
35		Install Deck Canopy Frame	15 days	Thu 8/14/25	Wed 9/3/25	32	Install Roof Frame
36		Install Perimiter Wood Curb and Guardrail	12 days	Tue 8/19/25	Wed 9/3/25	35SS+3 days	Install Wood Curb and Guardrail
37		Install Fire Sprinkler System	4 days	Thu 9/4/25	Tue 9/9/25	35	Install Fire Sprinkler
38		Install Canopy Roof, Patch Office Roof	3 days	Thu 9/4/25	Mon 9/8/25	35	Install Canopy
39		Minimal Electrical to Meet Code Requirements	4 days	Tue 9/9/25	Fri 9/12/25	38	Complete Electrical
40		Final Inspection and Punch List	10 days	Mon 9/15/25	Fri 9/26/25	39	Final Inspections and Punch List



Project: Triamid Construction S
Date: Tue 2/25/25

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

PROJECT MANUAL FOR

CITY OF SACRAMENTO

RIO CITY CAFE DECK REPAIR

LIONAKIS NO. 019124.02

100% Design Development Specifications

January 26, 2024

LIONAKIS

PROJECT MANUAL

FOR

CITY OF SACRAMENTO
RIO CITY CAFE DECK REPAIR

TABLE OF CONTENTS

DIVISION NO.	SECTION TITLE	PAGES INCLUSIVE
DIVISION 00	PROCUREMENT AND CONTRACTING REQUIREMENTS	
To be provided by Owner		
SPECIFICATIONS		
DIVISION 01	GENERAL REQUIREMENTS	
Section 01 73 29	Cutting and Patching	1 – 5
Additional Division 01 Sections to be provided by Owner		
DIVISION 02	EXISTING CONDITIONS	
Section 02 41 00	Demolition	1 – 2
DIVISION 03	CONCRETE	
Section 03 20 00	Concrete Reinforcing	1 – 6
Section 03 30 00	Cast-in-Place Concrete	1 – 21
DIVISION 04	NOT USED	
DIVISION 05	METALS	
Section 05 12 00	Structural Steel Framing	1 – 9
Section 05 31 00	Steel Decking	1 – 5
Section 05 50 00	Metal Fabrications	1 – 6
DIVISION 06	WOODS, PLASTICS, AND COMPOSITES	
Section 06 10 00	Rough Carpentry	1 – 7
Section 06 17 53	Shop-Fabricated Wood Trusses	1 – 3
DIVISION 07	THERMAL AND MOISTURE PROTECTION	
Section 07 13 26	Self-Adhering Sheet Waterproofing	1 – 5
Section 07 21 00	Thermal Insulation	1 – 3
Section 07 25 00	Weather Barriers	1 – 5
Section 07 54 23	Thermoplastic-Polyolefin Roofing	1 – 11
Section 07 62 00	Sheet Metal Flashing and Trim	1 – 6
Section 07 92 00	Joint Sealants	1 – 12
Section 07 95 00	Expansion Control	1 – 3
DIVISION 08	NOT USED	
DIVISION 09	FINISHES	
Section 09 29 00	Gypsum Board	1 – 6
Section 09 30 00	Tiling	1 – 7
Section 09 91 00	Painting	1 – 9
DIVISIONS 10 – 20	NOT USED	

DIVISION 21 FIRE PROTECTION
Section 21 05 00 Common Work Results for Fire Suppression ..... 1 -
Section 21 13 00 Fire-Suppression Sprinkler Systems ..... 1 – 7

DIVISION 22 PLUMBING
Section 22 05 10 Plumbing General Provisions ..... 1 – 18
Section 22 05 16 Expansion Fittings and Loops for Plumbing Piping ..... 1 – 4
Section 22 05 23 General-Duty Valves for Plumbing Piping ..... 1 – 10
Section 22 05 29 Hangers and Supports for Plumbing Piping and Equipment ..... 1 – 10
Section 22 05 53 Identification for Plumbing Piping and Equipment ..... 1 – 3
Section 22 07 19 Plumbing Piping Insulation ..... 1 – 7
Section 22 08 00 Plumbing Commissioning Requirements ..... 1 – 3
Section 22 10 05 Plumbing Piping ..... 1 – 9
Section 22 10 06 Plumbing Piping Specialties ..... 1 – 4
Section 22 40 00 Plumbing Fixtures ..... 1 – 4

DIVISION 23 HEATING, VENTILATING, AND AIR CONDITIONING
Section 23 05 10 Mechanical General Provisions ..... 1 – 18
Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment ..... 1 – 11
Section 23 05 53 Identification for HVAC Piping and Equipment ..... 1 – 4
Section 23 83 00 Radiant Heating and Cooling Units ..... 1 – 2

DIVISIONS 10 – 20 NOT USED

DIVISION 26 ELECTRICAL
Section 26 05 00 Common Work Results for Electrical ..... 1 – 19
Section 26 05 19 Low-Voltage Electrical Power Conductors and Cables ..... 1 – 23

DIVISION 26 ELECTRICAL (CONTINUED)
Section 26 05 26 Grounding and Bonding for Electrical Systems ..... 1 – 22
Section 26 05 29 Hangers and Supports for Electrical Systems ..... 1 – 14
Section 26 05 33.13 Conduit for Electrical Systems ..... 1 – 28
Section 26 05 33.16 Boxes for Electrical Systems ..... 1 – 17
Section 26 05 53 Identification for Electrical Systems ..... 1 – 19
Section 26 05 83 Wiring Connections ..... 1 – 4
Section 26 08 00 Electrical Commissioning Requirements ..... 1 – 6
Section 26 09 23 Lighting Control Devices ..... 1 – 32
Section 26 24 16 Panelboards ..... 1 – 17
Section 26 27 26 Wiring Devices ..... 1 – 24
Section 26 28 13 Fuses ..... 1 – 7
Section 26 51 00 Interior Lighting ..... 1 – 19
Section 26 56 00 Exterior Lighting ..... 1 – 14

DIVISIONS 27 – 49 NOT USED

END OF TABLE OF CONTENTS

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedural requirements and limitations for cutting and patching work.

B. Patching of existing materials and construction disturbed by Work under this Contract, including repair of damage to existing materials and construction caused by:
   1. Installation of new products, materials, and equipment or systems.
   2. Relocation or reinstallation of existing products, materials, and equipment or systems.

C. Removal, patching, and restoration work at new roofing system, when required.

D. Removal, patching, and restoration work at existing roofing system.

1.2 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures.

B. Section 01 35 16 – Alteration Project Procedures: Cutting and patching for alterations work.

C. Section 01 60 00 – Product Requirements: Product options and substitutions.

D. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work, including the following:
   1. Cutting and patching incidental to work of the individual Section.
   2. Advance notification to other Sections of openings required in work of those Sections.
   3. Limitations on cutting structural members.

1.3 SUBMITTALS

A. Submit written request in advance of cutting or patching which affects:
   1. Integrity of moisture-resistant, water-resistant, and exposed to weather elements.
   2. Utility services and mechanical/electrical systems.
   3. Operational elements.
   4. Visual qualities of sight exposed elements.
   5. Existing structural elements.
   6. Efficiency, maintenance, or safety of element.
   7. Work of Owner or separate contractor.

B. Include in request:
   1. Identification of Project.
   2. Location and description of affected Work.
   3. Necessity for cutting or patching.

4. Description of proposed Work and products to be used.
5. Alternatives to cutting and patching.
6. List of services and systems that will be temporarily out of service and length of disruption.
7. List of services and systems that will be relocated.
8. Reinforcement to structural elements, with details and engineering calculations showing integration of reinforcement with original structure.
9. Effect on work of Owner or separate contractor.
10. Written permission of affected separate contractor.
11. Date and time the work will be executed.

C. Architect's and Owner's Approval: Obtain approval of cutting and patching submittals before commencing cutting and patching work. Approval does not waive the right to require removal and replacement of unsatisfactory work.

1.4 DEFINITIONS

A. Cutting: Removal of in-place construction for installation or performance of other Work.

B. Patching: Repair work required for restoration of damaged surfaces to original condition after installation of other Work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or results in increased maintenance or decreased operational life or safety.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching work, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Applicable Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by appropriate methods and with suitable materials so that existing applicable warranties are not voided.

PART 2 PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution as specified in Section 01 60 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing work, assess conditions affecting performance of Work.

C. Beginning of cutting or patching means acceptance of existing conditions.

D. Identify hazardous substances or conditions exposed during the Work to Architect for decision or remedy.

3.2 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering Work.

3.3 CUTTING

A. Execute cutting and fitting to complete the Work.

B. Uncover in-place Work to reinstall improperly sequenced Work.

C. Remove and replace defective or non-conforming Work.

D. Obtain material samples of installed Work for testing, when requested.

E. Provide openings in the Work for penetration of mechanical and electrical work.

F. Employ experienced installer to perform cutting of moisture-resistant, water-resistant, exposed to weather elements, and surfaces exposed to view.

G. Cut rigid materials in straight, true and parallel or perpendicular lines.

H. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

I. Cut masonry and concrete materials using masonry saw or core drill.

J. Pneumatic tools are not allowed without prior approval from Architect and Owner.

K. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

3.4 PATCHING

A. Execute patching to complement adjacent Work.

B. Fit products together to integrate with other Work.

C. Execute Work by appropriate methods to avoid damage to other Work and to provide surfaces suitable for patching and finishing.

D. Employ experienced installer to perform patching of moisture-resistant, water-resistant, exposed to weather elements, and surfaces exposed to view.

E. Restore Work with new materials and products in accordance with requirements of the Contract Documents.

F. Fit Work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

G. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

H. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated material to full thickness of the penetrated element. Firestopping shall meet or exceed the fire rating of the assembly in which it is installed.

I. Fire rated assemblies disturbed or damaged during construction shall be repaired to pre-construction condition using like materials.

J. Refinish surfaces to match adjacent finish in all respects (type, texture, thickness, color, etc.). For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

K. Removal, Patching, and Restoration Work at New Roofing System: Work under this Project may require removal, patching, and restoration work at completed roofing system. Roof patching and restoration work shall be compatible with and identical to the original roofing system. Provide roof patching and restoration work in accordance with roofing manufacturer's written instructions, or applicable NRCA procedures and details, whichever is more stringent.

   1. Roofing Warranties: Contractor shall ensure that applicable warranties on the roofing system remain intact after completion of patching and restoration work.
   2. Prior to commencement of roof patching work, submit materials/product data and procedures proposed for roof patching and restoration work for Architect's review.
   3. Submit documentation under provisions of Section 01 33 00.
   4. Provide documentary evidence that roofing warranties are not voided due to roof patching and restoration work completed under this Project.

L. Removal, Patching, and Restoration Work at Existing Roofing: Work under this Project requires removal, patching, and/or restoration work at existing roofing system. Roofing system for patching and restoration work shall be compatible with and identical to the existing roofing system. Provide roof patching and restoration work in accordance with roofing manufacturer's written instructions, or applicable NRCA procedures and details, whichever is more stringent.

   1. Existing Roofing Warranties: Contractor shall ensure that applicable warranties on the existing roofing system remain intact after completion of roof patching and restoration work.
   2. Prior to commencement of roof patching and restoration work, submit materials/product data and procedures proposed for roof patching and restoration work for Architect's review.
   3. Submit documentation under provisions of Section 01 33 00.
   4. Provide documentary evidence that existing roofing warranties are not voided due to roof patching and restoration work completed under this Project.

3.5 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of designated construction.

B. Identification of utilities.

C. Demolition requirements.

1.2 RELATED SECTIONS

A. Division 01 Sections, as applicable.

1.3 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

B. Accurately record actual locations of capped utilities and subsurface obstructions.

1.4 REGULATORY REQUIREMENTS

A. Perform work of this Section under provisions of CBC Chapter 33, CFC Chapter 33, and NFPA 241 for demolition work, safety of structure, dust control and safety of occupants.

B. Obtain required permits from authorities.

C. Do not close or obstruct egress width to exits.

D. Do not disable or disrupt building fire or life safety systems without three-day prior written notice to Owner.

E. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.5 SCHEDULING

A. Schedule work under the provisions of Division 01.

B. Describe demolition removal procedures and schedule.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. Provide, erect and maintain temporary barriers as required.

B. Erect and maintain temporary partitions to prevent spread of dust, odors and noise to adjoining facilities.

C. Protect existing materials and finishes that are not scheduled or otherwise required to be demolished.

D. Mark location of utilities.

3.2 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent and occupied buildings.

B. Maintain protected egress and access to the Work.

3.3 DEMOLITION

A. Refer to Drawings for specific items to be demolished.

B. Disconnect, remove, cap, and identify designated utilities within demolition areas.

C. Demolish in an orderly and careful manner. Protect existing supporting structural members and materials.

D. Except where noted otherwise, remove demolished materials from site. Do not bury or burn materials on site.

E. Remove demolished materials from site as Work progresses. Upon completion of Work, leave areas in clean condition.

F. Remove temporary Work.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel reinforcement and accessories for concrete.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ACI SPEC-117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI SPEC-301 – Specifications for Structural Concrete.
3. ACI CODE-318 – Building Code Requirements for Structural Concrete and Commentary.
4. ACI MNL-66 – ACI Detailing Manual.
5. ASTM A615/A615M – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
6. ASTM A706/A706M – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
7. ASTM A1064/A1064M – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
8. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
9. CRSI Manual of Standard Practice.
10. Wire Reinforcement Institute (WRI) Manual of Standard Practice.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer’s descriptive literature, installation instructions, and product specification for the following products:

1. Mechanical splicing devices.
2. Bar supports.

C. Placement Drawings:

1. Prepare in accordance with ACI MNL-66.
2. Indicate bar sizes, spacing, locations, and quantities of steel reinforcement and wire fabric, bending and cutting schedules, and supporting and spacing devices.
3. If fusion welding is used, identify which members will utilize fusion welding process for preassembly, including details indicating the size/location of stirrups and holding wires, and welding requirements.
4. Identify placement drawings with reference to sheet and detail numbers from the Contract Documents.
5. Do not use scaled dimensions from Drawings to determine lengths of steel reinforcement.
6. Submit one copy of reproducible placement drawings in addition to those required by Division 01.
7. Contractor shall be responsible for correctness and completeness of steel reinforcing requirements.
8. Begin fabrication only when placement drawings have been accepted.

D. Quality Assurance/Control Submittals:

1. If fusion welding is used, submit complete shop welding program outlining the type of fusion welding machine to be used and periodic inspection of the in-plant welding.
2. Submit certified copies of mill test reports of reinforcing materials analysis to Owner's testing agency.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with CRSI Manual of Standard Practice; ACI SPEC-301; and 2022 California Building Code (CBC) Chapter 17 "Special Inspections and Tests", and Chapter 19 "Concrete", and as follows:

1. Steel Reinforcement, Tests and Materials: CBC Section 1903 "Specifications for Tests and Materials".
2. Reinforcing Bar Welding Testing: Per Section 1705, Table 1705.3 "Required Special Inspections and Tests of Concrete Construction".

B. Fusion welded reinforcing steel shall have one tensile test taken from one specimen sampled per 2.5 tons or fraction thereof for each size of reinforcing steel fusion welded. No bend test is necessary. The specimen shall have a holding wire attached to it that need not be removed. The elongation requirements shall comply with the ASTM of reinforcing steel specified. Test results shall be submitted to the Engineer of Record and the Authority Having Jurisdiction. Testing and inspection costs for fusion welding shall be paid for by the Contractor.

C. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting prior to commencing Work of this Section.
3. Coordinate Work in this Section with Work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver steel reinforcement in bundles marked with identification tags.

C. Handle and store materials to prevent damage and contamination, excessive rusting or coating with grease, oil, or other objectionable materials.

D. Store steel reinforcement, fabricated assemblies, and accessories off the ground on platforms, skids, or other supports.

E. Deliver and store welding electrodes in accordance with AWS D1.4.

PART 2 PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60, low-alloy deformed steel bars.

B. Reinforcing Steel Indicated to be Welded: ASTM A706/A706M, Grade 60, low-alloy deformed steel bars.

C. Tie Wire: Black annealed steel wire; No. 16 gauge.

D. Welded Wire Fabric: ASTM A1064/1064M; 65 ksi minimum yield strength; fabricated from as-drawn steel wire into flat sheets (rolled fabric not permitted).

1. Size: As indicated on Drawings.

2.2 ACCESSORIES

A. Bar Supports (Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place): Provide in accordance with CRSI Manual of Standard Practice from steel wire, plastic, or precast concrete or fiber-reinforced concrete of equal to or greater compressive strength than surrounding concrete. Provide as follows:

1. Footings: Precast concrete blocks with tie wires.
2. Slab on ground: Precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.
3. Where legs of wire bar supports contact forms: CRSI Class 1 plastic-protected or CRSI Class 2 stainless steel bar supports.
4. Where support is no closer to concrete surface than 1/2 inch: CRSI Class 3 wire supports.
5. Supports placed against ground: Precast concrete blocks not less than 4 inch square with embedded wire.

B. Welding Materials For Reinforcing Steel:

1. Weld Filler Material: AWS D1.4; low hydrogen, 80 ksi tensile strength.

C. Mechanical Splices: Splicing devices capable of developing 125 percent of the specified yield strength of the bar in compression and tension.

1. Metal Sleeve with Cast Filler Metal:

a. Acceptable Product: Cadweld Rebar by Erico International Corporation, Solon, OH; 800-248-2677; www.erico.com, or accepted equal.

2. Mechanical Threaded Connections: Provide threaded mechanical connections using a metal coupling sleeve with internal threads.

a. Acceptable Product: Lenton Couplers by Erico International Corporation DB-SAE Dowel Bar Splicers by Dayton Concrete Accessories, Miamisburg, OH; 800-745-3700, www.daytonconcreteacc.com, or accepted equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Clean steel reinforcement of rust and mill scale, earth, moisture, and other foreign materials before fabrication or placement.

3.3 STEEL REINFORCEMENT FABRICATION

A. Fabricate to shapes, dimensions, and tolerances in accordance with accepted placement drawings conforming to CRSI Manual of Standard Practice, ACI MNL-66, ACI CODE-318, ACI SPEC-117, and CBC Chapter 19.

B. Standard Hooks and Bends: Conform to ACI CODE-318.

C. Bending: Cold bend steel reinforcement in the field or at the mill. Heating for bending is not permitted unless otherwise specifically allowed by Architect.

D. Reinforcement must not be straightened or re-bent without approval of Structural Engineer of Record (SEOR).

E. Weld steel reinforcement in accordance with AWS D1.4.

3.4 PLACEMENT

A. Place steel reinforcement in accordance with accepted placement drawings in conformance with tolerances specified in ACI SPEC-117.

B. Install steel reinforcement in largest practical lengths. Accurately position, support, and secure reinforcement against displacement. Locate support reinforcement with bar supports to maintain minimum concrete cover.

C. Secure reinforcement against displacement within tolerances permitted in ACI CODE-318. Point wire tie ends away from forms.

D. Concrete Cover: Refer to Drawings. Cover tolerances shall comply with ACI SPEC-117.

E. Laps: Refer to Drawings.
   1. Offset laps in adjacent bars.

F. Splices:
   1. Splice reinforcing as shown.
   2. Tie lap splices securely to prevent displacement during concrete placement.
   3. Install mechanical splice in accordance with manufacturer's written instructions.
   4. Locate splices only where shown and accepted by Architect.

G. Welding:
   1. Welding is not permitted unless specifically detailed on Drawings or accepted by Architect.
   2. Employ shielded metal-arc method. Comply with AWS D1.4.
   3. Welding is not permitted on bars where the carbon content is not known or is determined to exceed 0.75 percent.
   4. Welding is not permitted within two bar diameters of any bent portion of a bar which has been bent cold.
   5. Welding of crossing bars is not permitted.

H. Maintain minimum clear distance between parallel bars at not less than 1-1/2 times nominal bar diameter, 1-1/2 times maximum size of coarse aggregate, or 1-1/2 inch.

I. Dowels: Place where indicated on Drawings. Grease loose end to prevent concrete from bonding to dowel. Sleeves may be used when accepted by Architect.

J. Welded Wire Reinforcement: Install in longest practical lengths on bar supports to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps to avoid continuous laps in either direction. Tie lap joints at 12 inches on center.

K. Field Adjustments: Move steel reinforcement as necessary to avoid interference with other reinforcing steel or other embedded items within accepted tolerances.
   1. Sleeves and embedded items: Do not cut bars to clear sleeves or slots through slabs or walls. Wrap bars around these openings.
   2. Openings: Compensate for steel reinforcement terminated at openings in slabs by placing one half of steel reinforcement terminated on each side of openings for the full span length.
   3. Steel reinforcement moved to avoid interference with other reinforcements, conduits, or embedded items, including additional steel reinforcement to meet structural requirements are subject to inspection and approval before concrete placement.

3.5 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. Testing Service: Owner will select and pay for independent testing agency, which will perform the following:

1. Inspect shop and field welding per AWS D1.4, including checking materials, equipment, procedures, and welder qualifications.
2. Inspector shall employ non-destructive testing or any other aid to visual inspection deemed necessary to assure adequacy of weld.

3.6 PROTECTION

A. Protect steel reinforcement from damage and displacement.

B. Protect for potential rust staining of adjacent surfaces. Wrap steel reinforcement with impervious tape or other methods as accepted by Architect. Remove protective cover and clean reinforcement before concrete placement.

C. Install safety caps on all exposed ends of vertical steel reinforcement that pose a danger to life safety.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete.

B. Concrete admixtures.

C. Curing and surface slab treatment.

D. Grouting, bonding, and patching materials.

1.2 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcing.

B. Section 05 31 00 – Steel Decking.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. ACI publications PRC-221, PRC-302.1, PRC-302.2, PRC-304, PRC-305, PRC-306, and PRC-309 contain recommended practices for concrete work. Submit any proposed deviations from these recommendations to Architect for review prior to commencing concrete work.

D. Referenced Standards:

1. ACI SPEC-117 – Specification for Tolerances for Concrete Construction and Materials.
2. ACI PRC-221 – Guide for Use of Normal Weight and Heavyweight Aggregates in Concrete.
3. ACI SPEC-301 – Specifications for Concrete Construction.
4. ACI PRC-302.1 – Guide for Concrete Floor and Slab Construction.
5. ACI PRC-302.2 – Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
6. ACI PRC-304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete.
7. ACI PRC-305 – Guide to Hot Weather Concreting.
8. ACI SPEC-305.1 – Standard Specification for Hot Weather Concreting.
9. ACI PRC-306 – Guide to Cold Weather Concreting.

10. ACI SPEC-306.1 – Standard Specification for Cold Weather Concreting.
11. ACI PRC-309 – Guide for Consolidation of Concrete.
12. ACI CODE-318 – Building Code Requirements for Structural Concrete.
13. ACI SP-15 – Field Reference Manual: Specifications for Structural Concrete ACI 301-10 with Selected ACI and ASTM References.
14. ASTM C31/C31M – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
15. ASTM C33/C33M – Standard Specification for Concrete Aggregates.
16. ASTM C39/C39M – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
17. ASTM C94/C94M – Standard Specification for Ready Mixed Concrete.
18. ASTM C109/C109M – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
19. ASTM C114 – Standard Test Methods for Chemical Analysis of Hydraulic Cement.
20. ASTM C138/C138M – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
21. ASTM C143/C143M – Standard Test Method for Slump of Hydraulic Cement Concrete.
22. ASTM C150/C150M – Standard Specification for Portland Cement.
23. ASTM C157/C157M – Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar and Concrete.
24. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
25. ASTM C172/C172M – Standard Practice for Sampling Freshly Mixed Concrete.
26. ASTM C309 – Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
27. ASTM C348 – Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
28. ASTM C494/C494M – Standard Specification for Chemical Admixtures for Concrete.
29. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
30. ASTM C881/C881M – Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.
31. ASTM C928/C928M – Standard Specification for Packaged, Dry, Rapid Hardening Cementitious Materials for Concrete Repairs.
32. ASTM C939/C939M – Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method).
33. ASTM C989/C989M – Standard Specification for Slag Cement for Use in Concrete and Mortars.
34. ASTM C1059/C1059M – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

35. ASTM C1064/C1064M – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
36. ASTM C1077 – Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
37. ASTM C1107/C1107M – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
38. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
39. ASTM C1602/C1602M – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
40. ASTM D4397 – Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
41. ASTM E303 – Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
42. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
43. ASTM E1155/E1155M – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
44. ISO/IEC/EN 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (formerly ISO/IEC Guide 25-1990 and ASTM E548).
45. NRMCA – Quality Control Checklist – Section 2.
46. NRMCA – Plant Certification Checklist – Section 3.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each product. Include manufacturer's written instructions and installation procedures.

C. Drawings: Submit concrete pouring plan showing proposed locations of construction and control joints for review by Architect prior to concrete placement.

D. Samples: Submit product samples when requested by Architect or testing laboratory.

E. Quality Assurance/Control Submittals:
   1. Certificates:
      a. Manufacturer's Certification of Compliance that materials (cementitious materials, aggregates, and admixtures) conform to specifications.
   2. Reference Documents: Maintain one copy of ACI SP-15 on site.
   3. Concrete mixture proportions and characteristics for each class/type of concrete used.

4. Concrete mixture proportion data for each class/type of concrete used:
    a. Calculation of required average compressive strength and supporting test records.
    b. Documentation indicating proposed mixture proportions will produce an average compressive strength greater than the required average compressive strength, including field strength test records or trial mixtures.
    c. Provide documentation in accordance with Concrete Mix Design Submittal Checklist located at the end of this Section.
5. Test Reports.
6. Batch Ticket: Furnish accepted batch tickets at the time of delivery for each concrete load. Indicate on each ticket equipment used for measuring and quantities, by weight, of cement, sand, each class of aggregate, admixtures, and amount of water in the aggregate, water added at the batching plant, and any water withheld at the batch plant. In addition, include mix number, total yield in cubic yards, date, and time of day (dispatch time, plant departure time, site arrival time, unloading start and end time).
7. Concrete Placement Record: Keep a record on site including time and date of concrete placing for each portion of the structure for the duration of the project. Record additional information not included in batch ticket such as admixtures added at the job site. Make records available to Architect for review. Submit record to Architect at project completion.
8. Protection of Slabs and Foundations: Submit plans for protection of slabs and foundations, including the following, if applicable:
    a. Cold Weather Concreting: Comply with submittal requirements of ACI SPEC-306.1.
    b. Hot Weather Concreting: Comply with submittal requirements of ACI SPEC-305.1.

F. Closeout Submittals:
1. Concrete placement record.
2. Show location of embedded utilities in record drawings.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Concrete Supplier: Firm specializing in products specified in this Section with a minimum five years documented experience; successfully supplying similar materials (design, content, and performance) as specified in this Section.
2. Concrete Batch Plant: Complies with requirements of ASTM C94, Sections 9 and 10, and is currently certified per NRMCA Plant Certification Checklist - Section 3 or other certification acceptable to Architect.
3. Contractor’s Design Laboratory: Under the direction of civil engineer licensed by the State of California; conforming to ASTM E329 and ASTM C1077.
4. Independent Testing Laboratory: Conforming to ASTM E329, ASTM C1077, and ISO/IEC/EN 17025, acceptable to Architect.

B. Regulatory Requirements: Conform to requirements of 2022 California Building Code (CBC), Chapter 19, “Concrete”, Chapter 17 “Special Inspections and Tests”, and as follows:
1. Materials:
    a. Cementitious Materials: CBC Chapter 19, Section 1903 “Specifications for Tests and Materials”.

2. Inspection: CBC Chapter 17, Section 1705 “Required Special Inspections and Tests” Article 1705.3 “Concrete Construction”, as applicable.

C. Drying Shrinkage Test: Perform per ASTM C157/C157M modified as follows:

1. Prepare 4 inch x 4 inch x 11 inch prisms with an effective gage length of 10 inches fabricated, cured, dried, and measured per ASTM C157/C157M except that specimens shall be removed from molds at an age of 23 hours +/- 1 hour after trial batching, and shall be placed immediately in water at 73 degrees F +/- 3 degrees for at least thirty minutes, and shall be measured within thirty minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F +/- 3 degrees.
2. Measurement to determine expansion expressed as a percentage of original length shall be made at seven days. This length at seven days shall be the base length for drying shrinkage calculations. Specimens shall then be stored immediately in a humidity control room, maintained at 73 degrees F +/- three degrees F and fifty percent +/- four percent relative humidity for the remainder of the test.
3. Measurements to determine shrinkage expressed as a percentage of base length shall be made and reported separately for 7, 14, and 21 days of drying after 7 days of moist curing.

D. Quality Control: Comply with NRMCA Quality Control Checklist – Section 2.

E. Materials Quality Assurance: Obtain cement and aggregates from same source for the duration of the work unless specifically accepted by Architect.

F. Pre-Installation Meetings:

1. Conduct pre-installation (pre-pour) meeting in accordance with Division 01.
2. Convene pre-installation (pre-pour) meeting one week prior to commencing work of this Section attended by concrete supplier.
3. Meeting minutes shall be taken and distributed to meeting attendees within three days of meeting.
4. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Store cement and other cementitious materials in weathertight buildings, bins, or silos which exclude moisture and contaminants and keep building materials completely separated.

D. Arrange and use aggregate stockpiles in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Do not store aggregates directly on ground unless a sacrificial layer is left undisturbed.

E. Refer to manufacturers’ product data sheets for recommended shelf life and storage conditions for admixtures.

F. Clearly and accurately label materials after containers have been opened.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, www.master-builders-solutions.com.
2. Grace Construction Products – W. R. Grace & Co., Cambridge, MA; 877-423-6491, www.na.graceconstruction.com.
3. Sika Corporation, Lyndhurst, NJ; 800-933-7452, www.usa.sika.com.
4. Stego Industries, LLC, San Clemente, CA; 877-464-7834, www.stegoindustries.com.
5. The Euclid Chemical Co., Cleveland, OH; 800-321-7628, www.euclidchemical.com.
6. US Mix Products Co., Denver, CO; 800-397-9903, www.usspec.com.
7. W. R. Meadows, Inc., Hampshire, IL; 800-342-5976, www.wrmeadows.com.

B. Substitutions: Manufacturers and products are listed in this Section to establish minimum requirements as to quality and performance. Comply with requirements of Division 01 for substitutions.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Cement: ASTM C150, Type II, low alkali (equivalent alkalis (Na_2O + 0.658K_2O) no more than 0.6 percent per ASTM C114), gray.
2. Supplementary Cementitious Materials (SCM):
   a. Fly Ash: ASTM C618, Class F. Class C is not permitted.
   b. Slag Cement: ASTM C989, Grade 100 or Grade 120.
   c. Silica Fume: ASTM C1240.
      1) MasterLife SF 100 by Master Builders Solutions.
   d. Metakaolin: ASTM C618, Class N.
      1) MasterLife MK 828 by Master Builders Solutions.

B. Aggregates: Aggregates used in concrete shall have a combined aggregate distribution similar to the aggregates used in the concrete represented by field test data or used in trial mixtures. Fine and coarse aggregates: ASTM C33. Low-shrinkage producing coarse aggregates per ACI PRC-221; and uniformly graded as follows (see following page):

Sieve Number or Size in Inches	Percent Retained by Weight		
	1-1/2 inch Max.	1 inch Max.	3/4 inch Max.
2 inch	0-5	–	–
1-1/2 inch	0-8	0-5	–
1 inch	8-18	0-8	0-5
3/4 inch	8-18	8-18	0-8
1/2 inch	8-18	8-18	8-18
3/8 inch	8-18	8-18	8-18
No. 4	8-18	8-18	8-18
No. 8	8-18	8-18	8-18
No. 16	8-18	8-18	8-18
No. 30	8-18	8-18	8-18
No. 50	0-18	0-18	0-18
No. 100	0-8	0-8	0-8
No. 200	0-8	0-8	0-8

1. Maximum Nominal Size of Coarse Aggregate: CBC Section 1903 “Specifications for Tests and Materials”, and as follows:
   a. 1/5 the narrowest dimension between sides of forms,
   b. 1/3 depth of slab, or
   c. 3/4 the minimum clear spacing between individual reinforcing bars.
2. Aggregate sources shall not contain any alkali-silica reactive material in accordance with ASTM C33, Appendix XI.

C. Water: Potable and complying with ASTM C1602/C1602M.

2.3 ADMIXTURES

A. General:
   1. Manufacturer certified to contain no intentionally added chlorides.
   2. Compatible with other admixtures and cementitious materials in the concrete mix.
   3. Obtain Architect’s written acceptance prior to use of admixtures. Use admixtures according to manufacturer's written instructions.

B. Water Reducing Admixtures:
   1. Normal Range: ASTM C494/C494M, Type A.
      a. Acceptable Products:
         1) MasterPozzolith Series by Master Builders Solutions.
         2) Eucon Series by The Euclid Chemical Co.
         3) WRDA 64 by Grace Construction Products.
         4) Plastocrete 161 by Sika Corp.
         5) Or accepted equal.

2. Mid-Range Water-Reducing: ASTM C494/C494M, Type A or Type F.
    a. Acceptable Products:
        1) MasterPolyheed Series by Master Builders Solutions.
        2) Eucon Series by The Euclid Chemical Co.
        3) Duracem 55 by Grace Construction Products.
        4) Or accepted equal.
3. High Range Water-Reducing: ASTM C494/C494M, Type F or G.
    a. Acceptable Products:
        1) MasterRheobuild 1000 or MasterGlenium Series by Master Builders Solutions.
        2) Eucon Series or Plastol Series by The Euclid Chemical Co.
        3) Duracem 100 by Grace Construction Products.
        4) Sikament 10 ESL by Sika Corp.
        5) Or accepted equal.

C. Shrinkage Reducing Admixtures: Reduces dry shrinkage up to 80 percent at 28 days, and up to 50 percent at one year and beyond as tested per ASTM C157/C157M.
    1. Acceptable Products:
        a. MasterLife SRA Series or MasterLife CRA 007 by Master Builders Solutions.
        b. Eclipse Floor and Eclipse Plus by Grace Construction Products.
        c. Eucon SRA Series or Conex by The Euclid Chemical Co.
        d. Or accepted equal.

D. Retarding Admixtures: ASTM C494/C494M, Type B or Type D.
    1. Acceptable Products:
        a. MasterSet R Series or MasterSet DELVO Series by Master Builders Solutions.
        b. Eucon Retarder Series, Eucon DS, or Eucon Stasis by The Euclid Chemical Co.
        c. Or accepted equal.

E. Accelerating Admixtures: ASTM C494/C494M, Type C or Type E.
    1. Acceptable Products:
        a. MasterSet AC 534 or MasterSet FP 20 by Master Builders Solutions.
        b. Accelguard Series by The Euclid Chemical Co.
        c. Or accepted equal.

F. Workability-Retaining Admixtures: Shall retain concrete workability without affecting time of setting or early-age strength development. ASTMC494/C494M, Type S.
    1. Acceptable Products:
        a. MasterSure Z 60 by Master Builders Solutions.
        b. Plastol AMP Series by The Euclid Chemical Co.
        c. Or accepted equal.

G. Permeability-Reducing Admixtures: ASTM C494/C 494M, Type S.

1. Shall be a Portland cement-based crystalline capillary waterproofing admixture that reacts in concrete to form insoluble crystalline hydration products in the capillary pores of concrete.
2. Shall show a reduction in permeability of concrete compared to an identical concrete mixture without the admixture, when tested in accordance with CRD-C48 at a pressure of 200 psi.
3. Shall reduce or have no penetration of water compared to an identical concrete mixture without the admixture, when tested in accordance with DIN 1048 for a duration of 96 hours.
4. NSF-61 certified.
5. Acceptable Product:
    a. MasterLife 300 Series by Master Builders Solutions.

2.4 CURING MATERIALS AND SLAB TREATMENT

A. General:

1. Comply with regulations of the California Air Resources Board and the local Air Pollution Control/Air Quality Management District.
    a. VOC Limit: 350 g/L.
2. Verify compatibility with subsequent adhesives and coatings before application; furnish Manufacturer's certificate of compatibility. Coordinate with related Sections.

B. Curing and Sealing Compound: Select as appropriate for compatibility of subsequent adhesives and coatings.

1. Acrylic emulsion blend; meets or exceed ASTM C309, Type 1, Class B.
    a. Acceptable Products:
        1) MasterKure CC 160WB by Master Builders Solutions.
        2) Diamond Clear VOX by The Euclid Chemical Co.
        3) Vocomp 20 by W. R. Meadows, Inc.
        4) US SPEC Hydrasheen 15% by US Mix Products Co.
        5) Or accepted equal.

C. Waterproof Sheet Materials for Curing: ASTM C171 and as follows:

1. Curing paper consisting of two sheets of kraft paper adhered together with a bituminous material with embedded cords or strands of fiber running in both directions not more than 1-1/4 inches apart.
    a. Tensile strength in machine direction: Thirty foot-pounds per inch of width minimum.
    b. Tensile strength in cross direction: Fifteen foot-pounds per inch of width minimum.
2. Polyethylene Film: ASTM D4397; minimum six mil thickness.
3. White burlap-polyethylene sheeting: Consisting of burlap weighing not less than nine ounces per square yard extrusion coated on one side with at least four mil white opaque polyethylene sheet.

D. Evaporation Retarder: Water-based polymer concentrate, readily dilutable in water.
   1. Acceptable Products:
      a. MasterKure ER50 by Master Builders Solutions.
      b. Eucobar by The Euclid Chemical Co.
      c. US SPEC Monofilm ER by US Mix Products Co.
      d. Or accepted equal.

E. Surface Retarder: Water soluble liquid, formulated to retard wet surface of mortar in concrete.
   1. Acceptable Products:
      a. MasterFinish EA by Master Builders Solutions.
      b. Sure Etch Series by The Euclid Chemical Co.
      c. Rugasol-S by Sika Corp.
      d. Or accepted equal.

2.5 GROUTING, BONDING, AND PATCHING MATERIALS

A. Grout:
   1. Non-shrink Grout: ASTM C1107, non-metallic aggregate grout; 7000 psi minimum 28-day compressive strength at fluid water ratio per ASTM C939.
      a. Acceptable Products:
         1) MasterFlow 928 by Master Builders Solutions.
         2) NS Grout, Hi-Flow Grout, or Euco Pre-Cast Grout by The Euclid Chemical Co.
         3) US SPEC MP Grout by US Mix Products Co.
         4) Or accepted equal.
   2. Non-shrink Drypack Grout: Non-shrink, natural aggregates, 7000 psi minimum 28-day compressive strength.
      a. Acceptable Products:
         1) MasterFlow 100 by Master Builders Solutions.
         2) Dry Pack Grout by The Euclid Chemical Co.
         3) Sealtight Pac-it by W.R. Meadows, Inc.
         4) Or accepted equal.

B. Bonding Materials:
   1. Bonding Agent/Admixture:
      a. Interior or exterior applications: Acrylic or SBR, latex cement bonding agent/admixture; non-re-emulsifiable; meets or exceeds ASTM C1059, Type II.
         1) Acceptable Products:
            a) Akkro-7T, Flex-Con, or SBR Latex by The Euclid Chemical Co.
            b) US SPEC Acrylcoat by US Mix Products Co.
            c) Sealtight Acry-Lok by W. R. Meadows, Inc.
            d) Or accepted equal.

b. Interior applications or exterior applications not subject to constant water immersions: Ethyl-vinyl acetate (EVA) copolymer liquid bonding agent and admixture; re-emulsifies once and will not re-wet; meets or exceeds ASTM C1059.

1) Acceptable Products:

a) Tammsweld by The Euclid Chemical Co.

b) US SPEC Multicoat by US Mix Products Co.

c) Or accepted equal.

2. Structural Bonding Epoxy Adhesive: Two component, 100 percent solids, 100 percent reactive; meets or exceeds ASTM C881/C881M, Type II, Grade 2, Class B or C as appropriate.

a. Acceptable Products:

1) MasterEmaco ADH 1090RS, MasterEmaco ADH 1420, or MasterEmaco ADH 327RS by Master Builders Solutions.

2) Dural 452 MV by The Euclid Chemical Co.

3) Sealtight Rezi-Weld 1000 by W. R. Meadows, Inc.

4) Or accepted equal.

C. Self-Leveling Underlayment: Portland cement based, self-leveling 1 inch thick to featheredge. Fast setting – minimum compressive strength 2200 psi after one day; minimum 4000 psi compressive strength at 28 days per ASTM C109.

1. Acceptable Products:

a. K-15 Self-Leveling Underlayment Concrete by ARDEX Engineered Cements.

b. MasterTop 110 SL by Master Builders Solutions.

c. Flo-Top or EucoFloor SL 160 by The Euclid Chemical Co.

d. US SPEC Self-Leveling Underlayment by US Mix Products Co.

e. Or accepted equal.

D. Repair Mortar: Exceeds ASTM C928, R1 and R2; rapid setting – minimum 1300 psi at three hours; 5500 psi at seven days per ASTM C109.

1. Acceptable Products:

a. MasterEmaco T 415/430 or MasterEmaco T 1060/1061 Repair Mortars by Master Builders Solutions.

b. Euco-Speed, Versaspeed, or Speedcrete 2028 by The Euclid Chemical Co.

c. US SPEC Transpatch by US Mix Products Co.

d. Or accepted equal.

E. Repair Mortar (for patching over steel): Liquid polymer modified, containing an integral corrosion inhibitor, exceeds C928, R2; rapid setting – minimum compressive strength 1500 psi at one day; 3500 psi at seven days; 5000 psi at 28 days per ASTM C109.

1. Acceptable Products:

a. MasterEmaco N 420CI or MasterEmaco T 310CI by Master Builders Solutions.

b. Concrete-Top Supreme by The Euclid Chemical Co.

c. US SPEC H2 by US Mix Products Co.

d. Sikatop 122 Plus by Sika Corp.

e. Or accepted equal.

F. Epoxy Joint Filler: Two component, 100 percent solids, semi-rigid epoxy; hardness: minimum 75 Shore A per ASTM D2240.

1. Acceptable Products:

a. MasterSeal CR 190 by Master Builders Solutions.

b. Euco 700 by The Euclid Chemical Co.

c. Sikadur 51 NS by Sika Corp.

d. Or accepted equal.

G. Polyurea Joint Filler: Two component, 100 percent solids, UV resistant, semi-rigid polyuria; hardness: minimum 80 Shore A per ASTM D2240. Color as selected by Architect from manufacturer's full range of standard colors.

1. Acceptable Products:

a. Euco QWIKjoint UVR by The Euclid Chemical Co.

b. MasterSeal CR 100 by Master Builders Solutions.

c. Or accepted equal.

2.6 CONCRETE MIX

A. General:

1. Proportion concrete design mixes per ACI SPEC-301 Section 4.2.3 and ACI CODE-318 Section 26.4.3.

2. Proportion concrete design mixes per ACI, prepared and tested by an independent testing laboratory acceptable to Architect prior to design mix approval. For each mix design, prepare and perform tests as follows:

a. Drying shrinkage test per modified ASTM C157/C157M as specified in this Section; provide at least three test specimens. Drying shrinkage test not required for below grade concrete.

3. Proportioning without field experience or trial mixtures may be permitted with written approval from Architect, where concrete manufacturer can establish the uniformity of its production for concrete of similar type and strength based on recent test data in accordance with ACI CODE-318, Chapter 26, Article 26.4.4 "Documentation of Concrete Mixture Characteristics".

4. Proportion concrete design mix to attain compressive strength as specified below and as needed, with early strength to meet Contractor's work program.

B. Mix Designs: Refer to Structural Drawings for mix design requirements.

1. Maximum Water Content: 300 pounds per cubic yard.

2. Water- Cementitious Materials Ratio: Refer to Drawings.

3. Maximum Drying Shrinkage: 0.048 percent as tested per modified ASTM C157/C157M as specified in this Section after 7 days moist curing plus 21 days drying. This requirement does not apply to below grade concrete.

C. Admixtures:

1. Use specified admixtures as acceptable to Architect. Verify compatibility of concrete admixtures when using multiple admixtures.

2.7 CONCRETE MIXING

A. Concrete shall be mixed per ACI PRC-304.

2.8 SOURCE QUALITY CONTROL

A. Owner shall employ a testing laboratory accepted by Architect to perform the following:

1. Review mix designs and certificates of compliance for materials Contractor proposes to use.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine and verify the following prior to concrete placement.

1. Forms are erected, adequately braced, sealed, lubricated (if required), and bulkhead provided where placing is to stop.
2. Thoroughly water soak wood forms other than plywood at least twelve hours before concrete placement.
3. Steel reinforcement are accurately positioned, securely tied and braced. Verify concrete cover requirements.
4. Coordination with related work is completed.
5. Anchors and embedded items are in position, securely held and braced.
6. Construction joints and previously placed concrete are prepared as specified.
7. Compliance with cold-weather or hot-weather requirements.
8. Compliance with cleaning and preparation requirements.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

C. Concrete formwork, reinforcement, inserts, and embedded items are subject to Architect's acceptance. Notify Architect at least 48 hours prior to concrete placement.

3.2 PREPARATION

A. Refer to Section 03 20 00 for reinforcing steel preparation.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI SPEC-301 and as specified in this Section.

1. Concrete construction tolerances shall be per ACI SPEC-301.

B. Add no water during delivery and at the project site unless specifically accepted by Architect. If water is withheld at batch plant, indicate in delivery ticket the design water for accepted mix, moisture content of aggregates, and free water added at batch plant. If total water added at plant is less than design water to attain slump of accepted mix design, water may be added to concrete at job site, not to exceed the design water content, subject to the limitations specified in ASTM C94/C94M. If additional slump is required, use water reducing admixture.

C. Discharge mixed concrete within 1-1/2 hours after the introduction of mixing water to the cement and aggregates. Reduce this time to 45 minutes when the concrete temperature exceeds 85 degrees F, unless appropriate measures as specified in ACI SPEC-305.1 are taken to maintain slump and temperature of concrete. Slump and concrete temperature can be maintained within limits longer with the use of retarding admixtures or hydration-control admixtures.

D. Place concrete within fifteen minutes after it has been discharged from the mixer. Handle concrete from mixer to forms in a continuous manner.

E. Deposit concrete as close as possible to its final position in the forms, with no vertical drop greater than five feet except where suitable equipment is provided to prevent segregation and where specifically authorized.

F. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If concrete cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

G. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.

H. Pumping concrete, when specifically accepted, may be conveyed by positive displacement pump such as piston or squeeze pressure type; pneumatic placing equipment is not permitted. Use rigid steel pipe or heavy-duty flexible hose with an inside diameter at least three times the nominal maximum-size coarse aggregate, but not less than 4 inches. Aluminum pipe is not allowed.

I. Provide adequate scaffolding, ramps and walkways in a manner so that personnel and equipment are not supported by in-place reinforcement.

J. Consolidation: Consolidate placed concrete with mechanical vibrating equipment per ACI SPEC-301.

   1. Consolidate each layer of concrete immediately after placing using internal vibrators, except for slabs 4 inches thick or less.

   2. Insert and withdraw vibrators vertically at uniformly spaced location no farther than the visible effectiveness of the vibrator. Hold vibrator stationary and slowly withdraw vertically while operating.

   3. Do not use vibrators to transport concrete inside forms.

   4. Place vibrator to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers that have begun to lose plasticity. Limit vibration duration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

K. Concrete Floors and Slabs: Deposit and consolidate concrete for floors and slabs in a continuous operation within limits of construction joints until placement of a panel or section is complete.

1. Consolidate concrete during placement so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope exterior surfaces for drainage as directed, unless otherwise shown.

L. Hot Weather Concreting: Place concrete according to ACI SPEC-305.1 and as follows:

1. Cool components before mixing to maintain concrete temperature below 85 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature. Calculate and include water equivalent of ice in designed water cement ratio.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
4. Protect concrete from surface drying; moisture loss from concrete in plastic state shall be maintained below 0.1 pounds per square foot per hour. Methods may include, but are not limited to: evaporation retardant, sun shades, wind breaks, and fog misting.

M. Cold Weather Concreting: Place concrete according to ACI SPEC-306.1 and as follows:

1. Protect concrete work from physical damage or reduced strength as a result of frost, freezing, or low temperatures.
2. When ambient temperature is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 75 degrees F.
3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade.
4. Do not incorporate calcium chloride, salt or other materials containing antifreeze agents into the concrete mix.
5. Upon Architect’s written acceptance and subject to prior approval of mix design, accelerating admixtures, containing no calcium chloride, as specified in this Section may be used.

3.4 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete, unless otherwise indicated on Drawings.

B. Construction Joints: Locate and install joints as indicated on Drawings or as accepted by Architect, and in a manner that strength and appearance of concrete are not impaired.

1. Comply with ACI CODE-318.
2. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.

3. Expose concrete aggregates, a minimum of 1/4 inch depth, creating a rough surface using a surface retardant. Within 24 hours after placing concrete, remove retarded surface mortar using either high pressure water jetting or stiff brushing or a combination of both to expose coarse aggregate. A rough surface of exposed aggregate may also be produced by sandblasting followed by high pressure water jetting.
4. Where new concrete joins existing concrete (concrete more than sixty days old), clean and roughen existing concrete to expose coarse aggregate. Coat with epoxy bonding compound prior to placing new concrete.

3.5 FORMED SURFACES FINISHING

A. Leave texture imparted on formed concrete surface, unless otherwise specified, except that defective surfaces shall be repaired. Repair defective concrete as specified in this Section.

B. Maintain uniform color of the concrete, unless painting of surfaces is required, by using only one mixture without changes in material or proportions for any structure or portion of structure exposed to public view.

3.6 CONCRETE FLOORS AND SLABS FINISHING

A. Comply with ACI PRC-302.2 and as specified in this Section. Comply with flatness and levelness tolerance requirements of this Section.

B. Trowel Finish:
1. After floating is complete and after surface moisture has disappeared, apply trowel finish using a power-driven trowel or hand trowel if area is small or inaccessible to power-driven trowel.
2. Steel trowel to a smooth, even, dense finish, free of blemishes including trowel marks.
3. Apply final steel troweling by hand.

C. Broom Finish:
1. After floating, lightly trowel surface and then carefully score by pulling a broom across the surface. Use appropriate type of broom to achieve texture specified.
2. Broom as indicated or as directed by Architect. Where not specifically indicated, broom transverse to traffic or at right angles to the slope of the slab.
3. Adding water to facilitate brooming is not permitted.
4. Exterior ramps, walks, and slabs: Apply a slip-resistant finish as follows:
   a. Where slope is six percent or greater: Heavy broom finish with at least 0.8 coefficient of friction per ASTM E303.
   b. Where slope is less than six percent: Medium broom finish with a minimum 0.6 coefficient of friction per ASTM E303.

D. Floor and Slab Flatness and Levelness Tolerance: Determine flatness and levelness of floor slabs using the F-Number System in accordance with ASTM E1155 using the inch-pound system of units. Calculate F-Numbers as follows:
1. Definitions:
   a. Face Flatness Number (F_F): The maximum slab curvature allowed over 24 inches computed on the basis of successive 12 inch elevation differentials.

b. Face Levelness Number (F_L): The relative conformity of the slab surface to a horizontal plane as measured over a ten foot distance.

2. These floor flatness and floor levelness tolerances apply to concrete slabs-on-ground. At raised slabs, only the floor flatness tolerance applies.
3. Sampling Requirements: As described in ACI SPEC-117.
4. Calculations:

$$F_F = \frac{4.57}{\text{Maximum difference in elevation (in decimals of inches) between successive 12 inch elevation differences.}}$$

$$F_L = \frac{12.5}{\text{Maximum difference in elevation (in decimals of inches) between two points 10 feet apart.}}$$

5. Tolerances, unless noted otherwise:
   a. Trowel finish surfaces on ground: F_F 25; F_L 20 (overall tolerance values).
   b. Float finish surfaces on ground: F_F 20; F_L 17 (overall tolerance values).
   c. Float finish surfaces at roof: F_F 20; F_L 17 (overall tolerance values).
   d. Trowel finish surfaces for concrete fill over steel deck **and elevated structural concrete slabs**: F_F 25.
      1) Depressions in floors between high spots shall not be greater than 5/16 inch below a 10 foot long straight edge.
      2) Top of concrete surface elevation shall not vary by more than ±3/4 inch from the average elevation.
   e. Minimum local tolerance (1/2 bay or as designated by Architect): 2/3 of specified tolerance values.
6. Refer to Article 3.9 of this Section for remedial work required for out-of-tolerance concrete.

3.7 CURING AND PROTECTION

A. Protect freshly placed concrete from premature drying, rapid temperature change, mechanical injury, and injury from flowing water for a curing period not less than seven days. Comply with ACI SPEC-306.1 for cold-weather protection and ACI SPEC-305.1 for hot-weather protection during curing.

B. Curing Methods:
   1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. If curing compound is applied using a hand held, pump-up sprayer, it shall be back-rolled using a short nap roller.

2. Moist Curing: Keep surfaces in a moist condition for not less than seven days using water saturated absorptive cover (burlap-polyethylene sheeting) kept wet continuously. Cover concrete completely in widest practicable width, with sides and ends lapped at least 12 inches, and sealed with waterproof tape or adhesive. Immediately repair and maintain rips and tears and keep traffic away from surface during curing period.
3. Ponding or Immersion: Continuously immerse concrete throughout the curing period in water not more than twenty degrees below the temperature of the concrete.

C. Concrete in Forms: Keep forms and exposed concrete surfaces covered and continuously moist. Provide soaker hoses at top of walls or other accepted means of keeping concrete and forms wet while forms remain in place. If forms are removed before end of curing period, continue curing by methods described in this Section.

D. Floors and Slabs:

1. Evaporation Retarder: Apply evaporation retarder to floors and slabs if hot, dry, or windy conditions cause moisture loss of 0.1 pounds per square foot per hour before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
2. Cure by application of curing and sealing compound or by moist curing.
3. Begin curing as soon as free water has disappeared from the concrete surface after placing and final finishing.

E. Protection:

1. Protect concrete surfaces from damage by tools, equipment, materials, and construction activity.
2. Traffic, shoring, or loading will not be permitted on concrete surface until it has sufficiently hardened to prevent injury to finish and strength.
3. Protect all flat work and other surfaces as required with full board of plywood coverings as necessary.

3.8 REMOVAL OF FORMS

A. Formwork for sides of curbs and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 48 hours after placing concrete provided concrete is hard enough not to be damaged by form-removal operations and provided curing and protection operations are maintained.

3.9 CONCRETE REPAIRS

A. General: Comply with ACI SPEC-301 as follows:

1. Completed concrete work shall conform to applicable requirements of this Section and Contract Documents.
2. Concrete work that fails to meet one or more requirements of the Contract Documents but subsequently is repaired to bring the concrete into compliance will be acceptable.
3. Concrete work that fails to meet one or more requirements of the Contract Documents and cannot be brought into compliance with the Contract Documents is subject to rejection.

4. Repair rejected concrete work by removing and replacing or by additional construction to strengthen or otherwise satisfy project requirements as directed by Architect. To bring rejected Work into compliance, use repair methods that meet applicable requirements for function, durability, dimensional tolerances, and appearance as determined by Architect.
5. Submit proposed repair methods, materials, and modifications needed to repair concrete work to meet the requirements of the Contract Documents.
6. Contractor shall be responsible to bring concrete work into compliance with requirements of Contract Documents.

B. Defective Concrete: Repair and patch defective concrete work and concrete not conforming to required lines, details, and elevations. Use materials and methods specified in this Section as accepted by Architect. Serious defects, defects affecting structural strength, or unsatisfactory patching may be cause for complete removal and replacement of concrete.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycomb, rock pockets, and voids more than 1/2 inch in any direction in solid concrete. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with drypack grout before bonding agent has dried.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, repair mortar will match surrounding color. Patch a test area at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed, formed surfaces that affect concrete’s durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness.
1. Repair defective finished surfaces including spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced section regardless of width, and other objectionable conditions.
2. After concrete has cured fourteen days, correct high spots by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish areas to blend into adjacent concrete.
4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surface in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete. Place, compact, and finish to blend with adjacent finished concrete.

5. Repair random cracks and single holes 1 inch or less in diameter with drypack grout. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place drypack grout before bonding agent has dried. Compact and finish grouted areas to match adjacent concrete.

E. Moist cure patches and repairs for at least 72 hours.

F. Perform concrete structural repairs subject to Architect's acceptance.

3.10 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. Testing Service: Owner will select and pay for independent testing agency.

C. Strength Test Specimen Cylinders: Conduct sampling, curing, and testing per ASTM C172, ASTM C31/C31M, and ASTM C39/C39M. Contractor shall provide molds required for strength test cylinders. Test samples shall be taken at the point of concrete placement.

1. Frequency: Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls.
2. A strength test shall be the average of the strengths of at least two 6 inch by 12 inch cylinders or at least three 4 inch by 8 inch cylinders made from the same sample of concrete and tested at the test age designated for the determination of concrete compressive strength.
3. Cylinder Label and Records: Mark and date each test cylinder. Maintain records of test specimen cylinders and send copies to Contractor, Architect, and Owner. Record the following information:
    a. Cylinder identification mark.
    b. Date made.
    c. Concrete supplier.
    d. Slump/slump flow.
    e. Specified concrete design strength.
    f. Pour location and type of structural member.
    g. Compressive strength test date and age.
    h. Admixtures added to concrete mix.
4. Compressive Strength Tests: Test laboratory cured specimens at the following ages and report compressive strengths as follows:
    a. 7 days where early compressive strength is required.
    b. 28 days.
    c. 56 days when concrete with SCM is used.
    d. Hold specimens for one strength test in reserve.
5. Test Reports: Furnish copies of test reports directly from testing agency to Contractor, Architect, Project inspector, and Owner.

D. Slump Test: ASTM C143/C143M. Conduct slump testing when test cylinders are made and additionally for every 150 cubic yards of concrete. Perform additional tests when concrete consistency appears to change. Slump not meeting slump indicated in accepted mix design (± one inch) will be rejected. Contractor shall provide slump cones.

E. Density: ASTM C138/C138M. Conduct density testing when test cylinders are made.

F. Concrete Temperature: ASTM C1064/C1064M. Check concrete temperature when test cylinders are made and every hour when ambient temperature is below 40 degrees F or above 90 degrees F.

G. In the event the cylinders tested do not meet the required concrete design strength, conduct core tests and additional tests or inspections as required by Architect to ascertain strength of placed concrete. Costs for additional tests and inspections shall be borne by Contractor.

H. Floor Flatness/Levelness: Provide verification of Floor and Slab Flatness and Levelness as indicated in Article 3.6.E of this Section. Furnish copies of report directly from testing agency to Contractor, Architect, Project Inspector, and Owner.

END OF SECTION

Concrete Mixture Design Submittal Checklist

☐ Specify Use: All mix designs must clearly note the concrete type or use. (i.e. footings, slab on grade, site concrete)

☐ Mix Design: Provide concrete mixture designs with proportions and characteristics including all admixtures.

☐ Gradation: Provide combined aggregate gradation by weight for all course and fine aggregates.

☐ Weight: Provide dry unit weight of mix. Normal weight concrete shall be limited to 145 PCF.

☐ Material Certificates: Provide supplier's certification that materials conform to specifications. This includes aggregates, admixtures, and cementitious materials such as cement, fly ash, silica fume, slag cement, and metakaolin.

☐ Product Data: Provide product literature for each product and admixture used. Include manufacturer's specification, written instructions, and installation procedures.

☐ Required SCM: Mix design must contain the percentage of supplementary cementitious materials noted in mix design table of the specifications.

☐ Admixtures: Where multiple admixtures are used, provide a letter from all manufacturers indicating there are no compatibility problems or adverse effects resulting from combination of products.

☐ Shrinkage: Provide shrinkage test per modified ASTM C157/C157M at 21 days. Shrinkage test must be for the same mix specified or a similar mix with the same water cement ratio and aggregate source. (Exception: shrinkage testing is not required for below grade concrete)

☐ Testing / Proportion Method: Concrete must be proportioned per the requirements of ACI SPEC-301-20. Indicated method used and provide complete test data and documentation for the chosen proportion method.

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing and support members.

B. Base plates.

C. Grouting under base plates.

1.2 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcing.

B. Section 03 30 00 – Cast-In-Place Concrete.

C. Section 05 31 00 – Steel Decking.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AISC 303-16 – Code of Standard Practice for Steel Buildings and Bridges.
2. ANSI B18.22.1 – Plain Washers.
3. ANSI B18.23.1 – Beveled Washers.
4. ASTM A6/A6M – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
5. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
6. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
7. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
8. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
9. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
10. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.

12. ASTM A572/A572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
14. ASTM A992 – Standard Specification for Structural Steel Shapes.
15. ASTM F436 – Standard Specification for Hardened Steel Washers.
16. ASTM F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
17. ASTM F959 – Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
18. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
19. ASTM F3125 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat-Treated, 120/150 ksi Minimum Tensile Strength.
20. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.
21. AWS D1.1 – Structural Welding Code – Steel.
22. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
23. AWS D1.8 – Structural Welding Code – Seismic Supplement.
24. AWS D2.0 – Specifications for Welded Highway and Railway Bridges.
25. RCSC – Specification for Structural Joints Using High Strength Bolts.
26. SSPC – Steel Structures Painting Manual, Volumes 1 and 2.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings:

1. Pages of electronic submittals shall be labeled and bookmarked. Bookmark naming shall match the naming of corresponding shop drawing sheets.
2. Indicate profiles, sizes, spacing, and locations of structural members, attachments, fasteners, and required connections, including connections not detailed on Drawings.
3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
4. Clearly distinguish between shop and field bolts and welds.

C. Manufacturer's Mill Certificate: Submit Manufacturer's Certificates under provisions of Division 01, certifying that steel, fasteners and welding electrodes meet or exceed specified requirements.

D. Mill Test Reports: Submit Manufacturer's Reports under provisions of Division 01, indicating structural strength, destructive and non-destructive test analysis and ladle analysis.

E. Submit product data for type of metal primer proposed for use.

F. Welders' Certificates: Submit certificates under provisions of Division 01, certifying welders employed on the Work, verifying AWS qualifications within the previous twelve months.

1. Welders who have not performed welding for period of three or more months shall be requalified.
2. Welders whose work fails to pass inspection shall be requalified before performing further welding.
3. Contractor shall pay costs of certifying qualifications.

G. Welding Procedures: Submit proposed Welding Procedure Specifications (WPS). Where WPS is not prequalified by AWS D1.1, submit supporting Performance Qualification Records (PQR).

H. Qualification Data: For qualified Fabricator and Installer.

1.5 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, Code of Standard Practice for Steel Buildings and Bridges.

B. Seismic-Force-Resisting System: Elements of structural-steel frame designated as "SFRS" or along grid lines designated as "SFRS" on Drawings, including columns, beams, and braces and their connection.

C. Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Force-Resisting System and which are indicated as "Demand Critical" on Drawings.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with the AISC Specification for Structural Steel Buildings, Code of Standard Practice for Steel Buildings and Bridges and Quality Criteria and Inspection Standards.

B. Fabricator Qualifications: Company specializing in performing the work of this Section with sufficient documented experience.

C. Installer (Erector) Qualifications: Company specializing in performing the work of this Section.

1.7 REGULATORY REQUIREMENTS

A. Conform to 2022 California Building Code (CBC), Chapter 16 “Structural Design”, Chapter 22 “Steel", and Chapter 17 “Special Inspections and Tests”.

B. Materials:

1. Material identification per CBC Chapter 22, Section 2202.1.
2. Protection of structural steel per CBC Chapter 22, Section 2203.1.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

B. Coordinate fabrication and delivery of structural steel items with concrete work and with all other trades to permit such items to be built into the structure without delay.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials to be Installed Under Other Sections: Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete construction shall be delivered to the project site in time to be installed before start of cast-in-place concrete operations.

B. Storage of Materials:

1. Structural steel members to be stored at the Project site shall be placed above ground, on platforms, skids or other supports.
2. Steel shall be protected from corrosion.
3. Other materials shall be stored in a watertight, dry place until ready for installation in the Work.
4. Packaged materials shall be stored in their original package or container.
5. Do not store materials on the structure in a manner that might cause distortion or damage to members of supporting structures. Repair or replace damaged materials or structure as directed by Architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Structural Steel Members:

1. ASTM A992 Grade 50 for wide flange and WT shapes.
2. ASTM A36/A36M or A572 Grade 50 for plates, as noted on Drawings.
3. ASTM A36/A36M for channels, angles and all other shapes.

B. HSS:

1. Tubing: ASTM A500, Grade C.
2. Round: ASTM A500, Grade C.

C. Pipe: ASTM A53/A53M, Type E or S, Grade B.

D. Bolts and Nuts: ASTM A307, Grade A, with ASTM A563, Grade A, hex nuts; ASTM F3125, Grade A325N, Type 1, with ASTM A563, Grade C, heavy hex nuts; anchor bolts, ASTM F1554, grade as indicated on Drawings.

E. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts.

F. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers, plain.

G. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125, Type 1, heavy hex head or round head steel structural bolts with splined ends; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

H. Welding Materials:

1. Typical Weld Locations: AWS D1.1; type required for materials being welded.
2. SFRS and Demand Critical Welds: AWS D1.8; filler metal shall be classified as low hydrogen and shall have a minimum Charpy V-notch toughness of twenty foot-pounds at minus 50 degrees F for SFRS welds and forty foot-pounds at 20 degrees F for Demand Critical Welds as determined by AWS classification or manufacturer certification. Demand critical weld material shall also meet heat input testing requirements of AWS D1.8, Clause 6.3.

I. Circular washers for common bolts: ASTM F844, Type A, and ANSI B18.22.1.

J. Beveled washers for common bolts: ANSI B18.23.1.

K. Washers for high strength bolts: Direct tension indicator. ASTM F959 hardened circular, beveled and clipped, ASTM F436.

L. Post-Installed Concrete Anchors: ICC approved, as indicated and manufactured by Hilti or accepted equal.

M. Eye Bolts and Nuts: ASTM A108, Grade 1030, cold-finished carbon steel.

N. Sleeve Nuts: ASTM A108, Grade 1018, cold-finished carbon steel.

O. Welded Headed Stud Anchors: ASTM A108. Welding, testing and inspection shall be in accordance with AWS D1.1.

P. Steel Shop and Touch-Up Primer: TNEMEC Series 115 Uni-Bond DF or accepted equal.

Q. Shop and Touch-Up Zinc Rich Primer for Galvanized Surfaces: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Phone: (800) 831-3275, or accepted equal.

R. Weld filler material: All weld filler material shall have a minimum tensile strength of 70 KSI per AWS D1.1, latest edition approved by code enforcement agency.

S. Reinforcing Steel: Refer to Section 03 20 00.

2.2 FABRICATION

A. General: Fabricate items of structural steel in accordance with AISC specifications and as indicated on Drawings. Fabrication tolerances shall be reduced as required for acceptance of subsequent work. Properly mark and match-mark all materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling.

1. Welded splicing of structural members may be done only upon written acceptance by Architect, unless otherwise indicated on Drawings. Splicing shall be thoroughly examined by a nondestructive means at Contractor's expense. Inspection shall be made by a recognized and approved testing laboratory; procedure, technique and standards of acceptance shall conform to Appendix E of AWS Standard D2.0-69. Correct faulty welds and re-examine in a manner specified for original welds.

B. Welded Construction:

1. Weld in accordance with AISC using manual shielded arc method or flux cored arc method in accordance with AWS D1.1 and AWS D1.8. Groove welds shall be complete joint penetration welds, unless specifically designated otherwise on Drawings.
2. Remove back-up plates for complete joint penetration welds when specifically requested by testing laboratory to perform non-destructive testing. Remove at no cost to Owner.
3. Weld reinforcing steel in accordance with AWS D1.4 and using prequalified procedures.

C. Connections:

1. Weld or bolt shop connections as indicated.
2. Bolt field connections except where welded or other connections are indicated. Provide unfinished threaded fasteners only where noted on Drawings and for temporary bracing to facilitate erections.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for the passage of work through steel framing members as indicated. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work. Cut, drill or punch holes perpendicular to metal surfaces. Thermally cut holes are only permitted at anchor rod holes.

2.3 FINISHES

A. Prepare structural component surfaces in accordance with SSPC SP-2 at concealed locations and SSPC SP-6 at exposed locations. Provide Class “A” (clean mill scale) contact surfaces per RCSC 2016 at high-strength bolted connections.

B. Do not prime surfaces in direct contact with concrete, where field welding is required, or contact surfaces of steel-to-steel connections. Provide Class “A” or better contact surfaces at steel connections per RCSC Specification for Structural Joints Using High Strength Bolts, latest edition.

C. All exposed interior steel shall be primed with shop primer unless otherwise noted.

1. Primer shall be applied in one coat, to meet or exceed the minimum mil thickness required by the primer manufacturer.

D. All un-exposed, concealed, or enclosed interior or exterior steel requires no finish.

E. All exposed exterior steel shall be galvanized unless otherwise noted.

1. Galvanize in accordance with ASTM A123/A123M, designated steel items. Provide minimum 1.25 ounce per square foot galvanized coating.
2. At galvanized members, touch-up all welds with zinc-rich primer.

F. Column Bases: Column bases and base plates shall be finished in accordance with the following requirements:

1. Steel bearing plates 2 inches or less in thickness are permitted without milling provided a smooth and notch-free contact bearing surface is obtained. Steel bearing plates over 2 inches but not over 4 inches in thickness are permitted to be straightened by pressing or, if presses are not available, by milling for bearing surfaces, except as stipulated in subparagraphs (2) and (3) below, to obtain a smooth and notch-free contact bearing surface. Steel bearing plates over 4 inches in thickness shall be milled for bearing surfaces, except as stipulated in subparagraphs (2) and (3) below.
2. Bottom surfaces of bearing plates and column bases that are grouted to ensure full bearing contact on foundations need not be milled.
3. Top surfaces of bearing plates need not be milled when complete-joint-penetration groove welds are provided between the column and the bearing plate.

2.4 TESTING AND INSPECTION

A. General: Owner will engage and pay a testing agency to perform the following services:

1. Review manufacturer's certificates and check heat numbers and that the steel is properly identified in accordance with CBC Section 2202 “Identification of Steel for Structural Purposes”.
2. Testing of unidentified materials or as directed by Owner.
3. Provide inspection per CBC Sections 1705.2 and 1705.13.
4. Provide testing per CBC Section 1705.14.
5. In the event an examination discloses faulty welds and additional tests are required to fully examine the welds, the cost of the additional tests shall be paid for by Owner and back-charged to Contractor.
6. All defective welds shall be repaired and tested at no expense to Owner.
7. Perform any physical tests of structural steel as required by Architect. Perform ultrasonic tests on members as determined by Architect to determine if delamination defects in steel members are evident.
8. High-strength bolting testing and inspection shall conform to the following requirements:
    a. Perform pre-installation verification of pretensioned bolts per RCSC Section 7.1 for the selected pretensioning method.
    b. Inspect bolted joints per RCSC Section 9 and CBC Section 1705.2.1.
    c. All fasteners failing to meet the specified tension shall be examined to determine the cause of failure and re-tested.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

C. Bolts shall be clean and free of grease, oil and all other deleterious substances.

3.2 ERECTION

A. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of permanent bracing.

B. Field weld components indicated on shop drawings.

C. Do not field cut or alter structural members without acceptance of Architect.

D. After erection, prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.

E. Setting Base Plates:

1. Clean concrete bearing surfaces and roughen to improve bond. Clean the bottom surface of base plates.
2. Set loose and attached base plates for structural members on adjusting nuts at anchor bolts. All anchor bolts shall have double nuts for adjusting.
3. Tighten anchor bolts after the supported members have been positioned and plumbed. Do not remove adjusting nuts.
4. Place non-shrink grout solidly between surfaces as shown to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow non-shrink grout to cure.

F. Structural steel work shall be set accurately at established lines and levels. Steel shall be plumb and level before final bolting or welding is commenced and after complete erection. All cutting, notching, coping, etc., required for proper assembly and fitting of parts and members, shall be done by the steel fabricator. Such workmanship shall be equal in quality to shop work.

1. Coordinate the erection of structural steel with other trades and locate temporary guys, braces, falsework and cribbing as may be necessary for erection so as not to interfere with the progress of other work.
2. Rolled sections, except for minor details, shall not be heated except for welding operations.
3. Upon acceptance by Architect, gas cutting may be permitted if the metal being cut is not highly stressed during the operation. Stresses shall not be transmitted through a flame cut surface unless such surfaces are cut by a mechanically guided torch. The radius of re-entrant flame cut fillets shall be as large as possible, but not less than 1 inch. To determine the net area of members so cut, 1/8 inch shall be deducted from the flame cut edges not made by a mechanically guided torch. Gas cuts shall be smooth and regular. Holes for bolts shall not be cut with a torch.
4. All contact surfaces shall be cleaned before assembly.
5. Provide setting diagrams and templates as required. Placement of beam connectors shall be the responsibility of structural steel fabricator.
6. Splice members only where indicated.

G. Connections shall be as specified hereinbefore under "Fabrication." In addition, bolted connections shall conform to the following requirements:

1. Beveled washers shall be used under all bolt heads and nuts where they rest on beveled surfaces.

2. Connectors shall have hexagon heads and nuts.
3. Nuts shall be drawn up tight. Check threads of unfinished bolts with chisel or approved self-locking nuts.
4. Bolts that have been completely tightened shall be marked with identifying symbol.
5. High-strength bolted construction: Install high-strength threaded fasteners in accordance with RCSC Specification for Structural Joints Using High-Strength Bolts. All high strength bolts shall be pretensioned, unless specifically noted otherwise. Pretensioning shall be by one of the methods permitted in RCSC Section 8.2.

H. Framing shall be carried up true and plumb. Temporary bracing shall be introduced wherever necessary to take care of all loads to which structure may be subjected, including erection equipment and its operation. Such bracing shall be left in place as long as may be required for safety. It shall finally be removed by Contractor as part of his equipment. As erection progresses, the work shall be securely connected to take care of all dead load, lateral loads and erection stresses. No final bolting or welding shall be done until the structure has been properly aligned.

3.3 ERECTION TOLERANCES

A. Level and plumb steel within the tolerances defined in the AISC Code of Standard Practice, latest edition. Erection tolerances shall be reduced as required for acceptance of subsequent work.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint as specified or according to ASTM A780, and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, abraded surfaces of prime-painted joists and accessories, and abutting structural steel.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

3.5 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from premises.

END OF SECTION

SECTION 05 31 00

STEEL DECKING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel decking and accessories:

B. Framing for openings up to and including 24 inches.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 05 12 00 – Structural Steel Framing.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Steel Members.
2. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
4. AWS D1.1 – Structural Welding Code – Steel.
5. AWS D1.3 – Standard Welding Code – Sheet Steel.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate decking plan, dimensions, sizes, support locations, projections, openings and reinforcement, pertinent anchoring details and accessories. Coordinate with other trades in accurately locating and detailing openings and penetrations.

C. Product Data: Provide deck profile characteristics and dimensions, structural properties, finishes and accessories.

D. Manufacturer's Installation Instructions: Indicate specific installation sequence and special instructions.

E. Certificates:

1. The manufacturer's certification and fire test reports to document that deck assemblies comply with requirements of this Section.
2. Furnish certification by approved testing agency for each welder employed.

1.5 PERFORMANCE REQUIREMENTS

A. Steel decking and section properties shall comply with AISI S100.

B. Profile and design of deck units and accessories shall conform to the details shown on Drawings. Units shall be one piece, unless indicated otherwise.

C. Steel decking and its installation shall meet the requirements of 2022 California Building Code (CBC).

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

1.7 TESTS AND INSPECTIONS

A. Furnish test specimens of materials when they are requested. Welded decking in place is subject to inspection and testing per CBC Chapter 17 “Special Inspections and Tests”, Section 1705 “Required Special Inspections and Tests”.

1. Expense of removing and replacing any portion of decking for testing purposes will be borne by Owner if installation is found to be satisfactory. All portions of the work found to be defective and not in conformity with contract requirements shall be removed and replaced at no cost to Owner.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 for testing indicated.

B. Welding: Qualify procedures and personnel according to AWS D1.3.

C. Installer: Company specializing in performing work of this Section.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Store decking on dry wood sleepers; slope for positive drainage. Work showing creases, burrs in cells, deformation, weathering, or other defects affecting its use or appearance in exposed locations will not be accepted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Basis-of-Design: ASC Steel Deck, West Sacramento, CA; 916-372-6851, www.ascsd.com; per evaluation agency reports as follows:

a. IAPMO Evaluation Report No. ER-0161 for bare steel deck.

b. IAPMO Evaluation Report No. ER-0329 for concrete-filled steel deck.

B. Substitutions: Under provisions of Division 01 with valid Evaluation Agency Report.

1. Substitution requests for steel decking shall consider the vertical and lateral load capacities of final system, including attachments. Provide a comparison summary of proposed and specified deck systems showing that the proposed system has equal or greater vertical and lateral load capacities for all conditions shown on Drawings. Systems with lower load capacities will not be acceptable.

2. Substitution requests will require review by the Structural Engineer of Record and Authority Having Jurisdiction (AHJ). Cost for such reviews shall be borne by Contractor.

3. Do not submit shop drawings with substituted decking manufacturer until decking manufacturer has been accepted via substitution request process.

2.2 MATERIALS

A. Sheet Steel for Bare Deck: ASTM A653/A653M, SS designation, Grade 40 (minimum yield 38 KSI); zinc coated conforming to ASTM A653/A653M, G185, unless noted otherwise. Refer to Drawings for types and sizes of steel decking.

B. Sheet Steel for Composite Deck: ASTM A653/A653M, SS designation, Grade 40 for 3 inch Type “W” and “WF” deck profiles (minimum yield 40 KSI); zinc coated conforming to ASTM A653/A653M, G185, unless noted otherwise. Refer to Drawings for types and sizes of steel decking.

C. Welding Materials: Conform to AWS D1.1 and D1.3, with a minimum 60 KSI filler metal yield strength.

D. Shop and Touch-Up Zinc Rich Primer for Galvanized Surfaces: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Marshfield, MA; 800-831-3275, www.zrcworldwide.com, or accepted equal.

E. Steel Decking and Design: Steel decking shall be metallic coated with interlocking side lap. Deck types and minimum structural properties shall be as indicated on Drawings. Submit Evaluation Agency Reports that demonstrate compliance with design requirements.

2.3 FABRICATION

A. Fabrication: All steel decking units shall be roll-formed to assure uniformity and strength.

B. Allowable Tolerances: Maximum variation in unit alignment 1/4 inch in 40 feet (1/1920).

C. Workmanship: All work shall be neat, trim, true to line and upon completion shall present a true finished surface of specified deck profile, free of dents, deformations, creases, weld spatter or other noticeable defects. Steel deck permanently exposed to view shall be manufactured, handled, and transported for “exposed” installation.

D. Reinforcement: Provide reinforcement for openings, cutouts and free edges of decking as required for strength and stiffness. Provide reinforcement where a cell is cut parallel to rib as necessary to make a tight fit along the cut cell. Such reinforcement shall be in addition to structural supports shown on Drawings and specified in Section 05 12 00.

E. Miscellaneous Work: Provide all other transition pieces, reinforcement, and miscellaneous decking items as detailed and required to provide a complete installation.

F. Where steel decking is scheduled to receive a paint finish, it shall be provided free of lubricants, oils, passivators, and other substances which would impair the adhesion of the paint system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work. Check supporting members for correct layout and alignment. Should layout and alignment be such as to prevent proper bearing of the deck units on supporting members, the deck installer shall bring it to the attention of structural steel installer in writing, with a copy to Architect, for corrective measures and action. Steel decking units shall not be placed until necessary corrections are made.

B. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Erect steel decking in accordance with Evaluation Agency Report, manufacturer's instructions and final shop drawings.

B. Placing and Fastening Deck Units: Place decking in a permanent position with all panels aligned end-to-end so that the fluted portions of the panels align accurately. Panels shall be placed on supporting framework and adjusted in final position before being permanently fastened. Ends shall be over structural supports with positive, complete bearing over full width of panels. Installation shall be accomplished without deformation of units. Decking layout shall be as indicated on Drawings.

1. Carefully check control points, as indicated, for layout of deck flutes. Where required, deck module shall be adjusted to conform to layout indicated.
2. Fasten deck units to structure and to each other as indicated.
3. At galvanized steel decks, deslag, clean, and touch-up all welds with zinc-rich primer, including those at the underside of deck.
    a. Exception: Do not touch-up welds on top of deck which will be covered with concrete.
4. Complete installation shall conform to manufacturer's specifications and as detailed.

C. Openings Through Decking: Steel decking fabricator shall cut and reinforce all openings in the metal deck, including framed openings indicated on Drawings. Small miscellaneous openings shall be field-cut by the trade requiring the opening.

1. All cutting of exposed edges shall be square, trim and equal to factory cutting.
2. Steel deck panels and accessories shall be cut and neatly fit around openings and other work projecting through the deck.
3. Openings shall be reinforced as indicated or required to provide a rigid installation.

D. Steel decking installation shall proceed in accordance with current Cal/OSHA and OSHA regulations including guidelines with respect to fall protection.

E. Steel decking shall be spread for safety and working platforms.

F. All steel decking sheets shall be wind tacked and loose bundles of deck shall be wired at the end of each shift.

G. Concrete Filled Deck Installation:

1. Provide deck accessories required to contain concrete during concrete placement.
2. Concrete fill thicknesses over steel deck indicated on the construction documents are minimum thicknesses. Provide additional concrete fill as required to compensate for framing or deck deflections during placement in order to maintain specified surface tolerances and minimum thicknesses.
3. Place concrete in a manner to avoid excessive deflections or ponding.
4. Place concrete fill on adjacent spans before placement on cantilever conditions.
5. Provide shoring where indicated on Drawings and where deck span exceeds manufacturer’s listed maximum unshored span. Do not remove forms until concrete fill has reached its minimum compressive strength.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

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

1. Additional inspection, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.4 PROTECTION

A. Do not use steel decking for storage or working platforms until it has been permanently fastened. Storage loads must be supported on wood blocking in the flutes of the deck.

1. Any damaged deck unit shall be repaired or replaced as directed by Architect and at no cost to Owner.

B. Assure that construction loads do not exceed the carrying capacity of the deck.

3.5 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from premises.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal fabrications as follows:
   1. Railing assemblies.
   2. Downspouts.
   3. Miscellaneous metal fabrications.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1.	ASTM A36/A36M	– Standard Specification for Carbon Structural Steel.
2.	ASTM A53/A53M	– Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3.	ASTM A123/A123M	– Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4.	ASTM A307	– Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
5.	ASTM A500	– Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
6.	ASTM D1187	– Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
7.	ASTM E488	– Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
8.	AWS A2.4	– Standard Symbols for Welding, Brazing, Nondestructive Examination.
9.	AWS D1.1	– Structural Welding Code – Steel.
10.	AWS D1.3	– Structural Welding Code – Sheet Steel.

11. SSPC SP-2 – Hand Tool Cleaning.
12. SSPC SP-6 – Commercial Blast Cleaning.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: For each item specified, indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories. Include erection drawings, elevations and details where applicable.

C. Product Data: Submit product data for each manufactured product specified by name and model number in this Section with the product and selected attributes clearly identified.

D. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code – Steel."
   2. AWS D1.3, "Structural Welding Code – Sheet Steel."

B. Conform to 2022 California Building Code (CBC), Chapter 17 “Special Inspections and Tests” and Chapter 22 “Steel”.
   1. Materials:
      a. Material Identification per CBC Chapter 22, Section 2202 “Identification of Steel for Structural Purposes”.
   2. Inspection and Tests:
      a. Welding Inspection per CBC Chapter 17, Section 1705, Paragraph 1705.2 “Steel Construction”.
      b. Non-Destructive Weld Testing per CBC Chapter 17, Section 1705, Paragraph 1705.13.1 “Structural Steel”.

C. Painting: Refer to Section 09 91 00 for field painting.
   1. Do not paint galvanized surfaces that are indicated to remain galvanized.

1.6 QUALIFICATIONS

A. Welders' Certificates: Submit certificates under provisions of Division 01, certifying welders employed on the Work, verifying AWS qualification within the previous twelve months.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel: Unless otherwise noted, provide steel materials as follows:
   1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
   2. Pipe: ASTM A53/A53M, Type E or S, Grade B.
   3. HSS:
      a. Tubing: ASTM A500, Grade C.
      b. Round: ASTM A500, Grade C.
   4. Bolts, Nuts and Washers: ASTM A307.

B. Anchorage:
   1. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
   2. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

C. Welding Materials:
   1. Steel: AWS D1.1; type as required for materials being welded.
   2. Sheet Steel: AWS D1.3; type as required for materials being welded.

D. Weld filler material: All weld filler material shall have a minimum tensile strength of 70 ksi per AWS D1.1, latest edition approved by code enforcement agency.

E. Steel Shop and Touch-Up Primer: TNEMEC Series 115 Uni-Bond DF or accepted equal.

F. Shop and Touch-Up Zinc Rich Primer for Galvanized Surfaces: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Phone: (800) 831-3275, or accepted equal.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.2 RAILING ASSEMBLIES

A. Steel Railing Assemblies: Fabricated from steel pipe, steel plates and sections; sizes and configurations as shown on Drawings. At exterior locations, hot-dip galvanize all components in accordance with ASTM A123/A123M, minimum 1.25 ounces per square foot.
   1. Steel Tubing: HSS, ASTM A500, Grade C. Refer to Drawings for configuration and sizes.
   2. Vertical Pickets: Steel bars, ASTM A36/A36M. Refer to Drawings for configuration and sizes.

3. Galvanize exterior handrail and guardrail assemblies after fabrication. After assembly has been galvanized, fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
4. Finish: Field painted with exterior industrial paint system in accordance with Section 09 91 00; color as selected by Architect.

B. Fabrication:

1. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.
2. Handrails shall not rotate in their fittings.

2.3 DOWNSPOUTS

A. Downspouts and Support Brackets:

1. Pipe: ASTM A53/A53M, Schedule 40, round, galvanized, size as indicated on Drawings.
2. Support Brackets: Steel plates, sections, and sheets: galvanized; size and thickness as shown on Drawings.
3. Finish: Site paint finish under provisions of Section 09 91 00. Color as selected by Architect.

2.4 MISCELLANEOUS METAL FABRICATIONS

A. Provide miscellaneous metal fabrications as required to complete work under other Sections, but not specified in those Sections.

B. Miscellaneous metal work, including, but not limited to, the following items:

1. Steel Framing and Supports For:
   a. Mechanical and electrical equipment.
2. Loose bearing and leveling plates.
3. Steel weld plates and angles for casting into concrete not specified in other Sections.

2.5 SHOP FABRICATION

A. Fit and shop assemble in largest practical sections, for delivery to site.

1. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Cut, drill, and punch metals cleanly and accurately. De-burr rough edges and holes.

E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication except where specifically noted otherwise.

H. Miter and weld members, welds ground smooth.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 FINISHES

A. Prepare structural component surfaces in accordance with SSPC SP-2 at concealed locations and SSPC SP-6 at exposed locations.

B. Do not prime surfaces in direct contact with concrete, where field welding is required, or contact surfaces of steel-to-steel connections.

C. Shop prime all exposed interior steel with shop primer unless otherwise noted. Apply primer in one coat, to meet or exceed the minimum mil thickness required by the primer manufacturer.

D. All unexposed, concealed, or enclosed interior or exterior steel requires no finish.

E. All exposed exterior steel shall be galvanized after fabrication unless otherwise noted.

1. Galvanizing shall be in accordance with ASTM A123/A123M, on designated steel items. Provide minimum 1.25 ounces per square foot galvanized coating.
2. At galvanized members, touch-up all welds with zinc-rich primer.

F. Painting shall conform to applicable requirements of Section 09 91 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions.

B. Verify structure or substrate is plumb, level, and ready to receive work.

C. Verify that appropriate backing, blocking, or structural reinforcing is provided at walls.

D. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, to appropriate Sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Install manufactured items in accordance with manufacturer's printed instructions.

C. Allow for erection loads and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components indicated on shop drawings.

E. Perform field welding in accordance with AWS D1.1 for steel and AWS D1.3 for sheet steel.

F. Obtain Architect's acceptance prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 CLEANING

A. Inspect components after completing installation. Remove dirt and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of requirements for materials, fabrications and installation of rough carpentry and associated items (except that which is specified elsewhere) indicated on Drawings and necessary to complete the work. Items include, but are not necessarily limited to, the following:

1. Wood framing.
2. Wood decking.
3. Plywood, general use.
4. Blocking, backing, stripping, furring, and nailers.
5. Rough hardware.
6. Preservative treatment.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 05 12 00 – Structural Steel Framing.

C. Section 06 17 53 – Shop-Fabricated Wood Trusses.

D. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ALSC – American Lumber Standard Committee: Softwood Lumber Standards.
2. ANSI/ASME B18.2.1. – Square and Hex Bolts and Screws Inch Series.
3. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
5. AWPA U1 – Use Category System: User Specification for Treated Wood.
6. The Engineered Wood Association (APA); Plywood Specifications and Grades.

7. International Code Council (ICC) Evaluation Report/Evaluation Service Report (ER/ESR).
8. National Design Specification (NDS).
9. NIST DOC PS-1-09 – Structural Plywood.
10. NIST DOC PS-2-10 – Performance Standard for Wood-based Structural-use Panels.
11. NIST DOC PS-20 – American Softwood Lumber Standard.

1.4 SUBMITTALS

A. Submit all products and materials proposed for use under provisions of Division 01.

B. Preservative Treatment Certification, Pressure Treated Wood:
   1. Submit certification by treating plant stating the chemicals and process used, net amount of preservative treatment product retained, and conformance with applicable standards.

1.5 QUALITY ASSURANCE

A. Coordinate work with other trades to ensure proper placement of materials, anchors, etc., as well as providing for openings and anchors for the installation of surface mounted items and equipment.

B. Qualifications of Workmen: Provide skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

C. Rejection: In the acceptance or rejection of rough carpentry, no allowance will be made for lack of skill on the part of the workmen.

D. Requirements of Regulatory Agencies:
   1. State of California, California Code of Regulations, Title 24, Part 2, Chapter 23 requirements apply.
      a. Grading and preservative treatment of lumber and plywood shall conform to CBC Section 2303, Minimum Standards and Quality.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protection:
   1. After delivery, store all materials in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather.
   2. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately store to prevent its inadvertent use. Do not allow installation of damaged or otherwise non-complying material.
   3. Use all means necessary to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make necessary repairs and replacements as acceptable to Architect and at no cost to Owner.

1.7 JOB AND ENVIRONMENTAL CONDITIONS

A. Environmental Requirements: Maintain uniform moisture content of lumber at 19 percent or less at time of installation.

B. Sequencing: Coordinate details with other work supporting, adjoining, or fastening to rough carpentry work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wood:

1. Lumber shall be identified by the grade mark of an approved lumber grading or inspection agency in conformance with NIST DOC PS-20.
2. Lumber sizes, species, and grades shall be as noted on Drawings.

B. Wood Sheathing:

1. General Use: NIST DOC PS-1, Exposure 1. Thickness and type shall be as indicated on Drawings.
2. Plywood back boards for electrical, telephone, and similar types of wall mounted equipment shall be provided as indicated and as required by design conditions. Unless otherwise specified, plywood shall be 3/4 inch thick, fire-retardant treated, exterior A-C plywood with “A” face exposed.
3. Structural Panels for Structural Usage: As indicated on Drawings.

C. Plates, Blocking, Cast-in-Nailers at Concrete Curbs, or Sills on Concrete: Douglas Fir No. 1 pressure-treated.

D. Preservative Treatment:

1. Furnish pressure treated wood in accordance with AWPA Standard U1.
2. All preservative treatment products shall be waterborne, alkali-based type, acceptable for use in California and meeting the minimum requirements of AWPA Use Categories noted. Type SBX/DOT preservative is only permitted when material is protected from exposure to any water during construction.
    a. Use Category 2 (Interior, Damp) shall apply to wood sills supported on concrete more than 6 inches above finish grade.
    b. Use Category 3B (Above Ground, Exposed) shall apply to wood used in exterior construction and not in contact with the ground.
    c. Use Category 4A (Ground Contact, General Use) for wood supported by concrete within 6 inches of finished grade, wood in contact with the ground or fresh water, or wood in direct contact with any older construction with evidence of decay.
3. Type of fasteners used with pressure treated wood shall be in accordance with CBC Section 2304.10.6.1.

E. Rough Hardware Fastenings and Connections: All types including bolts, lag screws, nails, spikes, screws, washers, framing devices and other rough hardware, or kinds that may be purchased and that require no further fabrication, shall be furnished and installed for all finish and rough carpentry. All exterior hardware shall be hot-dipped galvanized per ASTM A123/123M Standards.

1. Nails: Common wire nails or spikes and box nails, as indicated on Drawings; “sinkers” are not permitted.

2. Bolts: ASTM A307, Grade A, hexagonal heads, unless noted otherwise. Upset threads are not permitted.
3. Washers: Washers for bearing against wood shall be provided under all bolt heads and nuts. Washers shall be as indicated on Drawings.
4. Power Actuated Fasteners: Refer to Drawings. All fasteners shall have ICC approval.
5. Post-Installed Anchors: Refer to Drawings. All anchors shall have ICC approval.
6. Fabricated Sheet Metal Timber Framing Connectors: All framing connectors shall have ICC approval. Connector types shall be as indicated on Drawings. Provide timber framing connectors by Simpson Co. or accepted equal. Framing connectors shall be stamped with manufacturer's logo, and model designation.
7. Nailing Schedule: Except as otherwise indicated on Drawings or specified, nailing shall conform to 2022 CBC, Table 2304.10.2, Fastening Schedule.
8. Lag Screws: Conform to ANSI/ASME B.18.2.1. Dimensions and installation shall conform to requirements described in the National Design Specification (NDS), 2018 edition.

2.2 FABRICATION

A. Lumber:
   1. Air- or kiln-dry to maximum 19 percent moisture content, at the time of installation.
   2. Furnish S4S unless otherwise noted.
   3. Size to conform to rules of governing standard. Sizes shown are nominal unless otherwise noted.

2.3 SOURCE QUALITY CONTROL

A. Grade Mark each piece of lumber. Marking must be done by recognized agency.

B. Plywood: Each panel shall be legibly identified as to type, grade and specie by APA grade. If plies are spliced, the slope of the scarf shall not be steeper than 1:8. White pockets will not be permitted in face plies.

C. Each piece of preservative treated lumber shall bear AWPA quality stamp by an ALSC approved inspection agency indicating compliance with the AWPA standards.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
   1. Prior to execution of work under this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where work of this Section may properly proceed.
   2. Verify that rough carpentry may be performed in strict accordance with the original design and all pertinent codes and regulations.

B. Selection of Lumber Pieces: Carefully select all members. Select individual pieces so that knot and obvious defects will not interfere with placing bolts or proper nailing or making proper connections. Cut out and discard all defects which will render a piece unable to serve its intended function.

C. Lumber may be rejected by Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus or mold, as well as for improper cutting and fitting. No load carrying member shall fall below grade.

D. Shimming: Do not shim any framing component.

3.2 FASTENING

A. Nailing: Except as otherwise specified, all nailing shall be as scheduled on Drawings:

1. Nails or Spikes shall be common wire unless noted otherwise. Penetration of nails or spikes shall be one-half the length of the nail or spike into the piece receiving the point. However, to connect pieces 2 inches in thickness, 16d nails shall be used unless noted otherwise.

a. Bore holes for nails wherever necessary to prevent splitting. Hole size shall not exceed 75 percent of nail diameter.

b. Use finish or casing nails for finish work.

c. Use of nailing guns is limited by CBC requirements and subject to approval by Architect. Submit nailing gun and nail data for review.

B. Bolts: Bolts shall be of sizes indicated. Drive fit with washers under head and nuts. Lag screws shall be screwed (not driven) into place with holes bored the same depth and diameter as shank. For threaded portion, holes shall be no larger than root diameter. Retighten all bolts and screws before closing in.

C. Framing Devices: As specified under Products, sizes as indicated. Use half-length nails where required.

3.3 FRAMING AND ROUGH CARPENTRY

A. Sills: Shall be in long lengths of sizes shown, fastened with anchor bolts at exterior walls and with fasteners at non-structural interior walls as indicated on Drawings. Place malleable iron or steel plate washers (but not cut washers) under nuts bearing on wood.

B. Studs, Posts and Columns: Shall be full length. Corners shall be as detailed. Partitions or walls containing plumbing, heating or other piping shall be so formed as to give proper clearance for materials. Cut members as required to provide full bearing at ends. Connect to structure as indicated.

C. Plates: Shall be in long lengths and spliced as shown.

D. Fire Blocking: Shall be same thickness and width of studs or joists unless shown otherwise. Blocking shall not be spaced over 8 feet – 0 inches on center. Install fire blocking in accordance with CBC, Title 24, Part 2, Section 718, Concealed Spaces.

E. Joists and Beams: Shall be in long lengths and spliced over bearings unless shown otherwise. Install with crown side up. Beams or headers indicated to be built up of two or more joists shall be fabricated on the job using full length members. Clinch nails protruding through members.

1. Provide double joists and headers at all openings through floors and roofs unless otherwise shown on Drawings.

2. Provide typical headers at all openings through walls where one or more studs are required to be cut. For penetration through walls narrower than stud spacing, provide solid backing on all sides for fastening finish materials.

F. Plywood, General Use: Install to pattern indicated and provide blocking at joints where noted on Drawings. Center all joints over bearing supports. Nail to framing as indicated.

G. Wood Furring, Stripping and Grounds: Install as shown or required to provide nailing of materials or passage of pipes, conduits, etc., not otherwise accommodated.

H. Bridging: Space not over 8 feet-0 inches on center for spans over 16 feet-0 inches. Spans over 8 feet-0 inches and under 16 feet-0 inches shall have bridging placed at midspan. Bridging shall be two 2 x 3s or solid blocking as indicated. Joists 8 inches or less in depth shall not require bridging unless specifically indicated.

I. Backing/Blocking: Shall be provided for all wall and ceiling finishes and for the supporting and anchorage of products, fixtures and equipment for all trades. Coordinate size, type, and location of backing and supports with manufacturer or supplier of items requiring backing/blocking.

1. Install blocking for fastening surface applied items.
2. Install blocking at plywood joints unless otherwise noted on Drawings.

J. Framing members shall not be notched or bored unless specifically detailed on Drawings.

3.4 ROUGH HARDWARE

A. Rough hardware indicated or required but not specified elsewhere, shall be furnished and installed hereunder, including metal fittings, screws, bolts, and other fastening devices; size and configuration as applicable.

3.5 MISCELLANEOUS CARPENTRY WORK

A. Miscellaneous Carpentry Work not included under other Sections shall be furnished and installed hereunder as indicated. Carefully locate and securely anchor such items to structure.

B. Drypack: Drypack shall consist of one part high early strength Portland cement to not more than three parts of sand by volume. Add only a minimum amount of water to hold the mixture in shape while packing and to provide hydration. Solidly ram drypack into place to provide uniform bearing and cure with moist sacks or cloths for a period of at least three days.

C. Plywood back boards for electrical, telephone, and similar types of wall mounted equipment shall be provided as indicated and as required by design conditions. Plywood back boards may be installed either horizontally or vertically.

D. Shoring and Bracing: Shore or brace for temporary support of all work as required during the construction period except any shoring and bracing specified and included under other Sections of these specifications.

E. Temporary Enclosures: Provide and maintain all barricades and enclosures required to protect the work in progress.

F. Protect all work in progress and all work installed, as well as the work of all other trades. Any work damaged as a result of the work under this Section shall be corrected to its original condition or replaced if directed by Architect and at no cost to Owner.

G. Protection Devices: Pedestrian walkways, barricades, lights, shoring, and other protective structures and devices necessary for protection of pedestrians shall conform to requirements of 2022 CBC, Title 24, Section 3306, Protection of Pedestrians, and to the requirements of the Department of Public Works, City of Sacramento.

H. Wall Flashing: Install where shown on Drawings and per manufacturer's recommended installation procedures.

3.6 FRAMING TOLERANCES

A. Maximum variation from true flatness: 1/4 inch in 10 feet in any direction.

3.7 CLEAN-UP

A. Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from the premises.

END OF SECTION

SECTION 06 17 53

SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated wood trusses for structural framing.

B. Bridging, bracing, and anchorage.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ALSC – Softwood Lumber Standards.
2. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot Dip Process.
3. BCSI-1 – Bracing Wood Trusses.
4. BCSI-1 – Handling and Erecting Wood Trusses.
5. TPI 1 – Metal Plate Connected Parallel Chord Wood Trusses.
6. TPI 1 – Metal Plate Connected Wood Trusses.

1.4 SYSTEM DESCRIPTION

A. Design Loads: Refer to Structural Drawings.

1.5 SUBMITTALS FOR REVIEW

A. Submit under provisions of Division 01.

B. Truss Submittal Package: Provide a complete submittal package per CBC Section 2303.4.3. Truss design drawings shall bear the seal and signature of the truss designer in accordance with CBC Section 2303.4.1.4.1.

C. Design Calculations: Submit design calculations for each truss configuration and loading configuration. Design calculations shall bear the seal and signature of the truss designer.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:
   1. Lumber Grading Agency: Certified by ALSC.

B. Truss Design, Fabrication, and Installation: In accordance with BCSI-1 and TPI 1.

C. Maintain one copy of each document on site.

D. Manufacturer: Company specializing in manufacturing the Products specified in this section.

E. Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of California.

F. State of California, California Code of Regulations, CBC Part 2, 2022 Edition, Chapter 23.
   1. Lumber Grading as per CBC Section 2303.
   2. Metal Plate Connected Trusses as per CBC Section 2303.4.6.
   3. Truss Quality Assurance as per CBC Section 2303.4.7.

1.7 REGULATORY REQUIREMENTS

A. Conform to 2022 CBC for loads and other governing load criteria.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Division 01.

B. Handle and erect trusses in accordance with BCSI-1.

C. Store truss depth in vertical position resting on intermittent bearing pads.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Truss manufacturer shall be a company specializing in manufacturing the products specified in this Section.

2.2 MATERIALS

A. Lumber Grading Rules: AFPA, WCLIB and WWPA.

B. Wood Members: Single or multiple top and bottom chord, 19 percent maximum and 11 percent minimum moisture content.

C. Steel Plate Connectors: ASTM A653/A653 steel, Grade B, hot dip galvanized; die stamped with integral teeth.

D. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.3 ACCESSORIES

A. Wood Blocking, Plating, Support Members and Framing for Openings: In accordance with Section 06 10 00.

B. Fasteners and Anchors: Hot dipped galvanized steel.

C. Bearing Plates: Electro-galvanized.

2.4 FABRICATION

A. Fabricate trusses to achieve structural requirements specified.

B. Brace wood trusses for support in accordance with BCSI-1.

C. Provide bottom and top chord extensions as indicated.

D. Fabricate to achieve minimum end bearing of 2-3/4 inches.

E. Frame special sized openings in web framing as shown to accommodate ducts.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that supports and openings are ready to receive trusses.

3.2 PREPARATION

A. Coordinate placement of bearing items.

3.3 ERECTION

A. Install trusses in accordance with manufacturer's instructions and BCSI-1.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without acceptance of Architect.

E. Place headers and supports to frame openings.

F. Frame openings between trusses with lumber in accordance with Section 06 10 00.

G. Coordinate placement of sheathing with work of this Section.

H. After erection, touch-up damaged surfaces with primer consistent with shop coat.

3.4 ERECTION TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Self-adhesive elastomeric sheet membrane waterproofing for:
   1. Installation as air/water barrier/flashing at wall areas.

B. Drainage composite and protection board.

C. Accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 06 10 00 – Rough Carpentry.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

D. Section 07 92 00 – Joint Sealants.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
   2. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   3. ASTM D3767 – Standard Practice for Rubber-Measurement of Dimensions.
   4. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
   5. ASTM D6135 – Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing.
   6. ASTM G90 – Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials using Concentrated Natural Sunlight - EMMAqua test.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.

C. Manufacturer's Instructions: Furnish manufacturer's printed instructions for the installation of membranes, including procedures and materials for splicing and bonding.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Application shall be done only by an application firm normally engaged in this business and approved by the material manufacturers. All work shall be performed by qualified applicators working under an experienced supervisor.

B. Manufacturer's Representation During Installation: A qualified representative of the membrane manufacturer shall be present periodically during the work on the waterproof membrane system to assure compliance with the specifications and recommendations of the manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the job site in original unbroken packages bearing the manufacturer's label. Material shall be stored above the ground in a dry location. Containers shall be stored in such a manner as to prevent damage.

B. Cover materials and store in dry condition between temperatures of 40 degrees F and 90 degrees F. Install within one year of date of manufacture. Do not store at elevated temperatures which will reduce the shelf life of the product.

1.7 JOB AND ENVIRONMENTAL CONDITIONS

A. Job Conditions: The Membrane Waterproofing Contractor shall acquaint himself with all conditions, general construction methods, and sequence to be employed. No extras will be permitted for his failure to do so.

B. Environmental Conditions:

1. Temperature: Surface temperature shall not be higher than 90 degrees F and no lower than 40 degrees F during application of membrane.
2. Weather: Do not apply during periods of precipitation or when rain is expected for period of application, and for at least three hours following application.
3. Ventilation: Provide positive ventilation to all areas not subject to natural ventilation during application and curing periods.

1.8 WARRANTY

A. Membrane waterproofing shall be warrantied for two years from the date of filing Notice of Completion against all defects in materials. Warranty shall also cover damage due to leaks, defective materials, and installation.

B. Installer: Two year installer workmanship warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: GCP Applied Technologies, Products:
   1. Walls: Grace Ice and Water Shield HT.
   2. Primer: Perm-A-Barrier Primer Plus.

B. Epro.

C. Carlisle.

D. W. R. Meadows.

E. Henry Company.

F. Substitutions: Under provisions of Division 01.

2.2 MATERIALS – WALL AREAS

A. Elastic Sheet Membrane Waterproofing:
   1. Material: Cold applied, self-adhering membrane composed of a rubberized asphalt adhesive and interwound with a disposable release sheet. Provide an embossed, slip resistant surface on the high-performance film with UV barrier properties.
   2. Membrane Thickness: 40 mils per ASTM D3767 Method A.
   3. Membrane Tensile Strength: MD 33 lbf/in, CD 31 lbf/inch per ASTM D412 Die C Modified.
   4. Membrane Elongation: 250 percent per ASTM D412 Die C Modified.
   5. Low Temperature Flexibility: Unaffected at -20 degrees F per ASTM D1970.
   6. Maximum Permeance: 0.05 perms per ASTM E96.
   7. Maximum Material Weight Installed: 0.22 pounds per square foot per ASTM D461.
   8. Service Temperature: 240 degrees F per ASTM D1204
   9. Adhesive: Rubberized asphalt adhesive containing post-consumer recycled content, contains no calcium carbonate, sand or fly ash.
   10. Exposure: Can be left exposed for a maximum of 120 days from date of installation per ASTM G90 – EMMAqua test.

B. Primer: VOC compliant, low odor, water-based primer provided by sheet waterproofing manufacturer, which imparts a high tack finish on the treated substrate.

C. Sealant: Type specified in Section 07 92 00.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive membrane waterproofing to assure that they are smooth, dry, and free of foreign material, moisture and unevenness which would prevent the execution and quality of application of the membrane waterproofing as specified.

B. Do not proceed with application of waterproofing systems until defects are corrected.

3.2 PREPARATION OF SURFACES - GENERAL

A. Surfaces shall be dry, clean, smooth, and free from projections or holes that may cause puncture of membrane. Substrate shall be absolutely surface dry for proper adhesion of membrane. Minimum curing time for concrete shall be seven days prior to membrane installation.

B. Cleaning: Clean surfaces to remove all curing compounds, loose dirt, moisture, grease, dust, and other foreign material. Sweep or vacuum surface clean prior to membrane installation.

3.3 APPLICATION OF PRIMER

A. Apply primer over substrate per manufacturer’s recommendations.

B. Allow primer to fully dry prior to start of membrane installation.

3.4 APPLICATION OF MEMBRANE AT WALL AREAS

A. Install membrane per ASTM D6135 and manufacturer’s recommendations.
   1. Schedule installation such that membrane is covered by finish materials within 120 days after installation.
   2. Do not install membrane on wet or frozen substrates.
   3. Install when surface temperature of substrate is a minimum of 40 degrees F and rising.
   4. Remove dust, dirt, loose materials, and protrusions from substrate surface.
   5. Install membrane on clean, dry, continuous substrate. Fill voids and damaged or unsupported areas prior to installation.
   6. Install membrane such that all laps shed water. Work from the low point to the high point at all times.
   7. Side laps shall be minimum 4 inches and end laps shall be minimum 8 inches.
   8. Flash penetrations and repair damage using manufacturer’s recommended methods.
   9. Seal all reversed laps and exposed or cut membrane edges with continuous bead of compatible silicone weather barrier sealant.

3.5 CLEAN-UP

A. At the completion of the work of this Section, all surfaces and areas adjoining the membrane shall be left in a clean condition. All cartons, pails and equipment shall be removed from the premises.

B. Clean any stains on materials that would be exposed in the completed work.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Thermal insulation in exterior wall construction.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
3. UL 723 – Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed California Quality Standards.

1.5 SYSTEM DESCRIPTION

A. Materials of this Section: Provide continuity of thermal barrier at building enclosure elements.

1.6 COORDINATION

A. Coordinate work with other trades under provisions of Division 01.

PART 2 PRODUCTS

2.1 GLASS FIBER BATT INSULATION

A. Acceptable Manufacturers:
   1. Knauf Insulation, Shelbyville, IN; 317-398-4434, www.knaufusa.com. Product: EcoBatt.
   2. Owens-Corning, Toledo, OH; 800-438-7465, www.owenscorning.com.
   3. Certainteed Corp., Insulation Group, Valley Forge, PA; 800-233-8990, www.certainteed.com.
   4. Johns Manville, Denver, CO; 800-654-3103, www.specJM.com.
   5. Substitutions: Under provisions of Division 01.

B. Batt Insulation: Preformed glass fiber batt in accordance with 2022 CBC Section 720, California Referenced Standards Code Chapter 12-13, ASTM E84, and UL 723, conforming to the following:
   1. Facings:
      a. Faced on one side with foil reinforced kraft (FSK) face at exposed locations (facing not covered by finish materials); Type III, Class A per ASTM C665; flame spread 25 and smoke developed 50 per ASTM E84.
      b. Kraft facing at locations where insulation will be covered by finish materials; Type II, Class C per ASTM C665. In concealed locations, facings shall be installed behind and in substantial contact with the unexposed surface of the wall finish.
   2. Thermal Resistance Value: Minimum R-19.
   3. Provide formaldehyde-free thermal insulation products.
   4. Recycled Content: Minimum twenty percent post-consumer.

C. Accessories:
   1. Staples: Steel wire; galvanized; type and size to suit application.
   2. Tape: Polyester self-adhering type, mesh reinforced, 2 inches wide.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions.

B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.2 INSTALLATION – BATT INSULATION

A. Install insulation in accordance with insulation manufacturer's instructions and with the flame spread rating and smoke density requirements of CBC Section 720, ASTM E84, and UL 723.

B. Install in exterior walls, full width, depth, and height of cavity, without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

E. Install with factory applied vapor retarder membrane facing interior side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Securely fasten and anchor insulation in place to prevent displacement or sagging of material in all areas.

   1. At wood stud walls, staple facing flanges in place at maximum 6 inches on center.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

END OF SECTION

SECTION 07 25 00

WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Weather barrier membrane.

B. Seam tape.

C. Flexible flashings.

D. Fasteners.

E. Accessories.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 07 62 00 – Sheet Metal Flashing and Trim.

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
2. ASTM C1193 – Standard Guide for Use of Joint Sealants.
3. ASTM D882 – Test Method for Tensile Properties of Thin Plastic Sheeting.
4. ASTM D1117 – Standard Guide for Evaluating Non-Woven Fabrics.
5. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E96 – Test Method for Water Vapor Transmission of Materials.
7. ASTM E1677 – Specification for Air Retarder Material or System for Framed Building Walls.
8. ASTM E2178 – Test Method for Air Permeance of Building Materials.
9. ASTM E2357 – Test Method for Determining Air Leakage of Air Barrier Assemblies.
10. AATCC Test Method 127 – Water Resistance: Hydrostatic Pressure Test.
11. TAPPI Test Method T-410 – Grams of Paper and Paperboard (Weight per Unit Area).
12. TAPPI Test Method T-460 – Air Resistance of Paper (Gurley Hill Method).

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.

C. Quality Assurance Submittals:

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions and details.
3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

D. Closeout Submittals:

1. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Installer shall have experience with installation of specified weather barrier and flexible flashing assemblies under similar conditions.
2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.

B. Single Source Responsibility: Provide building wrap, flashings, and accessory materials from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

C. Pre-installation Meeting:

1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, installer, Owner's Representative, and weather barrier manufacturer's designated representative.
3. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities, and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration, and protection.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products and materials under provisions of Division 01.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.7 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.8 WARRANTY

A. Product and Labor Warranty: Weather barrier manufacturer shall warranty weather barrier assemblies for a period of ten years from date of Project Completion.

1. Weather barrier manufacturer's approval for warranty is required prior to assembly installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design: DuPont Building Innovations, Wilmington, DE; (800) 448-9835, http://construction.tyvek.com. Products:

1. DuPont Tyvek CommercialWrap D.
2. DuPont FlexWrap NF.
3. DuPont StraightFlash.

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Building Wrap: High-performance, flash spun-bonded olefin, non-woven, non-perforated weather barrier and related assembly components.

B. Performance Characteristics:

1. Air Penetration Resistance: <0.04 cfm/ft^2 at 1.57 psf, when tested in accordance with ASTM E2357. Type 1 per ASTM E1677.
2. Water Vapor Permeance: 30 perms, when tested in accordance with ASTM E96, Procedure A.
3. Water Penetration Resistance: Hydrostatic head resistance greater than 7.7 feet when tested in accordance with AATCC Test Method 127.
4. Basis Weight: Minimum 2.4 ounces per square yard, when tested in accordance with TAPPI Test Method T-410.
5. Air Penetration Resistance: >750 seconds/100cc, when tested in accordance with TAPPI Test Method T-460.
6. Breaking Strength: Minimum 33/41 lbs/in., when tested in accordance with ASTM D882.
7. Tear Resistance: 6/9 pounds, when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15, Smoke Developed: 25.

2.3 FLEXIBLE FLASHINGS

A. Flexible membrane flashing materials for openings and penetrations.

B. Straight flashing membrane materials for sealing penetrations.

2.4 ACCESSORIES

A. Seam Tape: DuPont Tyvek Tape, three inches wide, as manufactured by DuPont Building Innovations.

B. Fasteners: Tyvek Wrap Cap Screws, as manufactured by DuPont Building Innovations.

1. 1-5/8 inch corrosion resistant screws with 2-inch diameter high density polyethylene cap washers with UV inhibitors.

C. Sealants:

1. Provide sealants that comply with ASTM C920, Type S, Grade NS, Class 25 minimum, silicone sealant to maintain watertight conditions. All sealants shall be California VOC compliant.
2. Acceptable Products:
   a. Dow Corning Dowsil 758.
   b. GE SCS2000 Silpruf.
   c. Tremco Spectrem 1.
   d. Other sealants recommended by the weather barrier manufacturer.

D. Adhesives:

1. Provide adhesive recommended by weather barrier manufacturer. All adhesives shall be California VOC compliant.

E. Primers for Flashings:

1. Provide flashing manufacturer synthetic rubber-based, spray applied primer to assist in adhesion between substrate and flashing. All primers shall be California VOC compliant.
2. Acceptable Products:
   a. DuPont Adhesive Primer.
   b. Other primers recommended by the flashing manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION - WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations and as indicated on Drawings.

B. Install weather barrier prior to installation of exterior cladding materials.

C. Start weather barrier installation at a building corner, leaving 6 inches to 12 inches of weather barrier extended beyond corner to over lap.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface a minimum of 1 inch. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Overlap weather barrier:

1. Exterior Corners: Minimum 12 inches.
2. Seams: Minimum 6 inches.

G. Weather Barrier Attachment:

1. Attach weather barrier to wood studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 6 inches to 18 inches vertically on center along stud line, and 24 inches on center, maximum horizontally.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 FLEXIBLE FLASHINGS

A. Install flexible flashings per manufacturer’s recommendations.

3.5 FIELD QUALITY CONTROL

A. Notify manufacturer’s designated representative to obtain required periodic observations of weather barrier assembly installation.

3.6 PROTECTION

A. Protect installed weather barrier from damage.

B. Weather barrier shall be covered with exterior cladding materials prior to manufacturer’s recommended maximum exposure time.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC-POLYOLEFIN ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhered thermoplastic polyolefin (TPO) roofing membrane system.

B. Gypsum roof cover board.

C. Roofing accessories.

D. Existing roofing demolition.

1.2 RELATED SECTIONS

A. Section 02 41 00 – Demolition: Roofing Demolition.

B. Section 06 10 00 – Rough Carpentry.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

D. Section 07 95 00 – Expansion Control.

E. Divisions 21-23 – Mechanical.

F. Divisions 26-28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards and Manuals:

1. ASTM C1177/C1177M – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
2. ASTM C1371 – Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
3. ASTM C1549 – Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
4. ASTM D471 – Standard Test Method for Rubber Property – Effects of Liquids.
5. ASTM D751 – Standard Test Methods for Coated Fabrics.

6. ASTM D1204 – Standard Test Method for Linear Dimensional Changes of Non-Rigid Thermoplastic Sheathing or Film at Elevated Temperature.
7. ASTM D5884 – Standard Test Method for Determining Tearing Strength of Internally Reinforced Geomembranes.
8. ASTM D6878 – Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
9. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM E96 – Standard Test Method for Water Vapor Transmission of Materials.
11. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.
12. ASTM E408 – Standard Test Method for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
13. ASTM E1980 – Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
14. Factory Mutual Global (FMG) Approval Guide.
15. NRCA – National Roofing Contractors Association.
16. UL 790 – Standard Test Methods for Fire Tests of Roof Coverings.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data:
   1. Submit manufacturer's descriptive literature, product specification, and installation instructions for each product.
   2. Material Safety and Data Sheet (MSDS) for each product.

C. Shop Drawings:
   1. Single-Ply Roofing Membrane Setting Plan: Include layout of membrane, location of flashings and accessories.
      a. For mechanically fastened single-ply membrane system, indicate membrane fastener type, size, and spacing to meet CBC and ASCE 7 wind uplift requirements at the location of the work.
   2. Detail Drawings: Include joint or termination detail conditions, such as junction at deck and wall, curb flashing, roof drain, pre-molded pipe flashing, field fabricated pipe flashing, field fabricated hot pipe flashing, parapet flashing, inside corner and outside corner flashing, and sealant pockets.

D. Samples:
   1. Expansion joints.

E. Quality Assurance Submittals:
   1. ICC ES Report.
   2. Manufacturer's Field Reports: Submit under provisions of Division 01.

3. Manufacturer Certifications.
4. Installer Certifications.

F. Closeout Submittals:
1. Warranty certificate.
2. Maintenance instructions.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Provide cover board, membrane, and accessory materials from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

B. Qualifications:
1. Manufacturer Qualifications:
a. Firm specializing in roofing systems specified in this Section with a minimum ten years documented experience.
b. Furnish qualification documentation including a complete list of all projects (minimum of ten) within a 100-mile radius from project site, with the same climate zone, using the same roofing system, and single-ply membrane formulation/ingredients. Include information on project location, size (square feet), date of installation, and contact information.
c. Private-labeled single-ply membrane products are not acceptable.
2. Installer Qualifications:
a. Firm specializing and certified by roofing system manufacturer. Submit manufacturer's certification at time of bid.
b. Minimum of three years' experience in single-ply roofing installation.
c. State Contractor's License: Class C-39.

C. Regulatory Requirements:
1. Conform to the 2022 CBC, Section 1505 for roof assembly fire classification requirements.
2. Roof Assembly Fire Hazard Classification: UL Class A per ASTM E108 or UL 790.
3. All roof surfaces shall have positive roof drainage per definition in CBC Section 1502 and shall meet or exceed the minimum slope of 1/4 inch per foot as described in CBC Section 1507.12.1. Refer to Drawings for roof slopes and drainage patterns.
4. Thermoplastic single-ply roof covering shall comply with ASTM D6878 per CBC Section 1507.12.2.
5. Wind Uplift: Per CBC Section 1609.5.2, roof coverings shall be designed to withstand the wind pressures at the location of this Project, determined in accordance with ASCE 7.
a. Per CBC Section 1504.4, the wind load on the roof covering shall be permitted to be determined using allowable stress design.

D. Certifications:

1. Manufacturer Certification: Certify that the specified or proposed roofing system including type of deck, gypsum roof cover board, membrane type, adherence of components, perimeter attachment details, and all system component details are acceptable to meet warranty requirements and, when installed as per FMG Approval Guide, it will meet or exceed Factory Mutual System Approval and UL Classification Requirements as per UL RMSD.
2. Manufacturer's Acceptance of Roofing Installer: Certify that the roofing installer's qualifications have been reviewed, meet requirements of this Section, and is accepted by the roofing manufacturer.

E. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting at the site at least one week prior to commencing work on this Section.
    a. Attendees:
        1) Owner's representative, preferably including Owner's Facilities Manager and Maintenance Foreman.
        2) Architect.
        3) Contractor.
        4) Roofing installer.
        5) Related trades sub-contractors.
        6) Manufacturer Technical Representative/Inspector.
    b. Agenda:
        1) Review roof design (roof substrate, roofing system, flashings, gutters, etc.), shop drawings, and submittals.
        2) Review manufacturer's installation and technical information and provisions of this Section.
        3) Review substrate requirements including substrate preparation and procedures for inspection and handover to roofing installer.
        4) Review and coordinate schedule and site conditions related to project and work of this Section.
        5) Conduct a roofing substrate walk-through.
3. Contractor shall give a minimum one-week notice to pre-installation meeting participants.

F. Coordination: Coordinate the work in this Section with work in related Sections particularly roof substrate work. Convene a coordination meeting at least one week before roof substrate work with roof system manufacturer's representative attending and in accordance with Division 01.

1.6 SUSTAINABLE BUILDING DESIGN REQUIREMENTS

A. Provide highly reflective Energy Star compliant roofing system with emissivity of at least 0.9 when tested in accordance with ASTM E408 for a minimum of 75 percent of the roof surface.

1. Thermal Emissivity shall be measured in accordance with ASTM C1371.
2. Solar Reflectivity shall be measured in accordance with ASTM C1549.
3. Solar Reflectance Index shall be measured in accordance with ASTM E1980.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Store products in weather protected environment, clear of ground and moisture.

D. Store roofing membrane in the original undisturbed plastic wrap.

E. Store adhesives, sealants, and other curable materials in cool and dry location with temperatures between 60 degrees F and 90 degrees F. Do not store adhesive containers with opened lids due to the loss of solvent which occur from flash off.

1.8 PROJECT/SITE CONDITIONS

A. Do not apply roofing system during inclement weather.

B. Do not apply roofing system to damp or frozen substrate.

C. Take precautions to prevent wind blow-off or wind damage during the course of the roofing application.

D. Substrates to receive roofing system shall be thoroughly dry. Provide drying equipment should moisture occur.

1.9 WARRANTY

A. Comply with provisions of Division 01.

B. Warranty installed membrane roofing system including labor and materials for loss of water-tightness caused by defective materials (including accessories) or workmanship, with no dollar limit, for twenty years. Effective warranty start date shall be at the time of final acceptance by Owner.

C. Warranty shall provide for the removal, replacement, repair, and making good without cost to Owner, of defects due to defective materials or workmanship.

D. Repairs under warranty shall be made within three days after receiving notice of need for repairs from Owner, weather permitting.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products:
   1. TPO Roofing Membrane System:
      a. Carlisle Syntec Inc. Product: Sure-Weld 60.
         1) Flexible FAST adhesive for use on gypsum cover board.
         2) CAV-GRIP III Low-VOC Adhesive/Primer for use on roofing membrane.
      b. Tremco. Product: TremPly TPO - 60 mil.
      c. GAF Materials Corp. Product: EverGuard TPO 60.
      d. Johns Manville. Product: JM TPO Roofing Membrane - 60 mil.
   2. Gypsum Cover Board: Provided by roof system manufacturer.

B. Substitutions: Under provisions of Division 01.

2.2 TPO ROOFING MEMBRANE

A. Ultraviolet resistant thermoplastic polyolefin membrane reinforced with polyester fabric.

B. Properties:
   1. Thickness (ASTM D751): 60 mils nominal.
   2. Thickness over skrim: 15 mils nominal.
   3. Tolerance on nominal thickness: ± 10 percent.
   4. Minimum breaking strength (ASTM D751): 320 lbf/in.
   5. Elongation at break of fabric (ASTM D751): 28 percent.
   6. Tearing strength (ASTM D5884): 86 lbf.
   7. Dimensional stability (ASTM D1204): ± 1 percent.
   8. Water absorption (ASTM D471): ± 1 percent.
   9. Colors:
      a. White.
         1) Initial Solar Reflectance: 0.79.
         2) Initial Thermal Emittance: 0.90.
         3) Solar Reflectance Index: 99.

2.3 GYPSUM ROOF COVER BOARD

A. Glass mat-faced, noncombustible, moisture-resistant treated gypsum core panel specifically designed for roofing applications, 1/4 inch thick, square edges, factory primed, conforming to ASTM C1177.
   1. Where membrane is attached to gypsum roof cover board with adhesive (such as at vertical surfaces), cover board shall be factory primed and 5/8 inch thick. Do not use products intended for use as exterior wall sheathing.

2.4 ACCESSORIES

A. Non-Reinforced or Reinforced TPO Flashing, Pipe Boot and Flashings, Clamping Rings: Use roofing membrane provided and recommended by manufacturer.

B. Flashing Metal: 0.023 inch thick galvanized steel laminated to 0.020 inch thick roofing membrane in white color used for flashing and edge metal detailing as furnished by the membrane manufacturer.

C. Membrane Bonding Adhesive: Low-VOC, methylene chloride-free aerosol contact adhesive/primer meeting California Air Resources Board or local Air Pollution Control/Air Quality Management District regulations.

D. Adhesive for Gypsum Roof Cover Board Attachment for Adhered Single-Ply Roofing System: Two-component, low-rise adhesive approved by roofing system manufacturer and cover board manufacturers.

E. Termination Bar: Extruded aluminum bar 0.08 inch thick by 1 inch wide.

F. Membrane Cleaning Solution: Manufacturer approved or recommended.

G. Air and Vapor Barrier: Roofing manufacturer's 40 mil composite air and vapor barrier consisting of 35 mils of self-adhering rubberized asphalt laminated to a 5 mil polyolefin film with a siliconized one piece release liner. Permeability: 0.05 perms per ASTM D1970.

   1. Primer: Type as manufactured and recommended by roofing manufacturer, appropriate to substrate.

H. Sealants: Solvent-based ethylene propylene seam caulk approved by roofing system manufacturer.

I. All-Purpose Sealant: Single component, high-solids content, and gun grade, approved by membrane manufacturer.

J. Expansion Joints: Refer to Section 07 95 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected and only when substrate is inspected and accepted by roofing installer and roofing system manufacturer.

B. Verify that surfaces and site conditions are ready to receive work.

C. Verify that deck is structurally sound to secure adhered single ply roofing system. Inspect roof deck for corrosion, rotting, warping, etc. Repair or replace defective roof deck prior to installing the roofing system.

D. Verify that deck surfaces are dry to the touch and free of snow or ice.

E. Verify that deck is clean and smooth, free of noticeable high spots or depressions, and has a positive slope to gutters.

F. Verify that roof openings, curbs, pipes, sleeves, ducts, vents, etc. through roof are solidly set. Verify and ensure that all roof drain lines are clear.

3.2 PREPARATION - GENERAL

A. Protection: Protect roofing surface and adjacent work against damage to roofing work.

B. Review Material Safety Data Sheet and safety regulations recommended by OSHA.

C. Preparation Of Substrate:

1. General: To prevent delays or interruptions, coordinate with other work to ensure that components to be incorporated into the roofing system are available as the work progresses. Examine substrates to which the roofing materials are to be applied to ensure that their condition is satisfactory for the roofing systems application. Do not permit voids greater than 1/4 inch width in the substrate. Substrates for roofing materials shall be dry and free of oil, dirt, grease, sharp edges and debris. Inspect substrates and correct defects before application of roofing membrane.
2. Determine the condition of the structural substrate. Areas with deteriorated or damaged decking or other materials shall have those affected materials removed and replaced.
3. Provide temporary water cut-offs at the end of each day. Maintain watertight condition of roof to prevent water intrusion. Install only that amount of roofing and flashing that can be made watertight with new materials in a one-day period or prior to the onset of inclement weather. Remove cut-off before resuming roofing.
4. Cover decking with cover board, applied in accordance with manufacturer’s instructions and as required resulting in a UL Class A roof system.

3.3 AIR AND VAPOR BARRIER INSTALLATION

A. Prepare surfaces and install primer and air and vapor barrier per manufacturer’s recommendations.

1. Surfaces shall be clean, dry, smooth, and free of voids, spalled areas, sharp protrusions, loose aggregate, laitance, and curing and form release compounds.

B. Install air and vapor barrier over entire roof area and at all roof penetrations and deck to wall intersections.

3.4 GYPSUM ROOF COVER BOARD INSTALLATION

A. Place cover board over clean plywood sheathing.

B. Apply adhesive for adhered single-ply roofing system according to adhesive manufacturer’s instructions.

3.5 ROOFING MEMBRANE PLACEMENT, ATTACHMENT, AND HOT AIR WELDING

A. General: Install membrane in accordance with manufacturer’s instructions.

B. Sweep substrate of all loose debris before laying membrane.

C. Adhered Single-Ply Roofing System:

1. Apply adhesive per manufacturer's foam adhesive bead spacing requirements within the field, at perimeters, and at corners to meet wind uplift and warranty requirements.
2. Position membrane over the substrate.
3. Fold membrane sheet back so half the underside is exposed.
4. Stir bonding adhesive thoroughly scraping the sides and the bottom of the can (5 minutes minimum). Bonding surfaces must be dry and clean.
5. Apply bonding adhesive to the exposed underside of the membrane and the corresponding substrate area. Do not apply adhesive along the splice edge of the membrane to be hot air welded over adjoining sheet.
6. Apply adhesive evenly, without puddles using a plastic core medium nap roller to achieve continuous coating of both surfaces at a coverage rate recommended by adhesive manufacturer.
7. Due to solvent flash-off, condensation may form on freshly applied bonding adhesive when the ambient temperature is near the dew point. If condensation develops, possible surface contamination may occur and the application of bonding adhesive must be discontinued. Allow the surface to dry and apply a thin freshener coat to the previously coated surface when conditions allow for continuing.
8. Allow adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
9. Roll the coated membrane into the coated substrate while avoiding wrinkles.
10. Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.
11. Fold back the unbonded half of the sheet in the same manner, overlapping edges a minimum of 2 inches to provide for a minimum of 1-1/2 inch hot air weld.
12. Install adjoining membrane sheets in the same manner, overlapping a minimum of 2 inches to provide a minimum of 1-1/2 inch hot air weld.
13. Protect completed sections of the roof so bonding adhesive will not discolor the membrane surface. Do not place bonding adhesive containers or their lids directly on the surface of the membrane.
14. Install additional membrane securement at the perimeter of each roof level, roof section, curb, interior wall, etc. at any inside angle change where slope exceeds 2 inches in one horizontal foot. Use manufacturer approved fasteners and standard seam fastening plates installed horizontally or vertically at the base of the walls, curbs, etc., spaced a minimum of 12 inches on center and flashed as recommended by roofing system manufacturer.

D. Adhered Single-Ply Roofing System at Vertical Surfaces:

1. Apply the applicable bonding adhesive to the exposed underside of the membrane and the corresponding vertical substrate area at the published application rate on the applicable Product Data Sheet.
2. Allow adhesive to dry until tacky and install coated membrane into coated vertical substrate and avoid wrinkling.
3. Brush down the bonded section of membrane immediately with a soft bristle push broom.

4. Install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches to provide for a minimum 1-1/2 inch hot air weld. All splices be shingled to avoid bucking of water.
5. Hot air weld the membrane sheets a minimum of 1-1/2 inches with an automatic hot air welding machine.

E. Welding of Laps:
1. General:
a. Roofing membrane connection shall be hot air welded only.
b. Surfaces to be welded shall be clean and dry.
2. Hot Air Welding:
a. Hot air weld the membrane sheets with an automatic hot air welding machine. Follow hot air welding machine manufacturer's instructions for use.
b. Where use of automatic hot air welding machines is not practical, use a hand-held hot air welding machine. Preheat the nozzle tip and apply over the overlap area until the material reaches required temperature, immediately follow with a hand roller to press the heated membrane surfaces together with slow, even movements. Keep the roller within one inch of the nozzle tip. Seam strength may be tested when cool. For best results, test seams 8 hours after hot air welding.
3. Quality Control of Seams: After seaming, check welded seams for continuity and integrity. Repair openings or "fishmouths" with a hand-held hot air tool fitted with a narrow nozzle tip and with a roller.
4. Membrane lap edges that have been exposed to the elements for approximately seven days or longer must be prepared with manufacturer-approved membrane cleaner. Prepare the surface where the cleaner has been applied as per manufacturer's instructions prior to hot air welding.

3.6 MEMBRANE FLASHING

A. Flash all vertical surfaces with reinforced membrane. Use non-reinforced membrane only at inside and outside corners, field fabricated pipe seals, scuppers, and sealant pockets where the use of premolded accessories are not practical. Terminate the flashing in accordance with manufacturer-approved detail.

B. Use bonding adhesive on vertical surfaces more than 12 inches high such as walls, curbs, and pipes. Bonding adhesive is not required for vertical surfaces terminated under a metal counter flashing less than 12 inches high. Bonding adhesive may be eliminated for flashing heights 18 inches or less when a coping or termination bar is used for vertical terminations.

3.7 OTHER RELATED WORK

A. Counterflashing, and Other Metal Work: Refer to Section 07 62 00. Fasten flashing to prevent metal from pulling free or buckling. Seal to prevent moisture from entering the roofing system or building.

B. Expansion Joints: Refer to Section 07 95 00.

3.8 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. The manufacturer's representative shall observe, conduct tests, and prepare test reports in accordance with the provisions of this Section at predetermined periods before, during, and after installation of the work – specifically at critical periods identified by roofing system manufacturer to ensure a completely warranted system.

C. The manufacturer's representative and the testing agency shall conduct final roof inspection on completion of the work in this Section and submit report to Architect and Owner. Notify Architect and Owner 48 hours in advance of date and time of inspection.

3.9 CLEANING

A. Clean roof surfaces as recommended by manufacturer. Do not use materials or methods which may damage surface or surrounding construction.

B. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior wall flashings.

B. Roof flashings.

C. Gutters.

D. Rain water leaders.

E. Pre-manufactured roof penetration flashings.

F. Reglets.

1.2 RELATED SECTIONS

A. Section 07 54 23 – Thermoplastic-Polyolefin Roofing.

B. Section 07 92 00 – Joint Sealants.

C. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. AAMA 2605 – Voluntary Specifications, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
2. ANSI/SPRI/FM4435/ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
3. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
5. ASTM B32 – Standard Specification for Solder Metal.
6. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

7. ASTM B370 – Standard Specification for Copper Sheet and Strip for Building Construction.
8. ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
9. ASTM D4586 – Standard Specification for Asphalt Roof Cement, Asbestos Free.
10. CDA Copper in Architecture – Handbook.
11. NRCA Roofing Manual.
12. SMACNA Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Describe material profile, jointing pattern, jointing details, fastening methods and installation details.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with sufficient documented experience.

1.6 SYSTEM DESCRIPTION

A. Work of this Section is to physically protect roofing and exterior from damage that would permit water leakage to building interior.

1.7 PERFORMANCE

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

1.8 DELIVERY, STORAGE AND HANDLING

A. Store products under provisions of Division 01.

B. Stack preformed material to prevent twisting, bending or abrasion, and to provide ventilation.

C. Prevent contact with materials during storage that may cause discoloration, staining or damage.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, G90 zinc coating; 24 gauge core steel unless noted otherwise on Drawings.

B. Aluminum: ASTM B209, 0.032 inch thickness with mill finish, unless noted otherwise on Drawings.

C. Copper Sheet: ASTM B370, temper H00-1/8 hard (cold rolled), except where temper 060 is required for forming, 20 ounces per square foot.

D. Stainless Steel: ASTM A666, Type 304, soft temper, 28 gauge, smooth No. 4 finish

2.2 ACCESSORIES

A. Fasteners: Galvanized steel or stainless steel with soft neoprene washers. Finish exposed fasteners same as flashing metal.

B. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

C. Touch-up Paint: "Galvalloy" or "Galvweldalloy."

D. Sealant: Type specified in Section 07 92 00.

E. Bedding Compound: Rubber-asphalt type.

F. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

G. Solder:

1. Galvanized Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead with maximum lead content of 0.2 percent.
2. Copper: ASTM B32; 50-50 Tin-Lead type or lead-free alternative of similar or greater strength.

H. Flux: Type as recommended by sheet metal manufacturer.

1. Copper: Harris Stay-Clean Liquid Flux or muriatic acid neutralized with zinc.

I. Strainers: Provide and install strainers at downspout openings in gutters per SMACNA manual.

2.3 PREMANUFACTURED ROOF PENETRATION FLASHINGS

A. At single ply membrane roofing:

1. Products as manufactured by Portals Plus or accepted equal.
    a. Pipe Portal Systems Pipe Boots: Compression molded EPDM rubber caps mechanically sealed to substrate using two beads formed into the collar of the cover mated with double grooves molded into the inside of the cap. Provide manufacturer's standard adapter rings as required for a watertight installation. Size and type: As required for size and number of pipes to be flashed.

1) Provide stainless steel clamps for final securement of pipe boots around penetrations.

2.4 REGLETS

A. Manufacturers:

1. Fry. Products:

a. Plaster Flashing System: Fry Reglet Model “STX” Springlok Stucco Reglet and Counter Flashing. Material shall be 0.025 inch thick aluminum with mill finish.

b. Masonry Flashing System: Fry Reglet Model “MA” Springlok Masonry Reglet and Counter Flashing with 1-1/2 inch top flange. Material shall be 0.025 inch thick aluminum with gray polyester coating.

c. Surface Mounted Flashing System: Fry Reglet Model “SM” Surface Mounted Reglet and Counter Flashing. Material shall be 0.025 inch thick aluminum with mill finish.

2. MM Systems.

3. Superior.

B. Substitutions: Under provisions of Division 01.

2.5 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats and starter strips of same material as sheet, interlockable with sheet.

C. Form pieces in longest practical lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seam.

F. Solder and seal non-moving metal joints watertight. After soldering, remove flux. Wipe and wash solder joints clean.

G. Fabricate one piece corners with minimum 18 inch long legs; seam for rigidity, solder joint watertight.

H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

I. Expansion-contraction of sheet metal runs: Provide flat, 4 inch lap joints, sealed watertight with sealant, at maximum of 40 foot intervals.

2.6 FINISHES

A. Back-paint concealed metal surfaces with bituminous paint to a minimum dry film thickness of 15 mils.

B. Site paint finish under provisions of Section 09 91 00.

C. Pre-Finished Galvanized Steel: Shop pre-coated with PVDF coating.

1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605, multiple coat, thermally cured fluoropolymer paint finish system.

2. Colors: As selected by Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify shapes and dimensions of surfaces to be covered.

B. Verify substrates are clean, dry, smooth and free of defects to the extent needed for sheet metal work.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Field measure site conditions prior to fabricating work.

B. Install starter and edge strips, and cleats before starting installation.

C. Install reglets true to lines and levels. Seal top of surface mounted reglets with sealant.

D. Insert flashings into reglets to form tight fit. Secure in place with plastic wedges at maximum 12 inches on center. Seal flashings into reglets with sealant.

E. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations acceptable to Architect.

F. Lock and seal all joints.

G. Apply plastic cement compound between metal flashings and felt flashings.

H. Apply bituminous coating between dissimilar metals.

I. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

J. Solder non-moving metal joints watertight for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

K. Seal metal joints watertight.

L. Single-Ply Roofing:

1. Do not use petroleum-based products in conjunction with single-ply roofing.
2. All sealants used in conjunction with single-ply roofing shall be approved by roof membrane manufacturer.

3.3 INSTALLATION

A. Fabricate and install items in conformance with drawing details and SMACNA and NRCA manuals.

1. Install premanufactured items in accordance with manufacturer’s recommendations.

B. Ensure that items are installed in true and accurate alignment with other items and related work; that joints are accurately fitted; that exposed surfaces are free from dents; that corners are reinforced; that seams are watertight.

C. All work shall be left free of passivators, oil, grease, or acid residue, ready to receive paint finish.

D. Wherever possible, all fasteners shall be concealed. All exposed fasteners shall have neoprene gaskets and be capped with a bead of sealant.

E. Install counter-flashings in reglets with continuous bead of sealant.

3.4 TOUCH-UP

A. Where galvanized finish is damaged by fabrication or installation, repair with specified touch-up material, applying in accordance with manufacturer's printed instructions.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sealants.

B. Sealant accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 07 13 26 – Self-Adhering Sheet Waterproofing.

C. Section 07 62 00 – Sheet Metal Flashing and Trim.

D. Section 07 84 00 – Firestopping.

E. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM C510 – Standard Test Method for Staining and Color Change of Single or Multicomponent Joint Sealants.
2. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
3. ASTM C794 – Standard Test Method for Adhesion in Peel of Elastomeric Joint Sealants.
4. ASTM C834 – Standard Specification for Latex Sealants.
5. ASTM C881 – Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.
6. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.
7. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
8. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid Applied Sealants with Accessories Used in Structural Glazing Systems.
9. ASTM C1193 – Standard Guide for Use of Joint Sealants.
10. ASTM C1248 – Standard Test Method for Staining of Porous Substrate by Joint Sealants.

11. ASTM C1311 – Standard Specification for Solvent Release Sealants.
12. ASTM C1521 – Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
13. ASTM D2203 – Standard Test Method for Staining from Sealants.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit manufacturer's descriptive literature and product specification for each product, including primers and sealing compounds.
   1. Provide manufacturer's literature with selected colors clearly indicated.

C. Quality Assurance/Control Submittals:
   1. Product validation/assurance submittals.
   2. Manufacturer's laboratory adhesion and stain testing results.
   3. Joint sealants field adhesion to joint substrates test results.
   4. Installer qualifications.
   5. Written certification from the subcontractor that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

D. Sample Manufacturer's Warranty.

E. Closeout Submittals: Cleaning and maintenance data.

1.5 DEFINITIONS

A. Sealant Types:
   1. S: Single component sealant, cures by moisture reaction.
   2. M: Multiple component sealant; cures by chemical reaction.

B. Sealant Grades:
   1. NS: Non-sag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping.
   2. P: Pourable sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
   3. SL: Self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.

C. Sealant Classes:
   1. 12.5: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 12.5 percent of the joint width as measured at the time of application.

2. 25: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 25 percent of the joint width as measured at the time of application.
3. 35: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 35 percent of the joint width as measured at the time of application.
4. 50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 50 percent of the joint width as measured at the time of application.
5. 100/50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase of at least 100 percent and a decrease of at least 50 percent of the joint width as measured at the time of application.

D. Sealant Uses:

1. A: Sealant acceptable for use on an aluminum substrate.
2. G: Sealant acceptable for use on a glass substrate.
3. I: Sealant designed for use in joints which are submerged continuously in a liquid.
   a. Immersion rated sealant applications require primer.
4. M: Sealant acceptable for use on a mortar substrate.
5. NT: Sealant designed for use in joints in non-traffic areas.
6. T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks, and parking garages.
7. O: Sealant acceptable for use on substrates other than those listed above including, but not limited to, color anodized aluminum, metals other than aluminum, painted surfaces, brick, stone, tile, and wood.

E. Miscellaneous:

1. FC: Fast cure sealants; provides lesser cure times than corresponding standard cure sealants.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

A. Meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168. Information is available at www.aqmd.gov. VOC limit expressed in grams per liter as follows:

Sealant	VOC Limit
Architectural	250
Single Ply Roof Material Installation/Repair	450
Nonmembrane Roof Installation/Repair	300
Other	420

Sealant Primer	VOC Limit
Architectural – Nonporous	250
Architectural – Porous	775
Other	750

B. Provide sealants with no carcinogen or reproductive toxicant components at more than one percent of total mass of product as defined in the following lists:

1. California OEHHA, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Information is available at www.oehha.ca.gov/prop65.html.
2. California Air Resources Board (CARB), list of Toxic Air Contaminants (California Air Toxics). Information is available at www.arb.ca.gov/toxics.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section.
2. Applicator Qualifications: Firm specializing in installing work specified in this Section with experience on at least five projects of similar nature in past three years.

B. Product Validation/Assurance: Provide products with current SWRI Validation or provide independent third-party laboratory test results showing product meets performance requirements in accordance with ASTM C920 and as specified in this Section.

C. Compatibility: Materials forming joints and adjacent materials shall not adversely affect sealant materials or sealant color per ASTM C1087.

D. Staining: Sealants shall not stain joint substrates per ASTM C510, ASTM C1248, and ASTM D2203.

E. Manufacturer Adhesion, Cohesion, and Stain Testing: Provide manufacturer's laboratory adhesion and cohesion testing per ASTM C719 and ASTM C794, and stain testing per ASTM C510, using specimens of actual substrates to ensure sealant compatibility with substrate before product acceptance.

F. Joint Sealants Field Test for Adhesion and Cohesion to Joint Substrates: Perform field tests for each elastomeric joint sealant in accordance with ASTM C1521, with the manufacturer's representative present prior to installation as follows:

1. Install joint sealants in five foot joint lengths. Allow sealant to fully cure before testing.
2. Make a knife cut of the sealant across the joint and along each side of the joint approximately 3 inches long.
3. Place a mark on the sealant tab, 1 inch from the adhered joint to the tab's free end.
4. Grasp a 2 inch piece of sealant firmly just beyond the 1 inch mark and pull at a 90 degree angle.
5. Record whether or not sealant in joint maintained adhesion to substrate.
6. Record percentage length of sealant elongation.
7. Sealant product acceptance shall be based on pass/fail adhesion performance.

G. Coordination and Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with provisions of Division 01.
2. Convene pre-installation meeting prior to commencing work of this Section.
3. Take minutes of meeting. Distribute to all attendees and concerned parties within five days.
4. Coordinate work in this Section with work in related Sections.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver materials in the unopened, original containers or unopened packages with manufacturer's name, labels, product identification, color, expiration period, curing time and mixing instructions for multi-component materials.

C. Storage and Protection: Store materials in a dry secure location with ambient temperature range of 60 degrees F to 80 degrees F.

D. Carefully handle and store to prevent inclusion of foreign materials.

1.9 PROJECT/SITE CONDITIONS

A. Environmental Limitations:

1. Do not proceed with installation of primers and joint sealants under the following conditions:

a. When ambient and substrate temperature conditions are less than 40 degrees F, or as otherwise recommended by manufacturer.

b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.10 SEQUENCING

A. Apply waterproofing, water repellents, and preservative finishes after sealants have fully cured.

1.11 WARRANTY

A. Comply with provisions of Division 01.

B. Provide manufacturer's warranty against material defects, air and water tightness, loss of adhesion, cohesion, and staining as follows:

1. Silicone sealants – Twenty years.

2. Urethane sealants – Five years.

3. Other sealants – Two years.

C. Provide installer's two year workmanship warranty.

1.12 MAINTENANCE DATA

A. Submit in accordance with Division 01.

B. Provide cleaning and maintenance information, recommended inspection intervals, and instructions for repairing and replacing failed sealant joints.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. BASF Corporation – Building Systems, Shakopee, MN; 800-433-9517 www.buildingsystems.basf.com.
2. GCP Applied Technologies, Cambridge, MA; 617-876-1400, www.gcpat.com.
3. Pecora Corporation, Harleysville, PA; 800-523-6688, www.pecora.com.
4. Sika Corporation, Lyndhurst, NJ; 800-933-7452, www.usa.sika.com.
5. Specified Technologies Inc. (STI), Somerville, NJ; 800-992-1180, www.stifirestop.com.
6. The Dow Chemical Company, Midland, MI; 800-331-6451, www.consumer.dow.com.
7. The Euclid Chemical Company, Cleveland, OH; 800-321-7628, www.euclidchemical.com.
8. Tremco Sealant Weatherproofing Division of RPM International, Inc., Beachwood, OH; 800-321-7906, www.tremcosealants.com.
9. USG – United States Gypsum Co., Chicago, IL; 800-874-4968, www.usg.com.

B. Substitutions: Under provisions of Division 01.

2.2 SEALANTS

A. General:

1. Provide sealants that have been tested and found suitable for the substrates to which they will be applied.
2. Color: As selected by Architect from manufacturer's full range of colors.

B. Exterior Sealants:

1. Exterior Perimeter Sealant: Polyurethane sealant; ASTM C920; Type M; Grade NS; Class 50; uses: A, I, M, NT, O, T.
   a. Products:
      1) Tremco Dymeric 240FC.
      2) BASF MasterSeal NP2.
      3) Sika Sikaflex-2c NS.
      4) or accepted equal.
   b. Use at:
      1) Exterior vertical joints bordered on one or both sides by concrete, metal, and/or window perimeters, threshold bedding, and/or sheet metal flashing lap joints.
      2) Porous materials such as concrete or fiber cement siding.
      3) Non-porous materials such as painted metal, anodized or mill finish aluminum.
2. Exterior Perimeter Sealant: Medium modulus moisture curing, non-staining, non-bleeding silicone sealant; ASTM C920; Type S; Grade NS; Class 50/50; uses: A, G, M, NT, O.

a. Products:
   1) The Dow Chemical Company Dowsil 795 Silicone Building Sealant.
   2) Tremco Spectrem 2.
   3) Sika Sikasil WS-295.
   4) or accepted equal.
b. Use at:
   1) Exterior vertical joints bordered on one or both sides by concrete, metal, and/or window perimeters, threshold bedding, and/or sheet metal flashing lap joints.
   2) Porous materials such as concrete or fiber cement siding.
   3) Non-porous materials such as painted metal, anodized or mill finish aluminum.

3. Silicone Weather Barrier Sealant: High performance, moisture curing, gun grade silicone sealant; ASTM C920; Type S; Grade NS; Class 25; use: A, I, M, NT, O, T.
   a. Products:
      1) The Dow Chemical Company Dowsil 758.
      2) GCP Applied Technologies Perm-A-Barrier S100.
      3) Tremco Spectrem 1.
      4) or accepted equal.
   b. Use for bedding metal panel roof clips, sheet metal flashing and trim over self-adhering sheet waterproofing, and sealing reverse laps and exposed or cut self-adhering sheet waterproofing membrane edges not exposed to UV.
4. Traffic Sealant: Self leveling, chemical curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type M; Grade NS or Grade P; Class 25; uses: M, O, T.
   a. Products:
      1) Pecora Corp. Urexpan NR-200.
      2) BASF MasterSeal SL 2.
      3) Sika Sikaflex-2c SL.
      4) or accepted equal.
   b. Use at:
      1) Exterior horizontal traffic expansion joints in concrete with slopes less than five percent.
      2) Interior horizontal traffic joints in low-slope concrete with slopes less than five percent.
5. Traffic Sealant: Slope grade chemical curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type M; Grade P; Class 25; use: T.
   a. Products:
      1) Pecora Corp. DynaTrol II-SG.
      2) BASF MasterSeal SL 2 Slope Grade.
      3) Sika Sikaflex 2c NS TG.
      4) or accepted equal.

b. Use at:

1) Exterior horizontal traffic expansion joints in concrete with slopes between five percent and ten percent.

2) Interior horizontal traffic joints in concrete with slopes between five percent and ten percent.

6. Metal Lap and Bedding Sealant (non-soldered flashings): Non-drying, non-skinning, non-curing flexible butyl rubber sealant; ASTM C1311; Type S; Grade NS; Class 10; uses: G, M, O.

a. Products:

1) Tremco TREMpro JS773 Butyl Sealant.

2) Pecora Corp. BA-98 Butyl Rubber Sealant.

3) or accepted equal.

b. Use for bedding thresholds, glazing secondary seals, and sheet metal flashing and trim not exposed to ultraviolet (UV) light.

7. Metal Lap and Bedding Sealant (non-soldered flashings): High performance, moisture curing, gun grade polyurethane sealant; ASTM C920; Type S; Grade NS; Class 25; use: A, I, M, NT, O, T.

a. Products:

1) Tremco Vulkem 116.

2) BASF MasterSeal TX1.

3) Sika Sikaflex Textured Sealant.

4) or accepted equal.

b. Use for bedding thresholds, glazing secondary seals, and sheet metal flashing and trim exposed to ultraviolet (UV) light.

C. Interior Sealants:

1. Interior Sealant: Nonoxidizing, skinnable, paintable, gunnable, non-staining, non-bleeding acrylic latex sealant; ASTM C834; Type S; Grade NS; Class 12.5; use: O.

a. Products:

1) Tremco Tremflex 834.

2) Pecora Corp. AC-20 + Silicone.

3) or accepted equal.

b. Use at interior trim and finish joints expecting minimal movement.

2. Interior Sealant: Low modulus, moisture curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type S; Grade NS; Class 35; uses: A, M, NT, O.

a. Products:

1) Tremco Dymonic FC.

2) Euclid Chemical Company Eucolastic 1NS.

3) Sika Sikaflex 1a.

4) or accepted equal.

b. Use at interior vertical expansion, control, and air seal joints.

3. Sanitary Sealant: Mildew resistant with fungicide, acetoxy curing, non-staining, non-bleeding silicone sealant; ASTM C920; Type S; Grade NS; Class 25; uses: A, G, NT, O.
    a. Products:
        1) Tremco Tremsil 200 Sanitary.
        2) The Dow Chemical Company Dowsil 785 Mildew Resistant.
        3) Pecora 898NST.
        4) Sika Sikasil-N Plus US.
        5) or accepted equal.
    b. Use at interior joints with nonporous substrates around quarry tile, sinks and plumbing fixtures.
4. Acoustical Sealant: Non-skinning, non-hardening synthetic rubber sealant; ASTM C919; Type S; Grade NS; use: O.
    a. Products:
        1) Tremco Acoustical Sealant.
        2) Pecora BA-98.
        3) or accepted equal.
    b. Use at concealed joints and penetrations in interior acoustical walls.
5. Acoustical Sealant: Nonoxidizing, skinnable, paintable, gunnable, non-staining, non-bleeding acrylic latex sealant; ASTM C834 and C919; Type S; Grade NS; Class 12.5; use: O.
    a. Products:
        1) Tremco Tremflex 834.
        2) Pecora Corp. AC-20 FTR.
        3) USG Sheetrock Brand Acoustical Sealant.
        4) STI LC or SpecSeal Smoke “N” Sound Sealant.
        5) Hilti CS-S SA Light.
        6) or accepted equal.
    b. Use at exposed joints and penetrations in interior acoustical walls.

2.3 ACCESSORIES

A. Joint Cleaner: Non-corrosive and non-staining type as recommended by sealant manufacturer; compatible with joint forming materials.

B. Primers: Non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

C. Joint Backing: Non-adhering backing to sealant; non-staining, compatible with sealant and primer such as round, closed cell or bi-cell polyethylene foam rod; oversized 25 percent to 50 percent larger than joint width. Materials impregnated with oil, bitumen or similar materials are not permitted.

D. Bond Breakers: Type and consistency recommended by the sealant manufacturer to suit the particular application.

E. Bond Breaker Tape: Self-adhesive, pressure sensitive polyethylene tape.

F. Masking Tape: Non-staining, non-absorbent tape compatible with joint sealants and adjacent joint surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions; verify substrate, surfaces, and joint openings are ready to receive work and field measurements are as shown on drawings, as specified in this Section, and as recommended by manufacturer.

B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and prime joints in accordance with ASTM C1193 and manufacturer's written instructions.

B. Remove loose materials and foreign matter that might impair sealant adhesion. Clean porous materials such as concrete by grinding, sand or water blast cleaning, mechanical abrading, acid washing or a combination of these methods as required to provide a clean, sound base surface for sealant adhesion.

1. Remove laitance by acid washing, grinding or mechanical abrading.
2. Remove form oils, release agents, chemical retardants, by sand or water blast cleaning.
3. Blow from joints with oil-free compressed air loose particles resulting from grinding, abrading, or blast cleaning prior to sealant application.

C. Mechanically or chemically clean nonporous surfaces such as metal. Remove temporary protective coatings on metallic surfaces using solvents that leave no residue as recommended by metal surface manufacturer. When masking tape or strippable films are used, remove the tape or film, and clean any residual adhesive. Apply and wipe-dry cleaning solvents using clean, lint-free cloths or paper towels, do not allow solvent to air dry without wiping.

D. Protect elements surrounding the work of this Section from damage or disfiguration. Apply masking tape to adjacent surfaces to prevent damage to finishes from sealant installation.

3.3 APPLICATION

A. Apply sealants in accordance with ASTM C1193, manufacturer's written instructions, and accepted shop drawings.

B. Apply acoustical sealants in accordance with ASTM C919, manufacturer's written instructions, except where more stringent requirements are specified herein, and accepted shop drawings.

C. Apply sealant where indicated on the Drawings and at all exterior joints and openings in the building envelope that are observable sources of air or water infiltration.

D. Measure joint dimensions and size materials to achieve required width-to-depth ratios. Acceptable joint width-to-depth ratios:

Material	Joint Width	Joint Depth	
		Minimum	Maximum
Metal or other nonporous surfaces.	1/4 inch (minimum)	1/4 inch	1/4 inch
	Over 1/4 inch	1/2 of width	1/2 inch
Wood, concrete, or other porous surfaces.	1/4 inch (minimum)	1/4 inch	1/4 inch
	Over 1/4 inch	1/2 of width	1/2 inch
	Over 1/2 to 2 inches	1/2 inch	1/2 inch
	Over 2 inches	As recommended by sealant manufacturer.	

E. Install joint backing to achieve desired joint width-to-depth ratio. Roll the material into the joint to avoid lengthwise stretching. Do not twist or braid rod stock.

F. Install bond breaker where joint backing is not used to prevent three-sided adhesion.

G. Apply primer where required and where recommended by sealant manufacturer for sealant adhesion.

H. Install sealants within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

I. Install sealants immediately after joint preparation.

J. Install sealants free of air pockets, foreign embedded matter, ridges, and sags.

K. Produce uniform, cross sectional shapes and depths relative to joint width that allow optimum sealant movement capability.

L. Tool joints concave. Use dry tooling method.

M. Cure sealants in compliance with their manufacturer’s instructions to obtain high early bond strength, internal cohesive strength, and durability. Do not disturb seals until completely cured.

3.4 CLEANING AND REPAIRING

A. Immediately clean work under provisions of Division 01.

B. Clean adjacent soiled surfaces. Use a cleaning agent as recommended in writing by the sealant manufacturer. Remove any masking tape immediately after tooling joints, leaving finished work in neat and clean condition.

C. Repair or replace defaced or disfigured caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Division 01.

B. Protect sealant until cured.

C. Do not paint sealants until sealant is fully cured.

D. Do not paint silicone sealant.

E. Protect joint sealants from contact with contaminating substances and from damage. Cut out, remove, and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of Project Completion.

END OF SECTION

SECTION 07 95 00

EXPANSION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-rated expansion joint assemblies for roof surfaces.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section07 54 23 – Thermoplastic-Polyolefin Roofing.

C. Section 07 92 00 – Joint Sealants.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:

1. ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
2. ASTM D4637 – Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Provide line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and transition attachments.

1. Provide isometric drawings depicting how components interconnect to achieve and continuity and watertightness of joint covers and fillers.

C. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.

D. Manufacturer's Installation Instructions: Indicate rough-in sizes. Provide templates for cast-in or placed frames or anchors, and indicate tolerances for item placement.

1.5 QUALITY ASSURANCE

A. Manufacturer: Sufficient experience specializing in the manufacturing of expansion joint assemblies utilizing membrane seals.

B. Application: Factory approved, trained, and certified in the proper installation of the specified expansion control system.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products in each manufacturer's original, intact, labeled containers, pallets or bundles and store under shelter in a dry location with temperatures above 40 degrees F until installed. Store off the ground, protect from freezing, direct sun exposure in elevated temperatures and construction activities.

1.8 WARRANTY

A. The expansion system shall be warranted for a period of three years for normal usage under specified movements and design conditions.

B. The three year warranty shall warrant and provide at no charge, all materials and labor needed to properly repair or replace defective or damaged product within the term of the provided warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Balco, Inc. Product: Model #BRBS-3.5-7SE-R2W roof-to-wall bellows.

B. MM Systems Corporation.

C. Watson Bowman Acme.

D. InPro Corporation.

E. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Roof Bellows: 14 inch wide white 60 mil EPDM cover with closed cell support foam and 0.018 inch stainless steel flanges.

1. Provide manufacturer's prefabricated end caps.

B. Threaded Fasteners: Stainless steel.

C. Provide 45 mil flexible EPDM Class I (per ASTM D4637) water barriers with drainage fittings and tubing at exterior joints for a waterproof installation.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

2.3 FABRICATION

A. Joint Covers: Designed to permit ±50 percent joint movement with full recovery; refer to Drawings for type and locations.

B. Back paint components in contact with cementitious materials with bituminous coating.

C. Shop-assemble components and package with anchors and fittings. At metal components, provide factory welded transitions and corners.

D. Provide joint components in single length wherever practical. Minimize site splicing.

E. Only straight, butt splice connections shall be allowed on the jobsite following manufacturer's written instructions utilizing specialty heat fusing equipment or the manufacturer's specialty splicing adhesive. All factory and field fused connections shall incorporate bonding of the complete seal profile. This includes fusing of all internal and external web configurations. All corner connections shall be factory fabricated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to installation.

B. Verify that joint preparation and affected dimensions are acceptable.

3.2 PREPARATION

A. Provide anchoring devices for installation and embedment.

B. Provide templates and rough-in measurements.

3.3 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor components to substrate to prevent misalignment.

D. Make allowances for change in joint size due to difference between installation and building operating temperatures.

E. Cover and protect expansion joint cover assemblies from construction traffic.

F. Roof Joint Covers: Attach to curbs and substrates at 24 inches on center maximum.

G. Remove excess and misplaced sealants as work progresses.

H. Remove protective film or coverings from expansion joint covers upon completion of adjacent construction.

3.4 ADJUSTING AND PROTECTION

A. Adjust joint seal to freely accommodate joint movement.

B. Protect installation from damage by work of other Sections.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gypsum board:
   1. Type X gypsum board.
   2. Moisture resistant gypsum board.

B. Accessories.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry.

B. Section 07 21 00 – Thermal Insulation.

C. Section 07 92 00 – Joint Sealants.

D. Section 09 91 00 – Painting.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards:
   1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
   2. ASTM C473 – Standard Test Method for Physical Testing of Gypsum Panel Products.
   3. ASTM C475/C475M – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
   4. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
   5. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
   6. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
   7. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

8. ASTM C1396/C1396M – Standard Specification for Gypsum Board.
9. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
10. GA-214 – Recommended Levels of Gypsum Board Finish.
11. GA-216 – Application and Finishing of Gypsum Board.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years' experience.
2. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with experience on at least five projects of similar nature in past three years.

B. Regulatory Requirements: Comply with requirements of CBC Chapter 25.

C. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store materials in a dry secure place; neatly stacked to prevent sagging or damage to edges, ends, and surfaces. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Interior Environmental Requirements:

1. Maintain room temperature at not less than 40 degrees F during application of gypsum board. Maintain room temperature at not less than 50 degrees F for joint treatment, texturing, and decoration for 48 hours prior to and continuously thereafter until completely dry.
2. Provide adequate ventilation during installation and curing period.
3. Prevent exposure to excessive or continuous moisture before, during, and continuously after installation. Eliminate sources of moisture immediately.
4. Protect gypsum board from direct exposure to rain, snow, sunlight, or excessive weather conditions.

PART 2 PRODUCTS

2.1 SUSTAINABLE BUILDING DESIGN REQUIREMENTS

A. Provide sealants that meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168. Information is available at www.aqmd.gov.

B. Provide adhesive materials that meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule No. 1168.

2.2 MANUFACTURERS

A. Acceptable Manufacturers:
   1. USG – United States Gypsum Company, Chicago, IL; 312-606-4000, www.usg.com.
   2. National Gypsum Co., Charlotte, NC; 704-365-7300, www.nationalgypsum.com.
   3. GP-Gypsum – Georgia-Pacific Corp., Atlanta, GA; 404-652-4000, www.gp.com.
   4. CertainTeed Corporation, Malvern, PA; 800-233-8990, www.certainteed.com.
   5. PABCO Gypsum, Newark, CA; 510-792-9555, www.pabcogypsum.paccoast.com.

B. Substitutions: Under provisions of Division 01.

2.3 GYPSUM BOARD

A. Type X Gypsum Board: ASTM C1396/1396M; 5/8-inch thick; 2.2 pounds per square foot; fire resistant core; maximum permissible length; ends square cut, tapered edges.
   1. Acceptable Products:
      a. Sheetrock Brand Firecode X manufactured by USG,
      b. Gold Bond Brand XP Fire-Shield Gypsum Board manufactured by National Gypsum,
      c. ToughRock Fireguard manufactured by G-P Gypsum,
      d. CertainTeed Type X manufactured by CertainTeed Corporation,
      e. FLAME CURB Type X Gypsum Board manufactured by PABCO Gypsum,
      f. or accepted equal.

B. Moisture Resistant Gypsum Board: ASTM C1396/C1396M; 5/8 inch thick Type X, moisture and mold resistant core, encased in moisture resistant paper facers; maximum permissible length; ends square cut, tapered edges.
   1. Average water absorption after two-hour immersion per ASTM C473: 5 percent or less.
   2. Mold and mildew resistance per ASTM D3273: Minimum average score 8.
   3. Acceptable Products:
      a. Sheetrock Brand Mold Tough Gypsum Panels manufactured by USG,
      b. Gold Bond Brand XP Gypsum Board manufactured by National Gypsum,
      c. ToughRock Mold Guard manufactured by G-P Gypsum,
      d. M2Tech Type X manufactured by CertainTeed Corporation,
      e. MOLD CURB PLUS Type X Mold and Water Resistant Gypsum Board manufactured by PABCO Gypsum,
      f. or accepted equal.

2.4 ACCESSORIES

A. Corner Bead, Edge Trim, and Decorative Dividers: ASTM C1047; zinc-coated sheet steel. Acceptable product: 103 Deluxe Corner Bead manufactured by Clark Dietrich, or accepted equal.

B. Control Joints: ASTM C1047; roll-formed zinc joint with removable protected opening. Acceptable product: Zinc Control Joint No. 093 manufactured by Clark Dietrich, or accepted equal.

C. Screws: ASTM C1002 Type W or Type A; bugle head; provide sufficient length to provide a minimum 3/4 inch penetration into wood framing members.

D. Jointing Tape: ASTM C475/C475M; 2 inch wide heavy duty paper joint tape.

E. Joint Compound: ASTM C475/C475M.

F. Primer-Surfacer (used in lieu of skim coat in a Level 5 finish): High-build interior coating finish applied with an airless sprayer. Products: Sheetrock Brand Primer-Surfacer Tuff-Hide manufactured by USG, ProForm Brand Surfacer/Primer manufactured by National Gypsum, or accepted equal. Note: Walls applied with primer-surfacer do not require drywall paint primer prior to application of finish coats.

G. Acoustical Sealant: Refer to Section 07 92 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions.

B. Verify framing for acceptable placement, spacing, and tolerance (alignment and plumb).

C. Verify that framing and furring are securely attached.

D. Verify that all blocking, headers, and supports are in place to support plumbing fixtures, casework, shelves, and similar items.

E. Verify that insulation is secured.

F. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 SEALANTS

A. Apply acoustical sealant at partitions per sealant manufacturer’s instructions. Refer to Section 07 92 00.

3.3 GYPSUM BOARD INSTALLATION

A. Install gypsum board to framing and furring members in accordance with manufacturer’s recommendations, GA-216 or ASTM C840, and as specified in this Section.

B. Install gypsum board with separate panels in moderate contact, do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints.

1. Where two layers of gypsum board are installed, stagger all joints in top layer over joints in first layer.

C. Install gypsum board in most economical direction, using maximum practical lengths, with edges occurring over firm bearing. Install 1/4 inch (nominal) above rough floor or curb. Cut out gypsum board as required to make neat close joints around openings.

D. In vertical applications, provide lengths required to reach full height of vertical surfaces in one continuous piece.

E. Where gypsum board is carried full height to structure above, provide for deflection of structure by undercutting board 3/8 inch (nominal) and sealing top edge of board to substrate with a continuous bead of sealant to form an elastic closure.

F. Use screws to fasten gypsum board to framing.

G. Treat cut edges and holes in moisture resistant gypsum board per manufacturer's recommendations.

H. Place corner beads at all exterior corners. Use longest practical length. Place edge trims where gypsum board abuts dissimilar materials.

I. Control Joints: Install control joints where indicated on the Drawings. Where not specifically indicated, install consistent with lines of building spaces as directed by Architect; and as a minimum, install as follows:

1. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
2. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
3. In interior ceilings without perimeter relief so that linear dimensions between control joints do not exceed 30 feet and total area between control joints does not exceed 900 square feet.
4. Where ceiling framing members change direction.
5. Where a partition transitions from floor-supported framing to overhead hung framing.

J. Attach metal corner beads, edge trim, decorative dividers, and control joints to the supporting construction at 9 inches on center maximum spacing using same fasteners used to attach gypsum board panels.

3.4 JOINT TREATMENT AND FINISH TEXTURE

A. Finish gypsum board surfaces in accordance with ASTM C840, GA-214, and GA-216.

B. Remove dirt, oil, and other materials that may cause lack of bond from all surfaces to receive joint compound.

C. Set mechanical fasteners below the plane of the board.

D. Tape, fill, and sand all joints, edges and corners to produce smooth surface ready to receive finishes. Fill all dents, gouges, recesses, or other depressions with joint compound to produce a monolithic surface.

E. Feather coats onto adjoining surfaces so that camber is maximum 1/32-inch.

F. Spray apply texture where indicated on Drawings.

G. Levels of Finish: Finish gypsum board surfaces in accordance with GA-214 as follows:

Area	Finish
Plenum areas above ceilings.	Level 1 finish, no texture.
Light texture (medium orange-peel).	Level 4 finish.
Smooth finish; satin/eggshell paint finish.	Level 4 finish. Level 5 finish where critical (severe) lighting condition occurs (refer to GA-214 for description of critical lighting).
Smooth finish; semi-gloss paint finish.	Level 5 finish.

3.5 TOLERANCES

A. Maximum variation from true flatness: 1/4 inch in 10 feet in any direction.

3.6 CLEANING AND PROTECTION

A. Cleaning and Repair: Clean surfaces that have been spotted or soiled during wallboard application.

B. Defective Work: Remove and replace defective work that cannot be satisfactorily repaired, at the direction of the Architect, with no additional cost to the Owner.

C. Protection: Protect installed work against damage from other construction work.

D. Upon completion of the work under this Section, remove all surplus material, rubbish and debris from the premises and leave floors broom clean.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic tile.

B. Setting materials including adhesives and mortar.

C. Tile grout.

D. Sealants.

E. Waterproofing membranes:

F. Accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete.

B. Section 07 92 00 – Joint Sealants.

C. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards and Manuals:

1. ANSI A108.5 – Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
2. ANSI A108.6 – Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
3. ANSI A108.10 – Installation of Grout in Tilework.
4. ANSI A108.13 – Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
5. ANSI A118.3 – Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.
6. ANSI A118.4 – Latex-Portland Cement Mortar.
7. ANSI A118.10 – Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations.
8. ANSI A137.1 – Ceramic Tile.

9. ASTM C373 – Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products.
10. ASTM C648 – Standard Test Method for Breaking Strength of Ceramic Tile.
11. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
12. ASTM C1027 – Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile.
13. MIA Design Manual.
14. TCNA Handbook for Ceramic, Glass, and Stone Tile Installation by Tile Council of North America, Inc.

1.4 SUBMITTALS

A. General: Submit in accordance with Division 01.

B. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.

C. Submit instructions for installing membranes, adhesives, and grouts.

D. Samples: Submit two samples of each type and color of ceramic tile and trim.

E. Closeout Submittals: Cleaning and maintenance data.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum ten years' experience.
2. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with experience on at least five projects of similar nature in past three years.

B. Single Source Responsibility: Provide setting, grouting, membrane, and sealant products from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

C. Perform work in accordance with TCNA Handbook for Ceramic Tile Installation and ANSI A108 Series. Provide a copy of TCNA Handbook for Ceramic Tile Installation and ANSI A108 Series at the job site.

D. Pre-Installation Meetings:

1. Conduct pre-installation meeting in accordance with Division 01.
2. Convene pre-installation meeting prior to commencing work of this Section.
3. Coordinate work in this Section with work in related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Perform ceramic tile work when the ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed for at least seven days after completion of the work.

B. Do not install adhesives in a closed, unventilated environment.

1.8 WARRANTY

A. Comply with provisions of Division 01.

B. Provide manufacturer’s standard performance warranties that extend beyond a one-year period.

1.9 MAINTENANCE

A. Extra Materials: Provide five percent extra of the total square footage of each type and color of tile installed. Comply with provisions of Division 01.

B. Operation and Maintenance Data: Submit cleaning and maintenance data in accordance with Division 01.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Tile:
   1. Daltile Corp., Dallas, TX; (800) 933-8453, www.daltile.com.
   2. American Olean Tile Co., Dallas, TX; (888) 268-8453, www.aotile.com.
   3. Crossville Inc., Crossville, TN; (931) 484-2110, www.crossvilleinc.com.
   4. Interceramic, Garland, TX; (800) 688-5671, www.interceramic.com.
   5. Emser Tile, Los Angeles, CA; (323) 650-2000, www.emser.com.

B. Acceptable Manufacturers - Setting Materials:
   1. Custom Building Products, Seal Beach, CA; (209) 518-1153, www.custombuildingproducts.com.
   2. Laticrete International, Inc., Bethany, CT; (800) 243-4788, www.laticrete.com.
   3. Mapei Corp., Deerfield Beach, FL; (800) 426-2734, www.mapei.com.

C. Acceptable Manufacturers - Grout:
   1. Custom Building Products.
   2. Laticrete International, Inc.
   3. Mapei Corp.

D. Acceptable Manufacturers - Sealants:
   1. Custom Building Products.
   2. Laticrete International, Inc.
   3. Mapei Corp.
   4. Color Caulk, Inc.

E. Acceptable Manufacturers - Waterproofing Membranes:
   1. Custom Building Products.
   2. Laticrete International, Inc.
   3. Mapei Corp.

F. Acceptable Manufacturers - Accessories:
   1. Schlüter-Systems L.P., Plattsburgh, NY; (800) 472-4588, www.schluter.com.
   2. Custom Building Products, Seal Beach, CA; (209) 518-1153, www.custombuildingproducts.com.

G. Substitutions: Under provisions of Division 01.

2.2 CERAMIC TILE

A. General: ANSI A137.1, Standard Grade. Packaging shall be grade sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate.

B. Properties:
   1. Impact resistant with a minimum breaking strength of 90 pounds for wall tiles and 250 pounds for floor tiles in accordance with ASTM C648.
   2. Water absorption shall be 0.50 percent maximum in accordance with ASTM C373.
   3. Tile flooring shall be stable, firm, and slip resistant per CBC Section 11B-302.1. Floor tiles shall have a minimum dynamic coefficient of friction of 0.42 wet in accordance with the DCOF AcuTest.
   4. Floor tiles shall be minimum Class IV – Heavy Traffic durability when tested in accordance with ASTM C1027 for abrasion resistance as related to foot traffic.

C. Products:
   1. Quarry Tile:
      a. Match existing quarry tile in all respects.

D. Special Shapes (trimmers, angles, bases, caps, stops, and returns): Same nominal size as field tile; rounded concave and convex surfaces; same properties as field tile (moisture absorption, surface finish, and color). Provide radius at all outside vertical and horizontal corner tile. Provide base at wall tile.

E. Wall Base: Unless otherwise indicated, quarry tile wall base shall be 6 inches high with 3/8 inch minimum cove radius.

2.3 SETTING MATERIALS

A. Latex Portland Cement Mortar: Prepackaged, one-part, high performance, latex polymer modified dry-set, thin-set mortar. Meets or exceeds ANSI A118.4.

1. Products:
    a. Custom Building Products MegaLite Crack Prevention Mortar.
    b. Laticrete 254 Platinum Multipurpose Thin-Set Mortar.
    c. Mapei Keraflex Super.
    d. Or accepted equal.

2.4 GROUTING MATERIALS

A. Epoxy Grout: 100 percent solids epoxy grout; stainless, non-sagging, water cleanable; conforming to ANSI A118.3.

1. Products:
    a. Custom Building Products CEGLite Commercial Epoxy Grout.
    b. Laticrete Spectralock Pro Premium.
    c. Mapei Kerapoxy CQ.
    d. Or accepted equal.
2. Colors as selected by Architect.

2.5 SEALANTS

A. Latex siliconized sealant, non-sanded, in conformance with ASTM C920, Type S, Grade NS, Class 25, Uses NT, M and G. Color to match grout color.

1. Products:
    a. Custom Building Products 100% Silicone Commercial Caulk.
    b. Laticrete Latasil.
    c. Mapei Mapesil T Plus 100% Silicone Caulk.
    d. Color Caulk, Inc. Latex Siliconized Sealant.
    e. Or accepted equal.

2.6 MEMBRANES

A. Waterproofing Membrane: Trowel applied, liquid, load bearing; bonded; conforming to ANSI A118.10.

1. Products:
    a. Custom Building Products Custom 9240 Waterproofing and Crack Prevention Membrane. Self-curing liquid elastomeric membrane with reinforcing fabric.
    b. Laticrete 9235 Waterproofing Membrane with Microban. Self-curing liquid elastomeric membrane with reinforcing fabric forming a flexible, seamless waterproof membrane bonded to the substrate. Contains an antimicrobial protection to inhibit growth of mold and mildew.
    c. Mapei Mapelastic Aqua Defense, premixed, flexible, thin, ultra fast-drying waterproofing membrane.
    d. Or accepted equal.

2.7 ACCESSORIES

A. Expansion Joints: DILEX-AKWS surface joint profile with aluminum anchoring legs and 1/4 inch wide PVC movement zone manufactured by Schlüter-Systems L.P., Custom Building Products, or accepted equal. PVC color as selected by Architect from manufacturer's full range of standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine job site conditions and verify field dimensions. Verify substrate is plumb, level, true to line and square.

B. Substrate surface conditions shall conform to the requirements of ANSI A108 for the type of substrate specified and for workmanship.

C. Maximum surface variation of substrate shall not exceed maximum limits as specified in specific TCNA Methods or as follows, whichever is more stringent.

Type	Walls	Floors
Latex Portland Cement Mortar	Not applicable	1/8 inch in 10 feet

D. Tile work shall not be started until roughing in for mechanical and electrical work has been completed and tested.

E. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Install in accordance with TCNA Handbook for Ceramic Tile Installation and ANSI A108.
2. Install waterproofing membrane per manufacturer's recommendations.
3. Do not interrupt tile pattern through openings.
4. In areas requiring floor and wall tiles, floor tile installation shall not begin until after wall tiles have been installed.
5. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.
6. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
7. Provide grout joint spacing in accordance with tile manufacturer's recommendations.
8. Install movement joints where indicated on Drawings and as specified in this Section.
9. Install accessories per manufacturer's recommendations and as detailed on Drawings.
10. Sound tile after setting. Replace hollow sounding units.
11. Allow tile to set prior to grouting: Minimum of 48 hours for thin-set methods.

B. Installation Methods – Interior Floors:

Method	Substrate/Application	Setting Material
TCNA Method F122A; ANSI A108.5, A108.6, and A108.13.	Raised concrete slab; waterproof membrane; thin set application; epoxy grout.	Latex Portland cement mortar.

3.3 JOINTS

A. Joint Widths at Floors: Install tile on floors in the joint widths recommended by the tile manufacturer.

B. Expansion Joints:

1. Provide expansion joints at locations shown on the Drawings or where Drawings do not indicate location, provide in the following locations as a minimum requirement:
   a. Provide and install expansion joints per TCNA EJ171.
   b. At control joints and expansion joints in substrate material,
   c. Where substrate material changes to separate different materials,
   d. Over construction joints,
   e. Where tile abuts restraining surfaces, such as perimeter walls, curbs, and columns and at intervals of 24 to 36 feet each way in interior floor areas.

3.4 INSTALLATION - GROUT

A. Epoxy Grout: Install in accordance with manufacturer's printed instructions and ANSI A108.6.

1. Before grouting, ensure all tiles are firmly in place. Clean tile surfaces; remove paper and glue from face of mounted tiles. Remove spacers, strings, ropes, and pegs.
2. Clean open tile joints. Remove excess setting materials present in the open grout joints.
3. Mix grout in accordance with manufacturer's instructions.
4. Apply grout firmly into open joints using a hard rubber float.
5. Remove all excess epoxy grout from the tile surface with a rubber squeegee or rubber trowel before it loses plasticity and begins to set.
6. Immediately perform final clean up in accordance with manufacturer's instructions.

3.5 CLEANING AND PROTECTING

A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

B. Provide protective covering as recommended by tile manufacturer and as required to ensure installed tile finish will not be damaged by work of other trades. Protect installed tile finish surfaces from damage until Project Completion.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Painting schedules, including painting of exposed surfaces, interior and exterior, except as otherwise specified or indicated.

1.2 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel Framing.

B. Section 05 50 00 – Metal Fabrications.

C. Section 06 10 00 – Rough Carpentry.

D. Section 06 17 53 – Shop-Fabricated Wood Trusses.

E. Section 07 62 00 – Sheet Metal Flashing and Trim.

F. Section 09 29 00 – Gypsum Board.

G. Divisions 21 – 23 – Mechanical.

H. Divisions 26 – 28 – Electrical.

1.3 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. Referenced Standards, Manuals and Codes:

1. ASTM D523 – Standard Test Method for Specular Gloss.
2. The Master Painters Institute, MPI Gloss and Sheen Levels.
3. The Master Painters Institute, MPI Maintenance Repainting Manual.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Provide product data on all painting products and accessories.

C. Submit four brush-out samples 8 inches by 10 inches in size illustrating color and gloss level selected for each surface finishing product scheduled.

D. During the Contract Closeout period, provide two copies of coating maintenance manual including, but not limited to, location of manufacturer's paint store closest to the project site, area summary with finish schedule, area detail designating where each product, color, and finish was used, product data sheets and material safety data sheets for each product used, color formulations for each color used, cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with sufficient documented experience.

B. Applicator: Company specializing in commercial painting and finishing with sufficient documented experience.

C. Gloss Levels: Per Master Painters Institute (MPI) gloss standards "MPI Gloss and Sheen Levels," measured in accordance with ASTM D523.

GLOSS LEVEL	DESCRIPTION	GLOSS AT 60 DEGREES ASTM D523	SHEEN AT 85 DEGREES ASTM D523
G1	A traditional matte finish – flat.	5 units, maximum	and 10 units, maximum
G2	A high side sheen flat - "a velvet-like" finish.	10 units, maximum	and 10 - 35 units
G3	A traditional "eggshell-like" finish.	10 - 25 units	and 10 - 35 units
G4	A "satin-like" finish.	20 - 35 units	and 35 units, minimum
G5	A traditional semi-gloss.	35 - 70 units	-
G6	A traditional gloss.	70 - 85 units	-
G7	A high gloss.	More than 85 units	-

D. Previously Painted Surfaces Requiring Repainting: Surface preparation, priming, and paint application shall conform to applicable requirements of MPI Maintenance Repainting Manual.

1.6 REGULATORY REQUIREMENTS

A. Conform to California Building Code for flame spread and smoke density requirements for finishes.

B. Furnish certification that all paint coatings furnished for the location of the project comply with the EPA clean air act for permissible levels of volatile organic content for architectural coatings applied in California as designated by California Air Resources Board (CARB).

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site in manufacturer's original unopened, labeled containers; inspect to verify acceptance.

B. Store and protect products from abuse and contamination.

C. Container labeling is to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well-ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above fifty percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Paints: 50 degrees F for interior work and exterior work, unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

1.9 EXTRA STOCK

A. Provide a new and unopened one-gallon container of each type, color, and sheen to Owner.

B. Label each container with color, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 PAINT SYSTEMS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

2.2 SUSTAINABLE DESIGN REQUIREMENTS

A. VOC Content of Field-Applied Paints and Coatings: Provide products that comply with the SCAQMD rule 1113 limits for VOC content.

2.3 ACCEPTABLE MANUFACTURERS – PAINT

A. Refer to Table at the end of this Section.

B. Substitutions: Under provisions of Division 01.

2.4 ACCEPTABLE MANUFACTURERS – PRIMER SEALERS

A. Refer to Table at the end of this Section.

B. Substitutions: Under provisions of Division 01.

2.5 MATERIALS

A. All paint materials shall be provided from a single manufacturer unless noted otherwise in this Section.

B. Coatings:

1. Ready mixed. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating.

2. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. All field-applied interior paints shall use zero VOC colorants.

D. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.6 FINISHES

A. Refer to schedule at end of Section for surface finish schedule. Colors as selected by Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 18 percent.

2. Interior Located Wood: 15 percent.

3. Exterior Located Wood: 7 percent.

D. Beginning of application constitutes acceptance of existing surfaces.

3.2 PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces for painting.

B. Correct minor defects and clean surfaces that affect work of this Section.

C. Seal marks that may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Gypsum Board Surfaces: Latex fill minor defects. Spot-prime defects after repair.

F. Galvanized Surfaces: Remove passivators, oil, grease, acid residue, and surface contamination; wash with solvent. Apply coat of etching primer, unless otherwise recommended by finish coating system manufacturer.

G. Shop-Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces as recommended by primer manufacturer. Prime shop-primed steel items with steel primers specified in this Section.

H. Interior Wood Items Scheduled to Receive Finish: Hand sandpaper and wipe off dust and grit prior to priming. Seal knots, pitch streaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

1. At woodwork with transparent finish, nail holes, cracks or defects shall be filled with wood filler tinted to match color of stain.

I. Wood Decking: Clean wood decking with All Wood Cleaner as manufactured by Seal-Once or accepted equal.

J. Previously Painted Surfaces: Existing conditions vary. Evaluate degree of surface degradation. Surface preparation methods shall conform to applicable requirements of MPI Maintenance Repainting Manual.

3.3 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.4 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

1. Paint mil thicknesses shall not be less than the minimums recommended by the paint manufacturers.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand lightly between coats to achieve required finish.

F. Allow applied coat to dry before next coat is applied.

G. All shop-primed items shall be fully re-primed in the field.

H. Apply wood sealer on wood decking per manufacturer’s application instructions.

I. Previously Painted Surfaces: Priming shall conform to applicable requirements of MPI Maintenance Repainting Manual.

3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. See Divisions 21 – 23 and 26 – 28 for other items requiring painting.

B. Paint interior surfaces of air ducts and convector heating cabinets that are visible through grilles and louvers with one) coat of flat black paint, to limit of sight line. Paint dampers exposed behind grilles to match face panels. Paint all new interior and exterior exposed ductwork and ductwork supports. Paint all new conduit, pipes, and conduit/pipe supports in exposed interior and exterior locations.

C. Reinstall electrical plates, hardware, light fixture trim, and fittings removed for surface preparation or painting.

D. Do not paint factory-finished mechanical and electrical equipment.

3.6 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove from site daily.

3.7 PAINTING SCHEDULE – EXTERIOR SURFACES: Descriptions in schedule apply to new and previously painted surfaces, except surface preparation and priming of previously painted surfaces shall be in accordance with applicable requirements of MPI Maintenance Repainting Manual.

A. Wood:

1. 1st coat – Acrylic Flat Primer
2. 2nd and 3rd coats – 100 percent Acrylic Satin

B. Wood:

1. 1st coat – Acrylic Flat Primer
2. 2nd and 3rd coats – 100 percent Acrylic Semi-Gloss

C. Wood Decking:

1. 1st coat – Marine Premium Wood Sealer as manufactured by Seal-Once or accepted equal. Color: Clear Matte.
2. 2nd coat – Marine Premium Wood Sealer as manufactured by Seal-Once or accepted equal. Color: Clear Matte.
3. Board Ends: Apply Seal Ends Once as manufactured by Seal-Once or accepted equal. Color: Clear Matte.

D. Pressure Treated Wood:

1. 1st coat – Acrylic Flat Primer
2. 2nd and 3rd coats – 100 percent Acrylic Satin or **2406** 100 percent Acrylic Semi-Gloss

E. Ferrous Metal:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – 100 percent Acrylic Low Sheen

F. Ferrous Metal:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – 100 percent Acrylic Semi-Gloss

G. Ferrous and Galvanized Metal (Industrial) – For use at exterior metal railings:
   1. 1st coat – Epoxy Flat Primer
   2. 2nd and 3rd coats – Aliphatic Urethane Gloss Enamel

H. Galvanized Metal (Handrail and Guardrail Assemblies only):
   1. 1st coat – Etch Prep
   2. 2nd coat – Epoxy Flat Primer
   3. 3rd and 4th coats – High Dispersion Pure Acrylic Polymer Semi-Gloss

I. Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies):
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – 100 percent Acrylic Low Sheen

J. Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies):
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – 100 percent Acrylic Semi-Gloss

K. Fiber Cement Siding and Trim:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – 100 percent Acrylic Satin

3.8 PAINTING SCHEDULE – INTERIOR SURFACES: Descriptions in schedule apply to new and previously painted surfaces, except surface preparation and priming of previously painted surfaces shall be in accordance with applicable requirements of MPI Maintenance Repainting Manual.

A. Gypsum Board with Texture:
   1. 1st coat – PVA Flat Primer Sealer
   2. Texture per Section 09 29 00
   3. 2nd coat – PVA Flat Primer Sealer
   4. 3rd and 4th coats – Acrylic Semi-Gloss Enamel

B. Gypsum Board with Smooth Finish:
   1. 1st coat – PVA Flat Primer Sealer
   2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel

C. Gypsum Board with Texture:
   1. 1st coat – PVA Flat Primer Sealer
   2. Texture per Section 09 29 00
   3. 2nd coat – PVA Flat Primer Sealer
   4. 3rd and 4th coats – Acrylic Eggshell Enamel

D. Gypsum Board with Smooth Finish:
   1. 1st coat – PVA Flat Primer Sealer
   2. 2nd and 3rd coats – Acrylic Eggshell Enamel

E. Wood (Opaque finish):
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – Acrylic Eggshell Enamel

F. Wood (Opaque finish):
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel

G. Ferrous Metal:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – Acrylic Eggshell Enamel

H. Ferrous Metal:
   1. 1st coat – Acrylic Flat Primer
   2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel

I. Galvanized Metal, Zinc Alloy Metal, and Aluminum:
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – Acrylic Eggshell Enamel

J. Galvanized Metal, Zinc Alloy Metal, and Aluminum:
   1. 1st coat – Etch Prep
   2. 2nd coat – Acrylic Flat Primer
   3. 3rd and 4th coats – Acrylic Semi-Gloss Enamel

APPLICATION	TYPE	MPI Gloss Level	MANUFACTURERS				
			Dunn Edwards/US Coatings	PPG Paints	Sherwin Williams	Kelly Moore/Devoe	Benjamin Moore
PRIMERS							
Exterior Ferrous Metal	Acrylic	G1	BRPR00-1 or ENPR00	4020	B66W01310	6646	HP04
Exterior Ferrous and Galvanized Metal (Industrial)	Epoxy	G1	EG2300 EG2000 at ferrous.	Amerlock 2 VOC	B58W00620	Amerlock 2 VOC	Corotech V155
Exterior Galvanized Metal and Aluminum (Except Handrail and Guardrail Assemblies)	Acrylic	G1	ULGM00	4020	B66W01310	6646	HP04
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	Epoxy	G1	EG2300	98E-46	B58 646-100	98E-46	Corotech V155
Exterior Wood and Pressure Treated Wood	Acrylic	G1	EZSL00	17-921XI	B42W8041	255	027
Exterior Fiber Cement Siding and Trim	Acrylic	G1	ESPR00	17-921XI	LX02WU050	247	608
Zero VOC Interior Gypsum Board and Wood	Acrylic	G1	VNSL00	9-900	B28 2600	971/973	N534
Interior Gypsum Board	PVA	G1	VNSL00	6-2	B28 2600	971	N534
Interior Wood	Acrylic	G1	DCPR00	17-921XI	B28W8111	973	027
Interior Ferrous Metal	Acrylic	G1	BRPR00	4020	B66W01251	6646	HP04
Interior Galvanized Metal and Aluminum	Acrylic	G1	UGPR00 or ULGM00	4020	B66W01251	6646	HP04
FINISHES							
Exterior Ferrous Metal and Galvanized Metal, Aluminum, Wood, and Pressure Treated Wood (Except Handrail and Guardrail Assemblies)	100 percent Acrylic	G2	SSHL20	76-110XI	A75W51 Solo	1245	447
Exterior Ferrous Metal and Galvanized Metal, Aluminum, Wood, and Pressure Treated Wood (Except Handrail and Guardrail Assemblies)	100 percent Acrylic	G5	SSHL50	78-811XI	A76W51 Solo	1250	448
Exterior Ferrous and Galvanized Metal (Industrial)	Aliphatic Urethane Enamel	G6	UG3010 VOC	Amershield VOC	Acrolon 100	Amershield VOC	Corotech V500
Exterior Galvanized Metal (Handrail and Guardrail Assemblies Only)	High Dispersion Pure Acrylic	G5	ASHL50	4216	B53W03151	2888 Dura-Poxy HP	Corotech V500
Exterior Fiber Cement Siding and Trim, Wood, and Pressure Treated Wood	100 percent Acrylic	G4	SSHL40	76-110XI	A-89-1100	1247	455
Zero VOC Interior Gypsum Board and Wood	100 percent Acrylic	G1	SZRO10	9-110XI	Solo A74	1600	536
Zero VOC Interior Gypsum Board and Wood	100 percent Acrylic	G3	SWLL30	9-310XI	Solo A75	1610	537
Zero VOC Interior Gypsum Board, Wood	100 percent Acrylic	G5	SWLL50	9-510XI	Solo A76	1650	539
Interior Gypsum Board, Wood	100 percent Acrylic	G3	SWLL30	589-10	Solo A75	1610	537
Interior Gypsum Board, Wood	100 percent Acrylic	G5	SWLL50	9-510XI	Solo A76	1650	539
Interior Ferrous Metal, Galvanized Metal, and Aluminum	100 percent High Performance Acrylic	G3	Sierra Performance MetalMax DTM Acrylic Enamel	90-474	B66W01251	2887	V342
Interior Ferrous Metal, Galvanized Metal, and Aluminum	100 percent High Performance Acrylic	G5	Sierra Performance MetalMax DTM Acrylic Enamel	4216	B66W01151	2888	V341
MISCELLANEOUS							
Exterior Heavy Duty Cleaner	Water-Based	N/A	Krud Kutter Gloss-Off	Dura-Prep 88		Devprep 88	Corotech V600
Exterior and Interior Galvanized Metal Etch Prep.	N/A	N/A	Krud Kutter Metal Clean and Etch, Dissco Eco-Prime 100, or Jasco Prep & Prime				

END OF SECTION

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Expansions - hose and braid.

D. Mechanical couplings.

E. Pipe hangers and supports.

1.2 RELATED REQUIREMENTS

A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.

B. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

C. Division 22 - Plumbing

D. Division 23 - HVAC

E. Division 26 - Electrical

F. Division 28 - Electronic Safety and Security

1.3 REFERENCE STANDARDS

A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2021.

C. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250 2021.

D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard 2020.

E. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings 2018.

F. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded 2021.

G. ASME B16.25 - Buttwelding Ends 2017.

H. ASME B36.10M - Welded and Seamless Wrought Steel Pipe 2018.

I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).

J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.

K. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe 2021.

L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2023.

M. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.

N. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use 2021.

O. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings 2021.

P. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.

Q. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).

R. AWWA C606 - Grooved and Shouldered Joints 2022.

S. ITS (DIR) - Directory of Listed Products Current Edition.

T. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

U. NFPA 24 - Standard for the Installation of Private Fire Service Mains and their Appurtenances; 2019

V. NFPA 25 - Standard for the Testing, Inspection, and Maintenance of Water Based Fire Suppression Systems; 13CA

W. NFPA 72 - National Fire Alarm and Signaling Code; 2022

X. UL (DIR) - Online Certifications Directory Current Edition.

Y. California Building Code; 2022

Z. California Fire Code; 2022

1.4 SUBMITTALS

A. Contractor to include items listed in product section along with any additional items required to provide a complete and fully functioning installation per NFPA 13 and all adopted building and fire codes.

B. Product Data: Provide manufacturer's catalog information. Where more than one product or model is available, provide red marking arrows or highlights on the cut sheets to clearly identify the product models, finishes, orientations, and any further clarification needed of the intended products for use, to complete a thorough review.

C. Contractor Shop Drawings: Used for coordination and as installation drawings to indicate materials and finishes used, joint methods, pipe supports, elevations, floor and wall penetration details, and sealing methods. Indicate installation layout, hanger layout, weights, mounting and support details, seismic restraints with calculations, and piping connections.

D. Engineers review of submittals does not relieve Contractor from coordinating installation of work with other trades, or from compliance with Codes and Standards.

E. Project Record Documents: Record actual locations of components and tag numbering for final as builts in clients O&M's.

F. Operation and Maintenance Data: Include As-Built drawings, equipment and material data sheets, installation instructions, and spare parts lists.

G. Provide Owner with the following:

1. Manufacturer's literature and instructions describing operation and maintenance of equipment and devices installed.

2. Typewritten chart with identification and location of all access panels serving equipment and valves. Incorporate into Operation & Maintenance (O&M) manual.

3. Typewritten valve schedule indicating valve number, fixture/equipment or areas served by each numbered valve. Incorporate into O&M manual.

4. 8-1/2 x 11 laminated flow diagram showing isolation valve locations, drain valve locations, and system boundaries, where applicable, and attach it to the system riser.

5. Current copy of NFPA 25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Fabrication shop must provide welding certifications and copy of weld stamp when requested. Weld stamp to be provided on all pipe at welds.

C. Contractor Qualifications: Provide licensed persons employed by sprinkler contractor to perform planning, calculations, layout, installation, and testing of fire protection systems. The following are acceptable:

1. Licensed Professional Engineer

2. National Institute for Certification of Engineering Technologies (NICET) Level III

3. Certified sprinkler designer

D. Installer Qualifications: Company specializing in performing the work of this section shall provide journeyman sprinkler fitter(s) for installation and supervision with minimum 5 years experience.

E. Contractor shall be licensed in the State of California for installation of fire protection systems.

F. Comply with UL (DIR) requirements.

G. Valves: Bear UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.

H. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

I. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site under provisions of Division 01

B. Store and protect products under provisions of Division 01

C. All materials shall be stored in a clean, dry space.

D. Promptly inspect shipments to ensure material is undamaged and complies with Specifications. Storage and protection methods must allow inspection to verify products.

E. Deliver and store valves in shipping containers, with labeling in place.

F. Provide temporary protective coating on cast iron and steel valves.

G. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

H. Furnish pipe with plastic end-caps/plugs on each end of pipe. Maintain end-caps/plugs through shipping, storage and handling, and installation to prevent pipe-end damage and to eliminate dirt and construction debris from accumulating inside of pipe. Protect fittings and unions by storage inside or by durable, waterproof, aboveground packaging.

I. Cover pipe and fitting to prevent rust, corrosion, or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade.

J. Offsite storage agreements will not relieve Contractor from using proper storage techniques.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Comply with all building and fire code adoptions for the project location.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX.

D. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.2 ABOVE GROUND PIPING

A. Carbon Steel Pipe 2" and smaller: ASTM A53 Schedule 40 or ASTM A795 Schedule 40, galvanized.

1. Fittings: ASME B16.9 wrought steel, buttwelded, ASTM A234/A234M wrought carbon steel or alloy steel, or ASME B16.5 steel flanges and fittings.

a. Cast Iron Flanged Fittings: ASME B16.1, flanges and flanged fittings.

b. Cast Iron Threaded Fittings: Class 125, ANSI B16.4, 175 psi CWP rating.

c. Malleable Iron Threaded Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M class 150, 300 psi CWP rating, ASME B16.3

d. Ductile Iron Threaded Fittings: ASME B16.3, ASTM A536 Grade 65-45-12, thread per ASME B1.20.1; shall be UL listed for fire protection use.

1) Ductile iron threaded fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage and/or facilitate aggressive internal pipe corrosion. Ductile iron fittings should be tightened approximately three turns beyond hand tight, but no more than four turns, per manufacturer. Any deficiencies or damage caused to owners system or property due to over-tightening, shall be the full liability and responsibility of the contractor to pay for and correct.

e. Carbon steel butt weld, ASTM A234 Grade WPB/American Society of Mechanical Engineers (ASME) B16.9, standard weight, seamless.

f. Ductile iron or malleable iron, roll grooved for mechanical coupling: ASTM A47, 175 psi CWP rating, malleable iron.

1) Fitting, gasket, and coupling shall be furnished by same manufacturer.

g. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

h. Mechanical formed fittings: ASME 16.9, including, but not limited to, tees, saddle fittings, bushings and mechanical sprinkler head fittings shall not be used.

2. Joints:

a. Threaded, tapered pipe threads, ANSI B1.20.1

b. Flanged, cast iron, 175 psi CWP rating, ANSI B16.1, square head machine bolts with semi-finished hexagon nuts, ASTM A183, neoprene gasket

c. Welded, welding electrodes shall be Lincoln or equal with coating and diameter as recommended by manufacturer for type and thickness of work being done.

d. Mechanical:

1) Flexible mechanical, malleable iron, ASTM A47, equal to Victaulic Style 75

2) Rigid mechanical, ductile iron, ASTM A-536, equal to Victaulic Style 009N

3) Wet systems gasket: Grade E EPDM gasket per UL 157 and UL 213

4) Rigid or zero flex type couplings shall be provided when operating pressures cause piping to move out of place or sway on hangers. Flexible couplings may be used where pipe is braced or clamped into rigid position.

B. Carbon Steel Pipe 2-1/2" and larger: Schedule 10 pipe ASTM A795, ASTM A135, galvanized.

1. Fittings:

a. Carbon steel butt weld, ASTM A234 Grade WPB/ASME B16.9, Schedule 10, seamless

b. Ductile iron or malleable iron, roll grooved for mechanical coupling, 175 psi CWP rating, malleable iron conforming to ASTM A47.

1) Fitting, gasket, and coupling shall be furnished by same manufacturer.

2. Joints:

a. Welded, welding electrodes shall be Lincoln or equal with coating and diameter as recommended by manufacturer for type and thickness of work being done.

b. Mechanical:

1) Flexible mechanical, malleable iron, ASTM A47, equal to Victaulic Style 75

2) Rigid mechanical, ductile iron, ASTM A-536, equal to Victaulic Style 009N

3) Wet systems gasket: Grade E EPDM gasket per UL 157 and UL 213

4) Rigid or zero flex type couplings shall be provided when operating pressures cause piping to move out of place or sway on hangers. Flexible couplings may be used where pipe is braced or clamped into rigid position.

C. Plain end couplings (Roust-A-Bouts, Plainloks or similar couplings) are not allowed on either new or existing sprinkler systems.

D. Adjustable drop nipples are not allowed on either new or existing sprinkler systems.

E. All fittings for galvanized pipe shall match the pipe finish and be galvanized.

F. Clamp-on or saddle type fittings (i.e. mechanical tees or tee lox) are not allowed on new pipe. Outlet fittings inserted into holes drilled into piping are not allowed.

2.3 ESCUTCHEONS

A. Material:

1. Fabricate from nonferrous metal.

2. Chrome-plated.

B. Construction:

1. Mounting on pipe use split-pattern or split ring type.

2.4 PIPE HANGERS AND SUPPORTS

A. Provide hangers and associated parts to support piping in perfect alignment without sagging or interference, to permit free expansion and contraction, and meet requirements of NFPA 13 and manufacturer's installation instructions.

1. All hanger materials shall be listed for fire protection use and shall be galvanized or zinc coated.

B. Select and size building attachments per Manufacturer Standardization Society (MSS) standards and manufacturer's published load rating.

C. Coordinate hanger support installation to group piping of all trades.

D. Hang pipe from building members using either concrete inserts for concrete construction or beam clamps for steel construction. Installation shall comply with manufacturer's installation instructions. Expansion type inserts may be used for branch piping.

E. Suspend hangers by means of electroplated zinc or hot-dipped galvanized finish hanger rods, attachments, and supports.

F. Support pipe from top flange of beams.

G. Do not support equipment or piping from metal roof deck that does not have a concrete poured top.

H. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

1. Manufacturers:

a. Eaton; www.eaton.com; Tolco Fire Protection Solutions.

b. Anvil International; www.anvilintl.com/#sle.

I. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, swivel ring.

1. Manufacturers:

a. Anvil International; www.anvilintl.com/#sle.

b. Eaton; www.eaton.com; Tolco Fire Protection Solutions

J. Vertical Support: Steel riser clamp.

1. Manufacturers:

    a. Anvil International; www.anvilintl.com/#sle.

    b. Eaton; www.eaton.com; Tolco Fire Protection Solutions.

K. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support. Pipe stands shall be provided with a galvanized finish and be anchored into the floor.

1. Manufacturers:

    a. Anvil International: www.anvilintl.com/#sle.

    b. Eaton; www.eaton.com; Tolco Fire Protection Solutions.

L. Seismic Hangers:

1. All seismic hangers shall be galvanized finished or zinc coated.

2. Restraining clips/clamps are required in locations where vibration may be a concern.

3. Install flexible fitting at building's expansion or seismic joints per manufacturer's instructions.

4. All seismic hanger shall be listed for fire protection use.

5. Manufacturers:

    a. Anvil International Seismic Bracing Products.

    b. Eaton: Tolco Fire Protection Solutions.

2.5 MECHANICAL COUPLINGS

A. Manufacturers:

1. Tyco Fire Protection Products: www.tyco-fire.com/#sle.

2. Victaulic Company: www.victaulic.com/#sle.

B. Rigid Mechanical Couplings for Grooved Joints:

1. Dimensions and Testing: Comply with AWWA C606.

2. Minimum Working Pressure: 300 psig.

3. Housing Material: Fabricate of ductile iron complying with ASTM A536.

4. Housing Coating: Factory applied orange enamel or galvanized finished.
5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.
7. Couplings provided shall be from the same manufacturer of the fitting manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install sprinkler system and associated accessories according to NFPA 13.

B. Install pipe, fittings, couplings, and valves according to requirements of manufacturer.

C. Pipe and fittings shall be of corresponding materials when assembled.

D. Where galvanized pipe is used, hangers, seismic braces, and fittings shall match the pipe type and also be galvanized or zinc coated.

E. Group piping whenever practical at common elevations, taking into account space needed by other trades.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Provide auxiliary drains at low points of systems per requirements of NFPA 13.

I. Do not penetrate building structural members unless indicated.

J. Provide sleeves when penetrating footings, floors, and walls. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Non bearing wall partitions shall not require sleeves or to be provided with clearances.

2. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.

a. Fill hole clearance with pea gravel or insulation and caulk.

K. Escutcheons:

1. Install and firmly attach escutcheons at piping penetrations into finished spaces.

2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.

3. Use split chrome plated escutcheons in occupied spaces to conceal openings for wall and ceiling penetrations.

L. Die-cut threaded joints with full-cut, standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

M. Use joint compound sparingly

N. Provide reducing fittings or provide shop fabricated weld-o-lets to change pipe sizes in sprinkler/standpipe systems.

1. No bushings or grooved reducing couplings, such as Victaulic Style 750, are allowed.

O. Coat exposed threads when exposed to outside elements or where located in an attic space, with rust inhibiting paint equal to Rusto-leum.

1. Pipe dope and tape are not approved equivalents

2. Provide black paint with black pipe and silver paint with galvanized pipe.

3. Wipe threads clean with a cloth and use spray can application to coat threads only.

a. Overspray on pipe and/or fitting is not of concern.

P. Contactor to prep galvanized pipe and coat with a primer finish before installation.

1. Cover sprinkler heads with foil or bag before painter performs their work in the area of installation.

2. Painting contractor will come through and paint the pipe after install and remove the head covers.

3.3 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 21 05 00

SECTION 21 13 00 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

1.2 RELATED REQUIREMENTS

A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.

B. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.

C. Division 22 - Plumbing

D. Division 23 - HVAC

E. Division 26 - Electrical

F. Division 28 - Electronic Safety and Security

1.3 REFERENCE STANDARDS

A. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2022

B. UL (DIR) - Online Certifications Directory Current Edition.

1.4 SUBMITTALS

A. Contractor to include items listed in product section along with any additional items required to provide a complete and fully functioning installation per NFPA 13 and all adopted building and fire codes.

B. Product Data: Provide manufacturer's catalog information. Where more than one product or model is available, provide red marking arrows or highlights on the cut sheets to clearly identify the product models, finishes, orientations, and any further clarification needed of the intended products for use, to complete a thorough review. Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections, and accessories.

C. Shop Drawings: Fire sprinkler system design is a deferred submittal.

1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.

2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, seismic details and calculations, components and accessories. Indicate system controls.

3. Submit coordinated shop drawings to LP Engineers for approval.

4. Approved documents do not relieve the contractor of field coordination. It is the fire sprinkler contractors' responsibility to coordinate piping locations with the work of other trades.

5. Preparation of installation and fabrication drawings is the responsibility of the fire sprinkler contractor.

D. Material Data: Approved material data is a guideline. The fire sprinkler system design parameters must be strictly adhered to. Alternate manufacturers may be submitted to LP Consulting Engineers, Inc. for review of project compliance. A copy of the approved material data must be on the project site for the Project Inspector prior to the commencement of installation.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record as-built drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.

2. Sprinkler Wrenches: For each sprinkler type.

H. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

I. Provide Owner with the following;

1. Manufacturer's literature and instructions describing operation and maintenance of equipment and devices installed.

2. Typewritten chart with identification and location of all access panels serving equipment and valves. Incorporate into Operation & Maintenance (O&M) manual.

3. Typewritten valve schedule indicating valve number, fixture/equipment or areas served by each numbered valve. Incorporate into O&M manual.

4. 8-1/2 x 11 laminated flow diagram showing isolation valve locations, drain valve locations, and system boundaries, where applicable, and attach it to the system riser.

5. Current copy of NFPA 25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

1.5 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to UL and/or FM requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. Fabrication shop must provide welding certifications and copy of weld stamp. Weld stamp to be provided on all pipe at welds.

E. Contractor Qualifications: Provide licensed persons employed by sprinkler contractor to perform planning, calculations, layout, installation, and testing of fire protection systems. The following are acceptable:

1. Licensed Professional Engineer

2. National Institute for Certification of Engineering Technologies (NICET) Level III

3. Certified sprinkler designer

F. Installer Qualifications: Company specializing in performing the work of this section. with minimum five years experience approved by manufacturer.

1. Contractor shall be licensed in the State of California for installation of fire protection systems.

2. Installing company must have a valid State of California contractors' license with a C-16 classification.

G. Equipment and Components: Provide products that bear UL and FM label or marking.

H. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.6 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

A. Fire protection systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.

B. Fire protection systems and equipment shall include, but are not limited to, all piping, valve assemblies, fire pumps, electrical and control panels, conduits and other components.

C. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the State of California.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

B. Reference specification 21 0500 - Common Work Results for Fire Suppression section 1.06 for additional information.

PART 2 PRODUCTS

2.1 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted on drawings in accordance with NFPA 13.

B. Occupancy: Light Hazard.

C. Interface system with building fire and smoke alarm system.

D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to fire sprinkler riser. Supply no less than two (2) spare sprinklers of each type and temperature rating used on project. Storage cabinet to include a wrench(s) applicable to sprinkler types.

2.2 SPRINKLERS

A. Exposed Area Type: Pendant or Upright

1. Response Type: Quick.

2. Coverage Type: Standard.

3. Finish: White Poly.

4. Fusible Link: Glass bulb type intermediate temperature rated.

5. Manufacturers:

a. Tyco Fire Protection Products; www.tyco-fire.com/#sle.

b. Viking; vikinggroupinc.com.

6. Application: Areas with exposed construction unless noted otherwise

B. Guards: chrome plated with style to match the sprinkler head type used.

1. Only if client requested.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standards and adopted fire codes.

B. Approved documents do not relieve the fire sprinkler contractor of field coordination. It is the fire sprinkler contractors' responsibility to coordinate piping locations with the work of other trades.

C. Strict adherence to the contract documents is required. Any deviation from the contract documents requiring additional plan review, hydraulic calculations, structural review or calculations, or seismic calculations, shall be submitted to LP Consulting Engineers, Inc. for review prior to making changes.

D. Install equipment in accordance with manufacturer's instructions.

E. Preparation of installation and fabrication drawings is the responsibility of the fire sprinkler contractor.

F. Systems that are hydraulically calculated must include 1.2 factor for design area.

G. Hydraulically calculated system shall be designed to a minimum of 10% below the available water flow curve.

H. Fire Protection System Layout and Installation Drawings:

1. Contractor shall review Design Drawings and Specifications, and shall provide installation drawings, calculations, and product data sheets.

2. Layout of fire protection system has been established for the level shown in contract documents, as it relates to structure, and mechanical/electrical systems in building, and must be adhered to. Other layouts shall be produced by Contractor in coordination with building components.

3. Conceal sprinkler piping above ceilings where possible.

4. Contractor shall consult with Architect during development of piping layout to avoid conflicts with general appearance. Pipe routing is a critical issue due to attributes of this building.

5. Contractor shall be responsible to have examined "Reflected Ceiling" drawings as well as Mechanical, Electrical, Piping, Information Technology, Structural and Architectural building plans prior to system layout.

6. Contractor shall coordinate routing of piping with other trades and Architect.

7. Contractor shall participate in coordination process and shall not install piping prior to coordination with other trades.

I. Place pipe runs to minimize obstruction to other work.

J. Place piping in concealed spaces above finished ceilings.

K. Where pipe is exposed to outside elements, provide galvanized pipe, fittings, and hangers.

L. Threaded pipe where exposed threads are present outside, shall be coated with a corrosion resistant paint equal to Rusto-leum.

1. See specification 21 05 00 for reference for additional painting criteria.

M. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

N. All drops to sprinkler heads in finished ceilings shall be side or top takeoffs from the branch line pipe and shall be centered in ceiling tiles using hard pipe connections or when approved, with Flexhead flexible sprinkler drops.

    1. No bottom takeoffs other than pendent sprinkler heads attaching directly to branchline pipes, shall be permitted.

O. Apply masking tape or paper cover to ensure sprinklers do not receive field paint finish. Remove after painting. Replace painted sprinklers.

P. Flush entire piping system of foreign matter.

Q. Install head guards on sprinklers if requested.

R. Hydrostatically test entire system.

S. Required test to be witnessed by Fire Marshal.

T. Verification of weld inspection required prior to installation of fire sprinkler system.

END OF SECTION 21 13 00

SECTION 22 05 10 - PLUMBING GENERAL PROVISIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References.

B. Description of Work.

C. Drawings and Specifications.

D. Industry Standards and Codes.

E. Site Examination.

F. Permits, Fees and Utility Connections.

G. Coordination of Work.

H. Progress of Work.

I. Submittals

J. Operation and Maintenance Manuals.

K. Project Record Documents.

L. Warranty.

M. Quality and Care

N. Access Doors.

O. Starting Equipment and Systems.

1.2 RELATED SECTIONS

A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.

B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.

C. The requirements of this Section apply to all Work of Division 23.

1.3 REFERENCES

A. ANSI - American National Standards Institute.

B. ASTM - American Society for Testing Materials.

C. CEC - California Electric Code.

D. NEMA - National Electric Manufacturers' Association.

E. NFPA - National Fire Protection Association.

F. OSHA - Occupational Safety and Health Act.

G. UL - Underwriters' Laboratories.

H. See detailed References that are listed in individual sections.

1.4 DESCRIPTION OF WORK

A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Plumbing System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.

B. The work shall also include the completion of details of plumbing work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

1.5 DRAWINGS AND SPECIFICATIONS

A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, and other plumbing work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.

B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.

C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.

D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

1.6 INDUSTRY STANDARDS AND CODES

A. The Mechanical Contractor shall comply with the latest provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.

B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.

1. California Building Code, 2022.
2. California Mechanical Code, 2022.
3. California Plumbing Code, 2022.
4. California Electrical Code, 2022.
5. National Fire Protection Association.
6. California Fire Code, 2022.
7. California State Fire Marshal.
8. Occupational Safety and Health Administration, including CAL-OSHA.
9. California Energy Code, 2022.
10. California Green Building Standards Code, 2022.
11. State of California Code of Regulations, Title 24.
12. Other applicable state laws.

C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.

D. No material or product installed as a part of the Work shall contain asbestos in any form.

E. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.

1.7 SITE EXAMINATION

A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

1.8 PERMITS, FEES AND UTILITY SERVICES

A. Contractor shall pay for and obtain all permits and service required in the installation of this work.

B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

1.9 COORDINATION OF WORK

A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.

B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.

C. Arrange plumbing work in a neat, well-organized manner with the piping and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.

D. Verify the location of all equipment, plumbing devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

1.10 PROGRESS OF WORK

A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

A. Plumbing systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.

B. Plumbing systems and equipment shall include, but are not limited to, all piping, water heaters, expansion tanks, air compressors, vacuum pumps, electrical and control panels, conduits and other components.

C. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

1.12 SUBMITTALS

A. See Section 013300 - Submittals, for additional submittal procedures.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project.

D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.

E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.

G. Maintain a copy of the fire penetration installation instructions on site for use by the Inspector of Record.

1.13 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.

C. Substitutions may be considered when a product becomes unavailable through no fault of the .

D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.

E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

F. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.

G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.

I. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

3. The LP Consulting Engineers, Inc. will notify in writing of decision to accept or reject request.

4. Present each substitution individually. If a proposed substitute in not found to be acceptable, then the specified item shall be supplied.

1.14 OPERATION AND MAINTENANCE MANUALS

A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.

B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.

C. Operating and maintenance instructions shall be furnished for the following equipment and systems:

1. Plumbing Systems.

2. Medical Gas Equipment, Piping and Alarm Systems.

3. Piping Systems.

4. Temperature Controls Systems.

5. Testing, Adjusting, and Balancing Reports.

D. Provide manufacturer's model number, design data, capacities, etc. for each piece of plumbing equipment furnished as a part of the Work.

E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.

F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.

G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.

H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

1.15 PROJECT RECORD DOCUMENTS

A. See Section 017700 - Closeout Procedures.

B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of piping. Include notes explaining installed condition for complete understanding.

1.16 QUALITY ASSURANCE

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

1.17 PROJECT CONDITIONS

A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.18 WARRANTY

A. See Section 01700 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 QUALITY AND CARE

A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).

B. All capacities, sizes and efficiency ratings shown on the drawing are minimum. Gas meter and gas pressure reducing valve capacities are maximum allowable.

C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.

D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.

E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.

F. Inspect and report concealed damage to carrier within their required time period.

G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.

H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

2.2 ACCESS DOORS

A. Coordinate access door requirements with Section 08305. The more stringent requirements shall govern.

B. Provide access doors where access through floors, walls or ceilings is required to access plumbing equipment and plumbing devices or other systems requiring access for maintenance, test or observation.

1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.

2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.

C. Established standard: Milcor of types listed below. Other acceptable manufacturers: Cesco, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:

1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.

2. Concealed hinges to allow 175 degree opening.

3. Locks: flush, screw driver operated cam lock(s).

4. Provide anchoring devices suitable for the construction into which the doors are framed.

D. Application (as applicable):

1. In gypsum drywall walls and ceilings: Type DW.

2. In ceramic tile walls: Type MS (stainless steel).

3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

PART 3 EXECUTION

3.1 INSTALLATION

A. Access Doors

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.

2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.

3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.

4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.

5. Install in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with the requirements within this section.

B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

3.3 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS

A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic, duct and gas piping testing.

1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.

2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.

3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.

B. Test the following systems with the medium listed to the pressure indicated for the time period listed:

1. Sanitary Sewer, Drain, Vent Piping: Pressure=10 Ft.Hd. / Medium= Water / Duration=4 Hours.

2. Domestic Water Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.

3. Condensate drains: Pressure=10 Ft.Hd. / Medium=Water / Duration=4 Hours.

4. Gas Piping: Pressure=60 Psig / Medium=Air and soap / Duration=8 Hours.

3.4 CUTTING AND PATCHING

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of Project.

2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.

4. Visual qualities of sight exposed elements.

5. Work of Owner or separate Contractor.

B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.

C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new Products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements , to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.5 PRIMING AND PAINTING

A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted, including gas piping outdoors.

1. Primer shall be as recommended by the paint manufacturer for each specific application.

2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 09900 for other acceptable products.

B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except piping, or factory primed or finished.

C. Preparation:

1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.

2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be completely removed using Devoe KILSTAIN primers, shellac, or other coating acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.

3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.

4. Galvanized Surfaces:

   a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.

   b. Apply Devoe MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.

5. Uncoated Steel And Iron Surfaces:

   a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.

   b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.

6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devoe MIRROLAC metal primer or primer recommended by manufacturer.

D. Application:

1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.

2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.

3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

E. Finish Painting: See Section 09900.

3.6 STARTING EQUIPMENT AND SYSTEMS/COMMISSIONING

A. Start equipment and systems in accordance with manufacturer's written instructions..

B. Adjust for proper operation within manufacturer's published tolerances.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Description:

1. Comply with all start up of mechanical and electrical equipment systems as required in the various sections and herein.

2. Coordinate all testing and startup procedures with all other trades so that all non-plumbing and non-electrical work is completed and operational so that the specified testing can be performed.

E. Preliminary Work:

1. Prior to the startup, the Contractor shall ensure that the systems are ready to operate, and the following items have been completed and checked including but not limited to:

a. Proper motor and fan/pump rotation.

b. Flushing and cleaning of the system.

c. Wiring

d. Auxiliary connections

e. Lubrication.

f. Venting.

g. Controls.

h. Installation of filters and strainers.

i. Setting of relief and safety valves .

2. All electrical testing must be completed and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.

3. The Contractor shall submit at least 30 days in advance a schedule listing the date of completion of his work as it will be ready for equipment startup of Electrical/Plumbing equipment. This schedule shall include work on a system by system, floor by floor basis.

4. Two weeks prior to the startup of any major equipment, the Contractor shall certify in writing that the systems will be complete and ready for startup. Completeness shall not only include physical installation of individual pieces of equipment, but all related elements of other crafts to make all equipment operate as a system.

    a. The startup checklist will cover all related crafts, e.g., controls, electrical, plumbing, and a clean environment for equipment startup.

5. The Contractor shall schedule a tour with the Owner's representative and the Engineer to review startup conditions prior to equipment startup. This tour shall take place during the associated Engineer's regularly scheduled visit. This tour does not relieve the Contractor of any responsibilities to properly start equipment. The Engineer will issue a notice of deficiencies that will be required to be corrected prior to equipment startup. The Contractor will be required to reschedule a back check with the Engineer prior to attempting an equipment startup.

6. Equipment of systems should not be started until systems and associated subsystems are completed. Verify that other continuing work could not possibly damage completed systems if they are in operation. Furnish signed off prestartup check sheet.

F. Startup and Commissioning:

1. System Startup and Operation:

    a. The Contractor shall provide all labor, materials and services necessary for the initial startup and operation of all systems and equipment furnished and installed under this section.

b. The Contractor and the factory representative shall check all equipment during initial startup to insure correct rotation, proper lubrication, adequate fluids or air flows, nonoverloading electrical characteristics, proper alignment and vibration isolation. Systems shall be checked for water flows throughout without blockages.Plumbing systems shall be checked for proper connections and positions, nonexcessive electrical characteristics and minimal vibration. Other miscellaneous equipment shall be started and operated as described above as applicable. Manufacturer's representative shall submit a preliminary written copy of equipment startup check sheet prior to leaving job site.

c. After initial startup and operation of systems, the Contractor shall submit a report, showing proper operation before commencement of the final "Operation Test".

d. During initial operation of the system and until substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Items such as strainers, cleanouts, packing replacement, and other consumables shall be provided without cost to the Owner. Failure of equipment during this period due to lack of proper supervision is the responsibility of the Contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the Contractor. Submit written schedule of completed maintenance to the Engineer.

G. System Acceptance:

1. General: The system installation shall be complete and tested for proper operation prior to acceptance testing "Operation Test" for the Owners authorized representative. A letter shall be submitted to the Engineer requesting system acceptance. This letter shall certify that all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing shall commence at a mutually agreeable time within ten (10) calendar days of request. When the field test procedures have been demonstrated to the Owner's representative and pass, the system will be accepted. The warranty period may begin at this time.

H. Operation Test:

1. Provide all labor, equipment, and materials required to perform test.

2. The test shall occur after all major equipment startup and balance services have been performed as specified. The purpose is to demonstrate that individual pieces of equipment and all related elements operate as one complete system and not to identify incomplete or defective work.

3. All equipment is to be run in an automatic operating position and exercised for 72 hours to verify that they perform in accordance with the specified sequence of operation and designed operation logic.

4. The Engineer's representative shall be notified and may be present for the initiation of the test.

5. A log shall be prepared by the Contractor, to be submitted to the Engineer, of all tests including, but not limited to: time, temperatures, pressures, and other readings to prove all equipment is operating as specified.

6. All temperatures, pressures, status indication, etc., shall be verified by at least one other means of measurement or visual verification of condition.

7. Change set points and simulate conditions as directed to demonstrate:

    a. Ability to control to new set point.

    b. Interface between systems, fire alarm/fire sprinkler systems.

    c. Proper sequence and operation.

    d. Equipment safety systems and all automatic changeover/backup systems and alarms are functioning or will function.

8. If unsatisfactory performance or a system failure is experienced for any reason, the test shall be repeated until 72 hour consecutive hours are achieved. The Engineer's representative shall make all final decisions of a satisfactory test.

END OF SECTION 22 05 10

SECTION 22 05 16 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion/seismic loops and compensators.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.

C. The requirements of this Section apply to all Work of Division 22.

D. Section 22 10 05 - Plumbing Piping.

1.3 REFERENCE STANDARDS

A. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.4 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Loops/Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Maintenance Data: Include adjustment instructions.

D. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

1.5 REGULATORY REQUIREMENTS

A. Conform to UL and FM requirements.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Manufacturers:

1. Mercer Rubber Company: www.mercer-rubber.com/#sle.

2. The Metraflex Company: www.metraflex.com/#sle.

B. Inner Hose: Stainless steel.

C. Exterior Sleeve: Single braided, stainless steel.

D. Pressure Rating: 125 psi up to 12 inch.

E. Maximum Service Temperature: 450 degrees F.

F. Joint: Flanged or threaded with union.

G. Size: Use pipe sized units.

H. Maximum offset: 3/4 inch on each side of installed center line.

2.2 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Manufacturers:

1. Mercer Rubber Company: www.mercer-rubber.com/#sle.

2. The Metraflex Company: www.metraflex.com/#sle.

B. Inner Hose: Bronze.

C. Exterior Sleeve: Braided bronze.

D. Pressure Rating: 125 psi up to 2 inch.

E. Maximum Service Temperature: 450 degrees F.

F. Joint: Flanged or threaded with union.

G. Size: Use pipe sized units.

H. Maximum offset: 3/4 inch on each side of installed center line.

I. Application: Copper piping.

2.3 EXPANSION LOOPS

A. Manufacturers:

1. Metraflex Metraloop.

2. Twin Cities Hose Seismic 'V' Connector.

B. Provide flexible expansion loops of size to match piping in which installed as shown on the Drawings.

C. Flexible loops shall be designed to impart no thrust loads on the pipe anchors.

D. The loop shall consist of two flexible sections of hose and braid, two 90 degree elbows and a 180 degree return. Hose and braid shall be T304 stainless steel. Fittings shall be carbon steel. Provide connection ends to match piping fitting requirements.

E. Expansion loops shall be designed for 4 inches of movement in all directions and 4" axial movement. Maximum working pressure 150 PSI at 70 degrees.

F. Install at all locations where piping crosses building seismic expansion joints.

G. Expansion loops shall be certified for fluid/gas being transported for use in seismic applications.

2.4 EXPANSION LOOPS - HOSE AND BRAID

A. Manufacturers:

1. The Metraflex Company; Metraloop: www.metraflex.com/#sle.

2. Unisource Manufacturing, Inc; V-Loop: www.unisource-mfg.com/#sle.

B. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support brackets and plugged drain port for steam service.

C. Maximum Allowable Motion: 2 inch in the x, y, and z planes with no thrust loads to the building structure.

D. Maximum Working Pressure: 150 psi at 800 degrees F.

E. Construction: Class 150, schedule 40, stainless steel hose and braid assembly with carbon steel fittings, including elbows and flanged end connections sized to match pipe segment.

1. Selected Product to Accommodate:

    a. Angular Rotation: 15 degrees.

    b. Force developed by 1.5 times specified maximum allowable operating pressure.

2. Provide necessary accessories including, but not limited to, swivel joints.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. Anchor pipe to building structure where indicated or required. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

E. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

F. Install seismic expansion loops at all points where piping crosses building expansion joints.

END OF SECTION 22 05 16

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Applications.

B. Angle valves.

C. Ball valves.

D. Butterfly valves.

E. Check valves.

F. Gate valves.

G. Globe valves.

H. Lubricated plug valves.

1.2 RELATED REQUIREMENTS

A. Section 08 31 00 - Access Doors and Panels.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

C. Section 22 07 19 - Plumbing Piping Insulation.

D. Section 22 10 05 - Plumbing Piping.

1.3 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. SWP: Steam working pressure.

I. TFE: Tetrafluoroethylene.

J. WOG: Water, oil, and gas.

1.4 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

G. ASME B31.9 - Building Services Piping; 2020.

H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

I. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

J. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

K. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings; 2015 (Reapproved 2021).

L. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

M. AWWA C606 - Grooved and Shouldered Joints; 2022.

N. MSS SP-45 - Drain and Bypass Connections; 2020.

O. MSS SP-67 - Butterfly Valves; 2022.

P. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.

Q. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

R. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

S. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.

T. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

U. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends; 2011.

V. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

W. MSS SP-125 - Check Valves: Gray Iron and Ductile Iron, In-Line, Spring-Loaded, Center-Guided; 2018.

X. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

Y. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.5 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

D. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.

1.6 QUALITY ASSURANCE

A. Manufacturer:

1. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Provide the following valves for the applications if not indicated on drawings:

1. Shutoff: Ball, butterfly, gate or plug.

2. Throttling: Provide globe, angle, ball, or butterfly.

3. Swing Check (Pump Outlet):

a. 2 inch and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

b. 2-1/2 inch and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.

c. 2-1/2 inch and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

C. Required Valve End Connections for Non-Wafer Types:

1. Steel Pipe:

a. 2 inch and Smaller: Threaded ends.

b. 2-1/2 inch to 4 inch: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.

c. Grooved-End Steel Piping: Grooved.

2. Copper Tube:

a. 2 inch and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

b. 2-1/2 inch to 4 inch: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.

D. Domestic, Hot and Cold Water Valves:

1. All sizes:

a. Bronze and Brass: Provide with solder-joint or threaded ends.

b. Bronze Angle: Class 125, bronze disc.

c. Ball: Two piece, full port, brass with brass trim.

d. Bronze Swing Check: Class 125, bronze disc.

e. Bronze Gate: Class 125, NRS.

E. Gas Valves:

1. All sizes:

a. Bronze: Provide with threaded ends.

b. Ball: One piece, full port, bronze with bronze trim.

c. Lubricated Plug: Class 125, regular gland.

2.2 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Gear Actuator: Quarter-turn valves 8 inch and larger.

2. Handwheel: Valves other than quarter-turn types.

3. Hand Lever: Quarter-turn valves 6 inch and smaller except plug valves.

4. Wrench: Plug valves with square heads.

D. Insulated Piping Valves: With 2 inch stem extensions and the following features:

1. Gate Valves: Rising stem.

2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

3. Butterfly Valves: Extended neck.

4. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
4. Solder Joint Connections: ASME B16.18.
5. Grooved End Connections: AWWA C606.

F. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Solder-joint Connections: ASME B16.18.
3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:

1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.3 BRONZE, ANGLE VALVES

A. Class 125; CWP Rating: 200 psi:

1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. End Connections: Pipe thread.
4. Stem: Bronze.
5. Disc: Bronze.
6. Packing: Asbestos free.
7. Handwheel: Bronze or aluminum.

2.4 BRASS, BALL VALVES

A. Two Piece, Full Port with Brass Trim and Threaded or Soldered Connections:

1. Comply with MSS SP-110.

2. Seats: PTFE.

3. Ball: Chrome-plated brass.

2.5 BRONZE, BALL VALVES

A. General:

1. Fabricate from dezincification resistant material.

2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze Trim:

1. Comply with MSS SP-110.

2. WSP Rating: 150 psi.

3. WOG Rating: 600 psi.

4. Body: Forged bronze or dezincified-brass alloy.

5. Ends Connections: Pipe thread or solder.

6. Seats: PTFE.

7. Stem: Bronze, blowout proof.

8. Ball: Chrome plated brass.

2.6 BRONZE, LIFT CHECK VALVES

A. General:

1. Fabricate from dezincification resistant material.

2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:

1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.

2. CWP Rating: 200 psi.
3. Design: Vertical flow.
4. Body: Comply with ASTM B61 or ASTM B62, bronze.
5. End Connections: Threaded.

2.7 BRASS, INLINE CHECK VALVES

A. Class 150:
B. Maximum Service Temperature: 250 degrees F.
C. Body: Forged brass.
D. Disc: Forged brass.
E. Seal: PTFE, bubble-tight.
F. End Connections: Press.

2.8 BRASS, HORIZONTAL SWING CHECK VALVES

A. Class 125, Threaded End Connections:
1. WOG Rating: 200 psi.
2. Body: Forged brass.
3. Disc: Forged brass.
4. Hinge-Pin, Screw, and Cap: Forged brass.

2.9 BRONZE, SWING CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.
B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WOG Rating: 200 psi.

4. Body: Bronze, ASTM B62.
5. End Connections: Threaded.
6. Disc: Bronze.

2.10 BRONZE, GATE VALVES

A. General:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. NRS (Non-rising Stem) or OS & Y (Rising Stem):

1. Comply with MSS SP-80, Type I.
2. Class 125: CWP Rating 200 psig.
3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
4. Ends: Threaded or solder joint joint.
5. Stem: Bronze.
6. Disc: Solid wedge; bronze.
7. Packing: Asbestos free.
8. Handwheel: Malleable iron, bronze, or aluminum.

2.11 LUBRICATED PLUG VALVES

A. Regular Gland with Flanged Ends:

1. Comply with MSS SP-78, Type II.
2. Class 125: CWP Rating: 200 psi.
3. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system.
4. Pattern: Regular or short.
5. Plug: Cast iron or bronze with sealant groove.

PART 3 EXECUTION

3.1 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:

1. Lift Check: Install with stem plumb and vertical.

2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION 22 05 23

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Strut systems for pipe or equipment support.

B. Beam clamps.

C. Pipe hangers.

D. Pipe rollers and roller supports.

E. Pipe supports, guides, shields, and saddles.

F. Seismic bracing hardware.

G. Nonpenetrating rooftop supports for low-slope roofs.

H. Anchors and fasteners.

1.2 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

N. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

E. Fire Resistance: Provide hardware rated for 120 minutes resistance unless specifically indicated by the authority having jurisdiction.

F. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.

2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

G. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.2 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:

1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.

2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

2. Minimum Size, Unless Otherwise Indicated or Required:

   a. Equipment Supports: 1/2 inch diameter.

   b. Piping up to 4 inch: 3/8 inch diameter.

   c. Piping larger than 4 inch: 1/2 inch diameter.

   d. Trapeze Support for Multiple Pipes: 3/8 inch in length.

C. Channel Nuts:

1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.3 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

C. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.4 PIPE HANGERS

A. J-Hangers, Adjustable:

1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

B. Swivel Ring Hangers, Adjustable:

1. MSS SP-58 type 10, epoxy-painted, zinc-colored.

2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

3. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

C. Clevis Hangers, Adjustable:

1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.

2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.

3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.5 PIPE CLAMPS

A. Riser Clamps:

1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.

3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.

4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.

B. Extension Split Pipe Clamp:

1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.

2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.

3. Provide hanger rod and nuts of the same type and material for a given pipe run.

4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

C. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

D. Strut Clamps:

1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil.

E. Insulation Coupling:

1. Two bolt-type clamps designed for installation under insulation.

2. Material: Carbon steel with epoxy copper or zinc finish.

2.6 PIPE ROLLERS AND ROLLER SUPPORTS

A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.

B. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

2.7 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Stanchions:

1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.

2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.

3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

C. U-Bolts:

1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.

D. Pipe Alignment Guides, Galvanized steel:

1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.

2. Pipe Sizes 10 inch and Larger: Roller type.

E. Pipe Shields for Insulated Piping:

1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2. General Construction and Requirements:

   a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.

   b. Shields Material: UV-resistant polypropylene with glass fill.

   c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.

   d. Service Temperature: Minus 40 to 178 degrees F.

   e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

F. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2. Liquid Temperatures Up to 122 degrees F:

   a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.

   b. Support From Below: MSS SP-58 types 35 through 38.

3. Operating Temperatures from 122 to 446 degrees F:

   a. Overhead Support: MSS SP-58 type 1 or 3 through 12 clamps with appropriate saddle of MSS SP-58 type 40 for insulated pipe.

   b. Roller Chair: MSS SP-58 types 41 or 43 through 46 roller chair support with appropriate saddle of MSS SP-58 type 39 for insulated pipe.

   c. Sliding Support: MSS SP-58 types 35 through 38.

G. Pipe Supports, Thermal Insulated:

1. General Requirements:

   a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

b. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

c. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.

d. Provide pipe supports for 1/2 to 30 inch iron pipes.

e. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:

a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.

b. Minimum Service Temperature: Minus 40 degrees F.

c. Maximum Service Temperature: 180 degrees F.

d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.

e. Minimum Thickness: 60 mil, 0.06 inch.

2.8 SEISMIC BRACING HARDWARE

A. Cable Sway Bracing Systems:

1. Cable wire hanger with fix and release spring mechanism enclosed using zinc housing with 302 stainless steel components for pipe or equipment suspension to surface-mounted end-fixing fittings.

2. Provide cable wire and end-fixing as required to hold minimum weight of 100 lb.

2.9 NONPENETRATING ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS

A. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.

B. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

C. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

D. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

2.10 ANCHORS AND FASTENERS

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use preset concrete inserts or expansion anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors.

D. Hollow Masonry: Use toggle bolts.

E. Hollow Stud Walls: Use toggle bolts.

F. Steel: Use beam clamps, machine bolts, or welded threaded studs.

G. Sheet Metal: Use sheet metal screws.

H. Wood: Use wood screws.

I. Plastic and lead anchors are not permitted.

J. Powder-actuated fasteners are not permitted.

K. Hammer-driven anchors and fasteners are not permitted.

L. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

M. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

1. Channel Material: Use galvanized steel.

2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 22 05 29

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Heat Transfer Equipment: Nameplates.

B. Major Control Components: Nameplates.

C. Piping: Pipe markers.

D. Pumps: Nameplates.

E. Small-sized Equipment: Tags.

F. Tanks: Nameplates.

G. Valves: Tags and ceiling tacks where located above lay-in ceiling.

H. Water Treatment Devices: Nameplates.

2.2 MANUFACTURERS

A. Brady Corp.

B. Seton Identification Products.

2.3 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.

1. Letter Color: White.

2. Letter Height: 1/4 inch.

3. Background Color: Black.

4. Plastic: Comply with ASTM D709.

2.4 TAGS

A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

2.5 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Secure to pipe using two (2) bands of adhesive tape with flow arrows supplied by the manufacturer. Install securing bands completly around pipe and overlapped.

C. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.2 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

D. Identify domestic hot water heating equipment, including pumps, etc. with plastic nameplates.

E. Identify valves in main and branch piping with tags.

F. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

G. Identify all medium pressure gas piping (over 11" W.C. to 5 PSI pressure) with pressure contained within piping system (for example: "MPG 5 PSI")

END OF SECTION 22 05 53

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Piping insulation.

C. Glass fiber insulation.

D. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

E. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).

F. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

G. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

H. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2022.

I. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.2 GLASS FIBER INSULATION

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com.

2. Johns Manville Corporation: www.jm.com/#sle.

3. Knauf Insulation: www.knaufusa.com.

4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C547and ASTM C795; rigid molded, noncombustible.

1. 'K' value: ASTM C 177, 0.22 to 0.28 at 100 degrees F.

2. Maximum Service Temperature: 850 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Armacell LLC; AP Armaflex: www.armacell.us/#sle.

2. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.

3. Owens Corning Flex Tubing

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3; use molded tubular material wherever possible and sheet for equipment and other surfaces.

1. 'K' value: ASTM C 177; 0.27 at 75 degrees F.
2. Minimum Service Temperature: Minus 40 degrees F.
3. Maximum Service Temperature: 220 degrees F.
4. Maximum Moisture Absorption - Pipe Insulation: 3.5 percent, by weight, when tested in accordance with ASTM D 1056.
5. Water Vapor Permeability: 0.20 perm-inches, when tested in accordance with ASTM E 96.
6. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive:

D. Insulation Exposed to the Weather: Finish with two coats Armstrong white Armaflex finish. Provide aluminum jacketing.

2.4 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:

1. Manufacturers:
   a. Proto Corporation, Proto-Wrap 30 LoSmoke.
   b. Johns Manville Corporation: www.jm.com.
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   a. Minimum Service Temperature: 0 degrees F.
   b. Maximum Service Temperature: 150 degrees F.
   c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
   d. Thickness: 10 mil, 0.010 inch.
   e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.

B. Aluminum Jacket:

1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.016 inch sheet.
3. Finish: Embossed.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with molded PVC fitting covers.

D. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with molded PVC fitting covers.

E. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, use a UL rated fire penetration assembly, 3M or equal.

G. Pipe in Supply Air Plenum or Finished Spaces: Finish with PVC jacket and fitting covers.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

I. Exterior Applications (exposed to the weather): Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot and Tempered Water Supply:

a. Glass Fiber Insulation:

1) Pipe Size Range: 1-1/2 inch and larger.

a) Thickness: 2 inch.

2) Pipe Size Range: 1 inch and smaller.

a) Thickness: 1-1/2 inch.

2. Domestic Cold Water Located in Unheated Areas:

a. Glass Fiber Insulation:

1) Pipe Size Range: 1-1/2 inch and larger.

a) Thickness: 1 inch.

2) Pipe Size Range: 1 inch and smaller.

a) Thickness: 3/4 inch.

END OF SECTION 22 07 19

SECTION 22 08 00 - PLUMBING COMMISSIONING REQUIREMENTS

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 the Work of this Section.

B. Specific commissioning requirements are given in the following sections of these specifications. It is the contractor's responsibility to coordinate all HVAC systems testing with the GC and all other trades performing related testing services. The division 22 contractor shall provide all T24 required testing by what T24 calls "Certified Acceptance Test Technician". All such tests shall be provided to the districts CxA for inclusion into the CxA reports and submitted according to T24 requirements.

1. 01 91 00 - General Commissioning Requirements
2. 26 08 00 - Electrical Commissioning Requirements
3. 23 08 00 - Mechanical Commissioning Requirements
4. ASHRAE Guideline 0-2019 or superseding ASHRAE guideline
5. Title 24 / 2016 Section 120.8 or superseding CA Title 24 requirement
6. SUBMITALS
    a. General:
        1) Comply with Section –Submittal Procedures.
        2) See submittal requirements in Section 01 91 00–General Commissioning Requirements
        3) Prior to pre-functional testing:
            a) Provide a TAB plan for approval by the CxA
            b) Provide all Pre-Functional Tests for approval to the CxA
7. COORDINATION

a. The Contractor shall coordinate all testing and balancing and major equipment startup and installation with the Commissioning Provider (CxA) and the CM.

b. For the Plumbing domestic water equipment, the Contractor shall provide a short discussion of the control of the plumbing equipment during the mechanical or electrical training conducted by others.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Trade Contractor for the equipment being tested.

B. Datalogging equipment or software required to test equipment will be provided by the contractor, if required, but shall not become the property of the Owner.

C. All testing equipment shall be of sufficient quality and accuracy to test or measure system performance required by the Contract Documents.

PART 3 EXECUTION

3.1 TESTING PREPARATION

A. General Procedures are described in Section 01 91 00 – General Commissioning Requirements.

B. Contractor shall perform all pre-functional performance tests with the tests approved by the CxA. The CxA and the owner shall be advised of all tests as required in this section and by the general commissioning requirements in 01 91 00.

C. Pre-functional Checklists shall be completed and provided to the CxA for the following Plumbing systems:

1. Contractor to develop, fill out and sign approved pre-functional checklists according to 01 91 00 for the following equipment and systems .These tests shall be provided even if the CxA does not provide related Functional performance tests for these systems:

a. Domestic Hot Water System

b. Potable water system and booster pumps, as applicable

1) Contractor shall certify that Plumbing systems, subsystems, and equipment are completed, calibrated, and started based on the tests verified and approved by the CxA.

D. FUNCTIONAL PERFORMANCE TESTING

1. General procedures are described in the Division 01 Section "General Commissioning Requirements." 01 91 00

2. Contractor shall execute all functional performance tests provided by the Commissioning Provider. No functional tests shall be performed without the CxA present.

3. The details of the functional performance tests shall be reviewed and refined during the construction phase by the CxA. The final test will be provided to the contractor at least 5 business days before the test is conducted.

E. ELECTRONIC DOCUMENT REQUIREMENTS

1. All working documents shall be provided in electronic format whenever feasible. Hard copies are only permissible if soft copies of the documents are not available.

2. In addition to the hard copy requirements required in this section, at least all final documents shall be provided un pdf format, organized and tabulated identical to any hard copies provided. Coordinate media requirements with the owner at the time of submission

END OF SECTION 22 08 00

SECTION 22 10 05 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary waste piping, above grade.

B. Drains.

C. Domestic water piping, above grade.

D. Storm drainage piping, above grade.

E. Natural gas piping, above grade.

F. Pipe flanges, unions, and couplings.

G. Pipe hangers and supports.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

C. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

D. Section 22 07 19 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2019.

B. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D. ASME B31.1 - Power Piping; 2022.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

G. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

I. ASTM B32 - Standard Specification for Solder Metal; 2020.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

L. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

M. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

N. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

P. MSS SP-67 - Butterfly Valves; 2022.

Q. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. ; 2003.

R. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

S. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

T. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of California, standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of California plumbing code.

B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.

C. Conform to applicable code for installation of backflow prevention devices.

D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 SANITARY SEWER PIPING, BURIED

A. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies. Heavy duty, Husky SD4000, .015 inch thick 304 stainless steel shield, 4-band coupling.

2.3 DRAIN PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.

1. Application: Condensate drains outside building (non-acidic).

2. Threaded Joints: ASME B16.3 malleable iron fittings.

2.4 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy.

2. Joints: For sizes 1-1/2" and smaller, ASTM B 32, alloy Sn95 solder.

3. Joints: For sizes 2" and larger, AWS A5.8, BCuP5 silver braze.

B. Provide full solder cup for all fittings.

C. Schedule 40 Screwed Brass: Capped or plugged outlets.

2.5 STORM DRAINAGE PIPING, ABOVE GRADE

A. Storm drainage piping above grade to match sanitary drain piping above grade.

2.6 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Pipe size 2" and smaller: Malleable iron threaded fittings.

2. Pipe size 2-1/2" and larger: Steel butt welded fittings.

3. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

4. Joints: Threaded or welded to ASME B31.1.

B. Flexible Gas Piping:

1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.

2. Comply with ASTM E84.

3. Fittings: Provided by piping system manufacturer.

2.7 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 2 Inches and Under:

1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 2 inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8 PIPE HANGERS AND SUPPORTS

A. See Section 22 05 29 for additional requirements.

2.9 GAS PRESSURE REGULATING VALVES

A. Provide single stage, steel jacketed, corrosion resistant gas pressure regulating valves with atmospheric vent and elevation compensator sized for inlet and outlet pressures , specific gravity and volume indicated on the drawings.

B. Compliance requirements:

1. Appliance Regulator: ANSI Z21.18/CSA 6.3.

2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.

C. For sizes 2" and smaller: threaded ends.

D. For sizes 2-1/2" and larger: flanged ends.

E. Provide high and low pressure cutout and internal relief for each regulator.

2.10 STRAINERS

A. Size 2 inch and Smaller:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Provide anodeless transition riser at gas piping transition from below grade to above grade.

J. All natural gas piping exposed to outdoors shall be primed and painted, color by architect.

K. All ABS and PVC pipe material exposed to outdoors shall be primed and painted, color by architect.

L. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.

M. Install valves with stems upright or horizontal, not inverted. See Section 22 05 23.

N. Install water piping to ASME B31.9.

O. Sleeve pipes passing through partitions, walls, and floors.

P. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.

2. Support horizontal piping as indicated.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

6. Provide copper plated hangers and supports for copper piping.

7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

8. Support cast iron drainage piping at every joint.

3.4 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.5 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe Size: 1/2 inch to 1-1/4 inch:

1) Maximum Hanger Spacing: 6.5 ft.

2) Hanger Rod Diameter: 3/8 inches.

b. Pipe Size: 1-1/2 inch to 2 inch:

1) Maximum Hanger Spacing: 10 ft.

2) Hanger Rod Diameter: 3/8 inch.

c. Pipe Size: 2-1/2 inch to 3 inch:

1) Maximum Hanger Spacing: 10 ft.

2) Hanger Rod Diameter: 1/2 inch.

d. Pipe Size: 4 inch to 6 inch:

1) Maximum Hanger Spacing: 10 ft.

2) Hanger Rod Diameter: 5/8 inch.

END OF SECTION 22 10 05

SECTION 22 10 06 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor drains.

B. Cleanouts.

C. Water hammer arrestors.

D. Trap primers.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

B. Section 22 10 05 - Plumbing Piping.

1.3 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.

B. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011 (Reaffirmed 2016).

C. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

D. NSF 372 - Drinking Water System Components - Lead Content; 2022.

E. PDI-WH 201 - Water Hammer Arresters; 2017.

1.4 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Project Record Documents: Record actual locations of equipment, cleanouts, water hammer arrestors.

E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of California plumbing code.

B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.

C. Conform to applicable code for installation of backflow prevention devices.

D. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 REFER TO PLUMBING SCHEDULE FOR PLUMBING PIPING SPECIALTIES NOT LISTED HEREIN.

2.3 DRAINS

A. Manufacturers:

1. Josam Company: www.josam.com/#sle.

2. MIFAB, Inc: www.mifab.com/#sle.

3. Jay R. Smith Manufacturing Company.

4. Zurn Industries, LLC: www.zurn.com/#sle.

B. Downspout Nozzles:

1. Bronze round with straight bottom section. Zurn Z-199.

C. Floor Drain (FD):

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2. Provide accessories suitable for wood raised floor installation.

D. Floor Sink (FS):

1. Lacquered cast iron body with white acid resisting porcelain interior and top complete with aluminum anti-splash bottom dome strainer, square slotted medium duty half grate, anchor and seepage flange.

2.4 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.

2. Josam Company: www.josam.com/#sle.

3. Zurn Industries, LLC: www.zurn.com/#sle.

B. Cleanouts at Exterior Surfaced Areas:

1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas :

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and nickel bronze round gasketed scored cover in service areas and round or square nickel bronze gasketed depressed cover to accept floor finish in finished floor areas. Zurn ZN-1400.

E. Cleanouts at Interior Finished Wall Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw. Zurn Z-1441 or Z-1443.

F. Cleanouts in concealed aboveground cast iron soil or waste lines: Zurn Z-1440A with raised head ABS plastic plug.

2.5 TRAP PRIMERS

A. Provide trap primers, 1/2 inch size, where indicated on drawings. Provide with built-in air gap and install 1/2" shutoff valve. PVC housings are not acceptable. Install trap primer line with 1/4" per foot slope to insure full drainage to floor drain or floor sink. Install tap primer behind wall with access door.

B. Provide a distribution unit with feeder piping for a maximum of four (4) traps where multiple traps are serviced by a single trap primer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface as indicated on plans. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install cleanouts in all horizontal soil and waste piping at 100 feet maximum spacing inside building, 100 feet maximum spacing outside building, at every 135 degree change of direction and where shown on Drawings.

E. Install two way cleanout in building drain (waste line leaving the building) just outside of the building.

F. Install cleanouts in waste drops from each urinal and sink.

G. Install cleanouts in rain water (storm drain) drops 18 inches above finished floor. For concealed rainwater drops extend cleanout to building exterior for access.

H. Install floor cleanouts at elevation to accommodate finished floor.

I. Pipe relief from backflow preventer to nearest drain.

J. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatoriessinks and washing machine outletswater closets and as shown on plans.

END OF SECTION 22 10 06

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flush valve water closets.

B. Wall hung urinals.

C. Lavatories.

D. Sinks.

E. Indoor drinking fountains.

F. Service sinks.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

B. Section 22 10 05 - Plumbing Piping.

C. Section 22 10 06 - Plumbing Piping Specialties.

1.3 REFERENCE STANDARDS

A. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).

B. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

C. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

D. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

E. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

G. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

H. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of California plumbing code.

B. Domestic water piping and components shall be provided and installed in accordance with California AB 1953 Legislation (effective January 1, 2010), which limits the allowable lead content in certain domestic water system components.

C. Conform to applicable code for installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 WARRANTY

A. See Section 01700 - Contract Closeout, for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 GENERAL REQUIREMENTS:

A. Refer to Architectural drawings for exact locations, fixture mounting heights and ADA accessibility requirements.

B. Insulate domestic hot water, tempered water and waste piping below handicapped plumbing fixtures with molded single piece removable insulation covers, foam, fire resistant, Truebro, or equal. Install insulation covers in accordance with ADA requirements.

C. Provide 85% IPS red brass pipe for each connection to faucets, stops, hose bibs, and other fixtures/trim. Securely anchor brass pipe to structure. Install stop valves on water supply lines for each fixture, except hose bibbs.

D. Provide compression shutoff control stop valves with IPS inlets and threaded brass nipples at pipe connection on water supplies to each fixture. Provide stops with lock shield loose key and key handle for each stop. For combination fixtures, provide with compression stop and IPS inlet on each water supply fitting.

E. Provide cast brass escutcheons, except escutcheons exposed to view shall have chrome plated finish.

F. Provide chromium-plated finish on fittings and accessories exposed to view.

G. Fixture fittings and trim: Conform to ASME A112.18.1M and ASME A112.19.5, as applicable.

H. Centerset faucets: Top-mounted with inlets on not greater than 4 inch centers, unless specified otherwise below.

I. Separate faucets and combination supply fittings: Provide inlets on 8 inch centers.

J. Zinc-alloy or plastic handles are not permitted for faucets and valves.

K. Provide special roughing-in for wheelchair fixtures.

L. Lavatory flow rates not to exceed 0.5 GPM.

M. Water closet flush flow rates not to exceed 1.28 GPF.

N. Urinal flush flow rates not to exceed 0.125 GPF.

O. Provide water hammer arrestors at end of pipe runs to two or more fixtures, properly sized with sufficient displacement volume to dissipate calculated energy in the piping systems. Locate in accessible location or provide access panel with location approved by Architect.

P. Fixture dimensions specified are nominal.

2.3 SEE PLUMBING SCHEDULE FOR FIXTURE REQUIREMENTS.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall carriers and bolts.

E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.4 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

A. Clean plumbing fixtures and equipment.

END OF SECTION 22 40 00

SECTION 23 05 10 - MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References.

B. Description of Work.

C. Drawings and Specifications.

D. Industry Standards and Codes.

E. Site Examination.

F. Permits, Fees and Utility Connections.

G. Coordination of Work.

H. Progress of Work.

I. Submittals

J. Operation and Maintenance Manuals.

K. Project Record Documents.

L. Warranty.

M. Quality and Care

N. Access Doors.

O. Starting Equipment and Systems.

1.2 RELATED SECTIONS

A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.

B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.

C. The requirements of this Section apply to all Work of Division 23.

1.3 REFERENCES

A. ANSI - American National Standards Institute.

B. ASTM - American Society for Testing Materials.

C. CEC - California Electric Code.

D. NEMA - National Electric Manufacturers' Association.

E. NFPA - National Fire Protection Association.

F. OSHA - Occupational Safety and Health Act.

G. UL - Underwriters' Laboratories.

H. See detailed References that are listed in individual sections.

1.4 DESCRIPTION OF WORK

A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Mechanical System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.

B. The work shall also include the completion of details of mechanical work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

1.5 **DRAWINGS AND SPECIFICATIONS**

A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, ductwork and other mechanical work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.

B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.

C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.

D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

1.6 INDUSTRY STANDARDS AND CODES

A. The Mechanical Contractor shall comply with the latest provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.

B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.

1. California Building Code, 2022.
2. California Mechanical Code, 2022.
3. California Plumbing Code, 2022.
4. California Electrical Code, 2022.
5. National Fire Protection Association.
6. California Fire Code, 2022.
7. California State Fire Marshal.
8. Occupational Safety and Health Administration, including CAL-OSHA.
9. California Energy Code, 2022.
10. California Green Building Standards Code, 2022.
11. State of California Code of Regulations, Title 24.
12. Other applicable state laws.

C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.

D. No material or product installed as a part of the Work shall contain asbestos in any form.

1.7 SITE EXAMINATION

A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

1.8 PERMITS, FEES AND UTILITY SERVICES

A. Contractor shall pay for and obtain all permits and service required in the installation of this work.

B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

1.9 COORDINATION OF WORK

A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.

B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.

C. Arrange mechanical work in a neat, well-organized manner with the piping, conduit, and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.

D. Verify the location of all equipment, and devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

1.10 PROGRESS OF WORK

A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

A. Mechanical systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.

B. Mechanical systems and equipment shall include, but are not limited to, all piping, heating and ventilating equipment, electrical and control panels, conduits and other components.

C. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

1.12 SUBMITTALS

A. See Section 013300 - Submittal Procedures, for additional submittal procedures.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project.

D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.

E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.

G. Maintain a copy of the fire and smoke damper installation instructions on site for use by the Inspector of Record.

1.13 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.

C. Substitutions may be considered when a product becomes unavailable through no fault of the .

D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.

E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

F. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.

G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.

I. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

3. The LP Consulting Engineers, Inc. will notify in writing of decision to accept or reject request.

4. Present each substitution individually. If a proposed substitute in not found to be acceptable, then the specified item shall be supplied.

1.14 OPERATION AND MAINTENANCE MANUALS

A. See Section 01700 Closeout Submittals for Operation and Maintenance Manual requirements.

B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.

C. Operating and maintenance instructions shall be furnished for the following equipment and systems:

1. Ventilating Systems.

2. Air Conditioning Systems.

3. Piping Systems.

4. Temperature Controls Systems.

5. Motors.

6. Testing, Adjusting, and Balancing Reports.

D. Provide manufacturer's model number, design data, capacities, etc. for each piece of mechanical equipment furnished as a part of the Work.

E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.

F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.

G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.

H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

1.15 PROJECT RECORD DOCUMENTS

A. See Section 017700 - Closeout Procedures.

B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of ductwork. Include notes explaining installed condition for complete understanding.

1.16 QUALITY ASSURANCE

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from LP Consulting Engineers, Inc. before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

1.17 PROJECT CONDITIONS

A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.18 WARRANTY

A. See Section 01700 - Closeout Procedures, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 QUALITY AND CARE

A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).

B. All capacities, sizes and efficiency ratings shown on the drawing are minimum.

C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.

D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.

E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.

F. Inspect and report concealed damage to carrier within their required time period.

G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.

H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

2.2 ACCESS DOORS

A. Coordinate access door requirements with Section 083113. The more stringent requirements shall govern.

B. Provide access doors where access through floors, walls or ceilings is required to access mechanical, plumbing, control system components, fire dampers and fire alarm system components (such as smoke detectors, fire/smoke dampers, etc.) or other systems requiring access for maintenance, test or observation.

1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.

2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.

C. Established standard: Milcor of types listed below. Other acceptable manufacturers: Cesco, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:

1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.

2. Concealed hinges to allow 175 degree opening.

3. Locks: flush, screw driver operated cam lock(s).

4. Provide anchoring devices suitable for the construction into which the doors are framed.

D. Application (as applicable):

1. In gypsum drywall walls and ceilings: Type DW.

2. In ceramic tile walls: Type MS (stainless steel).

3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

PART 3 EXECUTION

3.1 INSTALLATION

A. Access Doors

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.

2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.

3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.

4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.

5. Install in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with the requirements within this section.

B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

3.3 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS

A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic piping and duct testing.

1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.

2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.

3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.

B. Test the following systems with the medium listed to the pressure indicated for the time period listed:

1. Hydronic Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.

3.4 CUTTING AND PATCHING

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of Project.

2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.

4. Visual qualities of sight exposed elements.

5. Work of Owner or separate Contractor.

B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.

C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new Products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements , to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.5 PRIMING AND PAINTING

A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted to match Architectural finsih requirements.

1. Primer shall be as recommended by the paint manufacturer for each specific application.

2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 092216 for other acceptable products.

B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except ductwork and piping, or factory primed or finished.

C. Preparation:

1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.

2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be completely removed using Devoe KILSTAIN primers, shellac, or other coating acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.

3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.

4. Galvanized Surfaces:

   a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.

   b. Apply Devoe MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.

5. Uncoated Steel And Iron Surfaces:

   a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.

   b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.

6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devoe MIRROLAC metal primer or primer recommended by manufacturer.

D. Application:

1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.

2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.

3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

E. Finish Painting: See Section 09900.

3.6 STARTING EQUIPMENT AND SYSTEMS/COMMISSIONING

A. Start equipment and systems in accordance with manufacturer's written instructions..

B. Adjust for proper operation within manufacturer's published tolerances.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Description:

1. Comply with all start up of mechanical and electrical equipment systems as required in the various sections and herein.

2. Coordinate all testing and startup procedures with all other trades so that all non-mechanical and non-electrical work is completed and operational so that the specified testing can be performed.

E. Preliminary Work:

1. Prior to the startup, the Contractor shall ensure that the systems are ready to operate, and the following items have been completed and checked including but not limited to:

a. Proper motor and pump rotation.

b. Flushing and cleaning of the system.

c. Wiring

d. Auxiliary connections

e. Lubrication.

f. Venting.

g. Controls.

h. Installation of filters and strainers.

i. Setting of relief and safety valves .

2. All electrical testing must be completed and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.

3. The Contractor shall submit at least 10 days in advance a schedule listing the date of completion of his work as it will be ready for equipment startup of Electrical/Mechanical equipment. This schedule shall include work on a system by system, floor by floor basis.

4. Two weeks prior to the startup of any major equipment, the Contractor shall certify in writing that the systems will be complete and ready for startup. Completeness shall not only include physical installation of individual pieces of equipment, but all related elements of other crafts to make all equipment operate as a system.

    a. The startup checklist will cover all related crafts, e.g., controls, electrical, mechanical, and a clean environment for equipment startup.

5. The Contractor shall schedule a tour with the Owner's representative and the Engineer to review startup conditions prior to equipment startup. This tour shall take place during the associated Engineer's regularly scheduled visit. This tour does not relieve the Contractor of any responsibilities to properly start equipment. The Engineer will issue a notice of deficiencies that will be required to be corrected prior to equipment startup. The Contractor will be required to reschedule a back check with the Engineer prior to attempting an equipment startup.

6. Equipment of systems should not be started until systems and associated subsystems are completed. Verify that other continuing work could not possibly damage completed systems if they are in operation. Furnish signed off prestartup check sheet.

F. Startup and Commissioning:

1. System Startup and Operation:

    a. The Contractor shall provide all labor, materials and services necessary for the initial startup and operation of all systems and equipment furnished and installed under this section.

    b. The Contractor and the factory representative shall check all equipment during initial startup to insure correct rotation, proper lubrication, adequate fluids or air flows, nonoverloading electrical characteristics, proper alignment and vibration isolation. Systems shall be checked for air and/or water flows throughout without blockages. Air handling systems shall be checked for proper damper connections and positions, aligned and adjusted belt drives, proper lubrication, temporary air filters installed, nonexcessive electrical characteristics and minimal vibration. Other miscellaneous equipment shall be started and operated as described above as applicable. Manufacturer's representative shall submit a preliminary written copy of equipment startup check sheet prior to leaving job site.

c. After initial startup and operation of systems, the Contractor shall submit a report, showing proper operation before commencement of the final "Operation Test".

d. During initial operation of the system and until substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Items such as strainers, cleanouts, filter replacement, bearing lubrication, packing replacement, and other consumables shall be provided without cost to the Owner. Failure of equipment during this period due to lack of proper supervision is the responsibility of the Contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the Contractor. Submit written schedule of completed maintenance to the Engineer.

G. System Acceptance:

1. General: The system installation shall be complete and tested for proper operation prior to acceptance testing "Operation Test" for the Owners authorized representative. A letter shall be submitted to the Engineer requesting system acceptance. This letter shall certify that all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing shall commence at a mutually agreeable time within ten (10) calendar days of request. When the field test procedures have been demonstrated to the Owner's representative and pass, the system will be accepted. The warranty period may begin at this time.

H. Operation Test:

1. Provide all labor, equipment, and materials required to perform test.

2. The test shall occur after all major equipment startup and balance services have been performed as specified. The purpose is to demonstrate that individual pieces of equipment and all related elements operate as one complete system and not to identify incomplete or defective work.

3. All equipment is to be run in an automatic operating position and exercised for 72 hours to verify that they perform in accordance with the specified sequence of operation and designed operation logic.

4. The Engineer's representative shall be notified and may be present for the initiation of the test.

5. A log shall be prepared by the Contractor, to be submitted to the Engineer, of all tests including, but not limited to: time, temperatures, pressures, and other readings to prove all equipment is operating as specified.

6. All temperatures, pressures, status indication, etc., shall be verified by at least one other means of measurement or visual verification of condition.

7. Change set points and simulate conditions as directed to demonstrate:

    a. Ability to control to new set point.

    b. Interface between systems, fire alarm/fire sprinkler systems.

    c. Proper sequence and operation.

    d. Equipment safety systems and all automatic changeover/backup systems and alarms are functioning or will function.

8. If unsatisfactory performance or a system failure is experienced for any reason, the test shall be repeated until 72 hour consecutive hours are achieved. The Engineer's representative shall make all final decisions of a satisfactory test.

END OF SECTION 23 05 10

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Strut systems for pipe or equipment support.

B. Beam clamps.

C. Pipe hangers.

D. Pipe rollers and roller supports.

E. Pipe supports, guides, shields, and saddles.

F. Seismic bracing hardware.

G. Nonpenetrating rooftop supports for low-slope roofs.

H. Anchors and fasteners.

1.2 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

N. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of mechanical work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

E. Fire Resistance: Provide hardware rated for 120 minutes resistance unless specifically indicated by the authority having jurisdiction.

F. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

1. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

G. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

1. Indoor Dry Locations: Use approved equivalent or galvanized steel unless otherwise indicated.

2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.2 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:

1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.

2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

2. Minimum Size, Unless Otherwise Indicated or Required:

a. Equipment Supports: 1/2 inch diameter.

b. Piping up to 4 inch: 3/8 inch diameter.

c. Piping larger than 4 inch: 1/2 inch diameter.

d. Trapeze Support for Multiple Pipes: 3/8 inch in length.

C. Channel Nuts:

1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.3 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

C. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.4 PIPE HANGERS

A. J-Hangers, Adjustable:

1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

B. Swivel Ring Hangers, Adjustable:

1. MSS SP-58 type 10, epoxy-painted, zinc-colored.

2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

3. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

C. Clevis Hangers, Adjustable:

1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.

2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.

3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.5 PIPE CLAMPS

A. Riser Clamps:

1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.

3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.

4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.

B. Extension Split Pipe Clamp:

1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.

2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.

3. Provide hanger rod and nuts of the same type and material for a given pipe run.

4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

C. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

D. Strut Clamps:

1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil.

E. Insulation Coupling:

1. Two bolt-type clamps designed for installation under insulation.

2. Material: Carbon steel with epoxy copper or zinc finish.

2.6 PIPE ROLLERS AND ROLLER SUPPORTS

A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.

B. Steel Yoke Type: MSS SP-58 type 44, vertically adjustable, nonconductive, and corrosion resistant.

C. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

2.7 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Stanchions:

1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.

2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.

3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

C. U-Bolts:

1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.

D. Pipe Alignment Guides, Galvanized steel:

1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.

2. Pipe Sizes 10 inch and Larger: Roller type.

E. Pipe Shields for Insulated Piping:

1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2. General Construction and Requirements:

a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.

b. Shields Material: UV-resistant polypropylene with glass fill.

c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.

d. Service Temperature: Minus 40 to 178 degrees F.

e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

F. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2. Liquid Temperatures Up to 122 degrees F:

a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.

b. Support From Below: MSS SP-58 types 35 through 38.

3. Operating Temperatures from 122 to 446 degrees F:

a. Overhead Support: MSS SP-58 type 1 or 3 through 12 clamps with appropriate saddle of MSS SP-58 type 40 for insulated pipe.

b. Roller Chair: MSS SP-58 types 41 or 43 through 46 roller chair support with appropriate saddle of MSS SP-58 type 39 for insulated pipe.

c. Sliding Support: MSS SP-58 types 35 through 38.

G. Pipe Supports, Thermal Insulated:

1. General Requirements:

a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

b. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

c. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.

d. Provide pipe supports for 1/2 to 30 inch iron pipes.

e. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:

a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.

b. Minimum Service Temperature: Minus 40 degrees F.

c. Maximum Service Temperature: 180 degrees F.

d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.

e. Minimum Thickness: 60 mil, 0.06 inch.

2.8 SEISMIC BRACING HARDWARE

A. Cable Sway Bracing Systems:

1. Cable wire hanger with fix and release spring mechanism enclosed using zinc housing with 302 stainless steel components for pipe or equipment suspension to surface-mounted end-fixing fittings.

2. Provide cable wire and end-fixing as required to hold minimum weight of 100 lb.

B. NONPENETRATING ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS

C. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.

D. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

E. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

F. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. ANCHORS AND FASTENERS

H. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

I. Concrete: Use preset concrete inserts or expansion anchors.

J. Solid or Grout-Filled Masonry: Use expansion anchors.

K. Hollow Masonry: Use toggle bolts.

L. Hollow Stud Walls: Use toggle bolts.

M. Steel: Use beam clamps, machine bolts, or welded threaded studs.

N. Sheet Metal: Use sheet metal screws.

O. Wood: Use wood screws.

P. Plastic and lead anchors are not permitted.

Q. Powder-actuated fasteners are not permitted.

R. Hammer-driven anchors and fasteners are not permitted.

S. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

T. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

1. Channel Material: Use galvanized steel.

2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 23 05 29

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

1.2 RELATED REQUIREMENTS

A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4 SUBMITTALS

A. See Division 1 specifications for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Nameplates.

C. Control Panels: Nameplates.

D. Dampers: Ceiling tacks, where located above lay-in ceiling.

E. Heat Transfer Equipment: Nameplates.

F. Major Control Components: Nameplates.

G. Piping: Pipe markers.

H. Pumps: Nameplates.

I. Small-sized Equipment: Tags.

J. Tanks: Nameplates.

K. Thermostats: Nameplates.

L. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

2.3 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.

2. Letter Height: Air Handling Units, Control panels: 1 inch.

3. Letter Height: All others: 1/4 inch.

4. Background Color: Black.

5. Plastic: Comply with ASTM D709.

2.4 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.5 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Secure to pipe using two (2) bands of adhesive tape with flow arrows supplied by the manufacturer. Install securing bands completly around pipe and overlapped.

C. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. Fire Dampers and Smoke Dampers: Red.

2. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Identify fans and filter boxes with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

E. Identify chilled/hot water equipment, including chillers, boilers, pumps, expansion tanks, air separators, etc. with plastic nameplates.

F. Identify air conditioning units, air handling units, heating and ventilating units, exhaust fans, pumps, heat transfer equipment, tanks, fire/smoke damper access doors, and water treatment devices with nameplates. Small devices, such as terminal units, in-line pumps, may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify thermostats/sensors relating to fan unit and/or zone unit with nameplates.

I. Identify valves in main and branch piping with tags.

J. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

K. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 23 05 53

SECTION 23 83 00 - RADIANT HEATING AND COOLING UNITS

PART 1 GENERAL

PART 2 PRODUCTS

2.1 GAS INFRARED RADIANT HEATERS

A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

B. Factory assembled including heating element, reflector, heater housing, mounting brackets, element holders, wire guards, and high temperature internal wiring for non-residential, indoor use only.

C. Heating Element:

1. Minimum 3/8 inch diameter quartz tube with coiled resistor wire.

2. Element operating temperature range: 1200 to 1800 degrees F.

D. Heater Housing:

1. Factory fabricated from aluminum clad steel, stainless steel, aluminum, low carbon steel, or _____ for indoor use as indicated.

2. Provide with baked enamel finish over corrosion-resistant primer.

3. Furnish chrome plated, stainless steel, or _____ wire guard designed to protect heating elements from damage.

4. Supply mounting chains to position heater in any horizontal angle.

E. Reflector: Polished aluminum, stainless steel, or _____.

F. Wiring:

1. Fully enclosed internal wiring.

2. Provide minimum 6 inch slack fixture (heater) wire for connection to branch circuit wiring.

G. Accessories:

H. Electrical Characteristics:

PART 3 EXECUTION

3.1 EXAMINATION

A. Gas Infrared Radiant Heaters: Verify and maintain minimum distances from combustibles. Verify heater installation is not in a hazardous location.

3.2 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

END OF SECTION 23 83 00

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 CONTRACT PROVISIONS

A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.2 SUMMARY

A. This section describes the requirements for the electrical work includes, among others, the furnishing and installation of the following:

1. Electrical service from the Main Switchboard to the building Distribution Panel(s) including transformer(s), conduit and trenching, conductors.
2. Power distribution system.
3. Grounding system.
4. Lighting and lighting control systems.
5. Wiring systems including power wiring to plumbing and HVAC and other misc. appliances and equipment.
6. Electrical services (power) for Communications management system. (voice/video/media/clock) as described in Division 27 and as indicated on the drawings.
7. Electrical services (power) for Computer data systems, as described in Division 28 and as indicated on the drawings to include outlets, raceways, and cabling.
8. Electrical services (power) for Intrusion alarm and security systems as described in Division 28 and as indicated on the drawings.
9. Emergency egress lighting.
10. Emergency Power System.
11. Testing and commissioning for all electrical work installed under this contract and as described in these specifications and indicated on the drawings.

B. Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Division of the Specifications to provide a complete and functional electrical installation. This work includes but is not limited to all material and labor required for installation of electrical and special systems complete as described herein this specification and drawings; and connections (and installation where not otherwise provided for) of electrical equipment furnished by others. Provide and install all items of equipment, devices, supports, etc., which are incidental to the major components shown on the Drawings or described in these Specifications.

1.3 DEFINITIONS

A. The meaning of words shall be as defined in the CEC Article 100, Definitions, unless defined otherwise in an individual specification section.

B. The following specification development organizations are referenced throughout the various specification sections of Division 26:

1. ADAAG – Americans with Disabilities Act Accessibility Guidelines.
2. Air Pollution Control District, Air Quality Management District.
3. ANSI – American National Standards Institute.
4. AQMD – Air Quality Management District.
5. ASME – American Society of Mechanical Engineers.
6. ASTM – American Society for Testing and Materials.
7. CBC – California Building Code.
8. 10. CCR – California Code of Regulations Title 24 State Chapters.
9. 11. CEC – California Electrical Code.
10. 12. CFC – California Fire Code.
11. 13. CMC – California Mechanical Code.
12. 15. EIA – Electronic Industries Association.
13. 16. FCC – Federal Communications Commission.
14. 19. ICEA – Insulated Cable Engineers Association.
15. 20. IEC – International Electromechanical Commission.
16. 21. IEEE – Institute of Electrical and Electronic Engineers.

17. 24. ISO – International Organization for Standardization.

18. 27. NECA – National Electrical Contractors Association.

19. 28. NEMA – National Electrical Manufacturing Association.

20. 29. NETA – National Electrical Testing Association.

21. 30. NFPA – National Fire Protection Association.

22. 32. OSHA – Occupational Safety and Health Administration.

23. 34. UL – Underwriters Laboratories.

1.4 RELATED WORK INCLUDED IN OTHER DIVISIONS

A. Finish painting except factory applied finishes and repair of factory finishes shall be provided in accordance with appropriate sections of this Specification. Coordinate "painting" requirements of this Division with other trades as required to assure timely and satisfactory completion of required work. In finished areas, all exposed raceway, boxes, galvanized steel box covers (where allowed), and other electrical "structure" shall be finished to match adjacent structures. Verify that all raceway openings are closed and box covers are in place prior to finishing work done by others.

B. Examine the drawings and specification for mechanical and plumbing equipment and provide electrical installation for heating, ventilation and air conditioning equipment, motors, pumps and associated motor starters and controls as described in Division 22 and Division 23.

C. Examine the Architectural drawings and specification for electrical appliances and equipment which may not be shown on the plans to include and provide electrical installations as described in the architectural division of work.

D. Examine the Architectural drawings and provide all construction necessary to maintain the integrity of the fire rated barriers.

E. Examine the Architectural drawings and coordinate with the Architect to provide access doors, whether shown on drawings or not, where floors, walls, or ceiling must be penetrated for access to electrical equipment, outlet boxes, devices, etc., and as specified in this specification.

F. Provide and install, as part of the work described in this Division, all power and control wiring fed from a source of 30 Volts or more (i.e. all wiring except temperature control wiring) for mechanical equipment described in Division 23.

G. Examine the fire sprinkler system drawings and specifications for electrical work which may not be shown on the electrical and/or fire detection and alarm plans to be included in the electrical work as necessary as described in the Division 21 fire sprinkler system.

1.5 APPLICATION OF OTHER DIVISIONS

A. Where carpentry, masonry, concrete work, painting, etc., is required in the installation of equipment specified under this Division, the work shall be done in accordance with the applicable Division of these Specifications. This work could include for example: work associated with panelboard installation, equipment pads or bases, support structures, etc.

1.6 DRAWINGS AND SPECIFICATIONS

A. The information presented in these Specifications, and on the drawings, is intended to describe the utilitarian and physical aspects of the systems shown as well as the quality of the entire installation. All information is as complete and thorough as possible, but every condition or situation cannot be anticipated. Exact locations, dimensions, elevations, etc. must be determined "on the job" with careful attention to the "intent" of the Drawings and Specifications.

B. The above paragraph shall not be construed as to allow significant deviation from either the Drawings or Specifications without prior approval of the Architect, but minor changes in conduit routing or equipment locations may be required or desired due to specific conditions encountered. This work shall be accomplished in accordance with these Specifications and no "extra charges" are to be created for any unanticipated labor or material.

C. Any error or omissions of detail in either the drawings or the specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical systems.

D. Contractor shall inspect the site and verify all measurements and conditions. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.

1. The Drawings are diagrammatic in nature, but the locations of devices, equipment, outlets, and lighting fixtures are shown approximately where installations are intended. Architectural, structural, mechanical, audio/video, theatrical lighting and other drawings shall be examined, noting all conditions that may affect this work. Report conflicting conditions to the Architect/Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without reporting the matter, he does so on his own responsibility and shall alter work if directed by the Architect/Engineer at his own expense.

E. Examine the architectural, structural, mechanical, fire sprinkler and manufacturer's drawings for various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.

F. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to rough in without incurring any additional cost or changes.

G. If significant departures from the Drawings or Specifications are considered necessary by the Contractor, details of the changes and the reasons therefore shall be submitted to the Architect as within thirty days after award of contract. Prior written acceptance of the Architect is required for these departures.

H. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Architect/Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the Owner.

1.7 CODES, STANDARDS, RULES AND REGULATIONS

A. All work and materials shall be in full accordance with the latest rules, codes, and/or regulations and not limited to the following:

B. NFPA 70 - National Electrical Code; National Fire Protection Association, 2020 with 2022 California Electrical Code amendments

C. NFPA 101 - Life Safety Code

D. NFPA 72 - Fire Alarm Code

E. Title 24 - State of California Administrative Code

F. California Building Code (CBC)

G. City or County Electrical Code as applicable.

H. Utility rules and regulations.

I. Any applicable additional codes and regulatory documents effective at the project site.

J. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.

1. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

1.8 MANUFACTURER'S INSTRUCTIONS

A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified on the contract documents.

B. Notify the Architect/Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.9 WORKMANSHIP

A. High quality workmanship shall be evidenced in the installation of all electrical equipment and materials. Use the National Electrical Contractors Association's "Standard of Installation" as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

1.10 COORDINATION WITH OTHER TRADES

A. Examine the Electrical Drawings and refer to the Drawings and Specifications describing other work to be accomplished. Verify and coordinate prior to bid. Continue to coordinate work planning and all work in the field to avoid conflicts, errors, and/or delays. No compensation will be allowed for extra work necessitated by lack of coordination.

1.11 AUTHORITY OF THE ARCHITECT

A. As used in this paragraph only, the word "Architect" shall mean the Architect of record or his designated representative.

B. The authority of the Architect shall be absolute with respect to all performance under this Specification. In case of dispute, the decision of the Architect shall be final.

C. Where optional materials, methods, or installation techniques are allowed under the provisions of this Specification, they may be used at the discretion of the Architect. The Architect may require specific materials, methods, or techniques to be used in specific situations where use of other materials, methods, or techniques might in his judgment result in loss of aesthetics, accidental damage, life safety hazard, or loss of utility over the system design lifetime.

D. No additional charges will be allowed for work or material require to be supplied under the conditions of this paragraph unless the need for such material or work could not have been anticipated by thorough study of the site, Drawings, and Specifications and knowledge of all applicable codes, laws, and ordinances.

1.12 EXAMINATION OF THE SITE

A. The contractor is required to visit the site of construction prior to bid to determine existing conditions and their effect upon the work he will be required to perform. No additional compensation will be allowed for any extra expenses incurred by failure to detect and evaluate all existing conditions that will affect his work to be included in the bid to accomplish this contract document's goal.

1.13 STRUCTURAL REQUIREMENTS

A. Secure all anchors for electrical equipment in a manner, which will not decrease the structural value of any structure to an unsafe level. Install all equipment, fixtures, etc. to resist seismic movements. Inform the Architect in advance and provide drawings of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in this project.

1.14 PERMITS, FEES, AND, INSPECTIONS

A. Obtain all permits and licenses as required and pay all fees incidental to construction.

B. Inspections required by prevailing Local Authorities, and/or ordinances, shall be coordinated and arranged by the contractor. Provide the Architect with a schedule of inspections, where applicable, and submit all certificates of inspection to the Architect.

C. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate equipment, or perform any reasonable work, which, in the opinion of the Architect, will be necessary to determine the quality or adequacy of the work. Work shall not be closed in or covered before inspection and approval by the Architect. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Architect, remove the materials from the premises.

1.15 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable to the Owner. Secure material from weather or accidental damage.

1.16 SEQUENCING AND SCHEDULING

A. Sequence work under provisions of Division 1.

B. Coordinate the incoming electrical, telephone and cable television services with the local serving utility companies. Install utility service trench and duct systems in accordance with the respective serving utility company requirements.

C. Coordinate hand hole locations with the existing site conditions. Hand holes are to be located approximately five feet from building or as indicated on drawings.

1.17 SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY

A. The contractor shall provide short circuit, protective device and arc flash studies for the complete electrical distribution system. Submit to the Electrical Engineer of Record for review. Provide all short circuit device and equipment characteristic information for all electrical components. Provide Time-Current curves for all overcurrent protective devices in the submittal. Set and adjust all devices in accordance with the results of this study prior to energizing equipment. Refer to Section 26 05 73, Power Systems Studies for additional requirements.

B. The Contractor shall be responsible for obtaining all pertinent information necessary in order to perform the required short circuit, protective device coordination and arc flash studies to include but not limited to the following:

1. Contacting the serving power utility to obtain the available short circuit current at the project point of connection and/or secondary of the serving utility company service transformer(s).

2. Field investigation to determine the short circuit current rating for any existing electrical service and distribution equipment.

3. Electrical characteristics for all proposed new electrical service and distribution equipment.

4. The Contractor shall provide approved permanent labels for all electrical service and distribution equipment to clearly identify the available short circuit current and arc flash energy levels and required PPE (Personnel Protective Equipment).

1.18 OPERATING INSTRUCTIONS

A. Instruct the Owner as to function, operation, maintenance, and adjustment of each system and piece of equipment provided.

1.19 RECORD DRAWING

A. The Contractor shall keep a separate set of Electrical Drawings at the job site to be used as RECORD Drawings. These Drawings are to be kept current and in a neat and clean condition at all times. They are to be available for inspection by the Architect or Engineer at any time during site visitations. These Drawings shall be "red lined" to indicate all changes in equipment, device, and outlet locations; and to indicate the true locations of all concealed or underground work where different from that shown on the Drawings. Each sheet of this set shall be clearly and permanently marked "RECORD DRAWINGS".

B. Upon completion of the project and prior to final payment, transfer all RECORD DRAWINGS information to the provided original drawings. All information shall be clearly drawn with “RED” ink. The drawings shall be scanned, 100% edited, and converted into an AutoCAD “.dwg” version 2011 (or higher) electronic file. Deliver the original, final sets, and electronic files (CD) to the Architect for review and delivery to the Owner.

1.20 SPARE PARTS

A. Spare parts shall be provided and maintained by the Contractor to support the maintenance response requirements defined in this document.

B. At a minimum, the following spare parts shall be stored onsite at a location identified by the Owner's representative. The spare parts shall be the property of the Owner. The spare parts shall be of the same type submitted and installed in the facility to include the following:

C. Lighting fixture LED driver, one for each fixture type.

D. Branch circuit panelboard circuit breaker, one for each circuit breaker type.

E. Fuses, one set of three for each fuse type and size.

F. Lighting occupancy sensors and switches, one for each sensor and switch type.

1.21 GUARANTEE

A. All electrical work, material, and equipment shall be guaranteed to be free from defects in workmanship or material for a period of two (2) year from the date of final acceptance. Repair or replace all such defects in a timely manner and any damage to the owner's property resulting from such defect or repair thereof. All equipment and material provided and all work accomplished under the requirements of this section shall be at no expense to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless specifically indicated otherwise, all material shall be new and free from defects; it shall be listed by Underwriters' Laboratories where applicable. Like items shall be of the same manufacturer (except lighting fixtures - which shall be as specified).

B. Except as noted otherwise, where material of a particular manufacturer is specified, the intent is to describe the quality and function of the item. The term "...or acceptable equal" is implied. A substitution of any of these items will require that the item be presented in a submittal whether specifically listed in the "Submittals" paragraph below or not.

2.2 SUBMITTALS

A. Material submittals shall be complete and submitted all at the same time. The individual groups of submittal types (e.g.: lighting fixtures, wiring devices, distribution equipment, etc.) MUST be prefaced with a list of contents identifying each item by its project name or symbol, manufacturer, and complete catalog number. Each copy of each submittal group shall have the list of contents attached. These lists will be used to report submittal comments. The Contractor is responsible for submitting this information in a timely manner so that material may be ordered early enough to meet the construction schedule. If material is not ordered in time for whatever reason, pay such premium prices and special handling charges as are required to meet the construction schedule. No substitution of an "accepted" item will be allowed due to failure to plan for adequate material procurement lead time.

B. Shop drawings shall be drawn to scale or completely dimensioned and shall give all information required to completely describe the item. The Contractor shall carefully check all the shop drawings for compliance with these specifications and the Plans.

C. If the shop drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in order that if (acceptable) suitable action may be taken for proper adjustment of the Contract. The Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract, even though the shop drawings have been reviewed.

D. Work requiring shop drawings shall not be started before receipt of the Architect's review and acceptance.

E. The Architect's/Engineer's review of the submitted materials, items and shop drawings are for general compliance with the plans and specifications and general design and arrangement only. Therefore, it shall not relieve the Contractor from responsibility for errors of any sort in the materials, items, shop drawings or schedules. The Contractor shall verify all dimensions and job site conditions affecting the work, and shall be responsible for furnishing and installing the proper materials required by the Contract, whether or not indicated on the drawings and specifications.

F. As a minimum, submittals are required for the following items:

1. RACEWAY COMPONENTS

2. WIRE AND CABLE

3. WIRING DEVICES

4. MAIN SWITCHBOARD AND DISTRIBUTION PANELS
5. PANELBOARDS
6. PULL BOXES
7. SAFETY SWITCHES, DISCONNECTS AND CIRCUIT BREAKERS
8. TRANSFORMERS
9. LIGHTING FIXTURES, CONTROL SYSTEMS, PEDESTALS AND POLES
10. EMERGENCY GENERATOR AND TRANSFER SWITCH(ES)

2.3 SUBSTITUTIONS

A. Specific brand names and catalog numbers are used to describe materials in order to establish of performance and quality.

B. Only one substitution will be considered for any item. Substitute materials must be equal in quality and function to that specified. Allowance of a substitution does not permit any reduction of system performance or utility, and the Contractor is responsible for additional costs incurred due to use of a substituted item. If the proposed substitute item is "rejected", the specified item shall be provided (re-submittal required) without further discussions or delay.

C. Any Contractor's proposed substitution of material, article, or method in the opinion of the Architect/Engineer are equal to that specified will be accepted, provided the Contractor submits a single written request, in triplicate, to the Architect, with the following information for each item:

D. Name of Manufacturer or supplier.

E. Trade or brand names.

F. Type, model, style, and/or catalog number.

1. Size or capacity rating.

G. After receipt of a written request from the contractor, the engineer of record will review product substitutions fourteen (14) days prior to the bid date. If system substitutions are submitted after the award of the project contract, the analysis for the whole system substitution will be charged to the contractor at senior engineer hourly rates.

H. The decision of the Architect/Engineer shall govern as to what is equal to the item specified in the plans and specifications. Equality will be judge on the basis of the following:

1. Conformance with description or performance required.
2. Equal in quality.
3. Comparable in appearance and artistic effect where these are in considerations.
4. Comparable operation, maintenance and performance.
5. Equal in longevity and service under conditions of climate and usage.
6. Conformance with space allocations and requirements for operations from in details and construction of related work.
7. Conformance with all applicable codes and regulations.

I. If the Architect/Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Architect.

2.4 ENCLOSURES

A. Provide enclosures suitable for the specific type of location in which they are installed.

1. Provide NEMA 1 or NEMA 12 boxes and enclosures for dry locations. Dry locations are all indoor areas that do not fall within the definitions below for wet or damp locations.
2. Provide NEMA 3R boxes and enclosures for wet locations. Wet locations are all locations exposed to weather, whether under a roof or not.
3. Provide NEMA 4 boxes and enclosures for damp locations. Damp locations are all indoor spaces wholly or partially underground or any area subject to water spray.
4. Provide NEMA 4X, stainless steel enclosures in all kitchen and wash down areas.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All equipment shall be set square and plumb, securely mounted, adequately supported, and permanent. Provide workspace around items of electrical equipment as required by California Electrical Code (CEC). In general, equipment is to be installed in accordance with manufacturer's instructions; but the requirements of these specifications shall take precedence where conflicts exist.

B. WIRING METHODS: The cables and conductors of all systems specified in the Specification are required to be installed in raceway.

C. Coordinate electrical work with the Owner’s representative and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the facility during construction.

D. Check and coordinate the approximate locations of electrical stub-ups, light fixtures, electrical outlets, equipment, and other electrical system components shown on the Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify the architect in writing. The architect’s decision shall govern. Make modifications and changes required to correct conflicts as required.

3.2 ELECTRICAL WORK FOR EQUIPMENT PROVIDED UNDER OTHER SECTIONS

A. Install power conductors and terminate on equipment provided under other specification sections. Verify specific requirements.

B. Install and terminate electrical controls as described on the Electrical Drawings (For mechanical equipment specified in Division 23).

C. Line voltage control wiring of exhaust fans is to be accomplished under this Division. The controlling device may be specified elsewhere.

D. Provide and install all disconnect/safety switches and motor starters except those devices specified to be furnished with equipment specified elsewhere.

E. Unless provided for in another Division, install all items of electrical equipment provided by others.

F. Assist others in equipment testing to verify that wiring and connections made under this Division are correct.

3.3 EQUIPMENT IDENTIFICATION

A. Nameplates shall be installed on all items of electrical equipment as follows: switchboard(s) and switchboard circuit breakers, panelboards, terminal cabinets, time switches, contactors, motor control switches, wall switches (where noted on the Drawings), motor starters provided under this Division where the function is not immediately obvious, and safety switches.

B. The nameplate shall identify the item by Drawing name where applicable and describe its use or function in this installation.

C. Permanently mark all utility outlets to show source of power panel and circuit breaker number.

D. Provide nameplates per Section 26 05 53.

3.4 EXCAVATION AND BACKFILL

A. Excavation and backfill shall be accomplished as required for installation of electrical equipment as shown on the Drawings. Restore all surfaces, roadways, walks, etc., and any existing underground structures which might be disturbed during this work to their original condition in a manner acceptable to the Architect.

B. Trenches shall be straight except where otherwise indicated. Depth shall be as noted on the Drawings and at least as required to provide the minimum cover specified by applicable codes and regulations for the equipment installed. Bottom of trench shall be smooth and free of any rock points. Place a 4" sand bed in trench if these conditions cannot be met with native material.

C. Backfill shall be clean and free of rocks and debris. Backfill is to be tamped in 6" layers to nominal 95% compaction using a mechanical tamper manufactured specifically for this purpose. In an area of engineered fill or other area of specified compaction, backfill shall be compacted to match that specified for that area.

D. At a depth of 12" below finished grade and at least 6" above installed equipment, lay a 6" wide yellow warning tape on the compacted backfill for the full length of the trench. Do not stretch the tape. Use Brady "Identoline" stating: "CAUTION BURIED ELECTRICAL LINE". Installation under building slabs is not required unless noted otherwise.

E. If at any time during a period of one-year dating from the date of final acceptance of the project, there shall be any settlement of conduit trenches, the Architect may notify the Contractor to immediately provide additional fill and to make such repairs or replacements in paving, planting, or structures, as may be deemed necessary at the Contractor's expense.

F. Cooperate and coordinate with others in planning for and execution of all trench work.

1. The Contractor is expected to exercise due care when excavating in an area of existing utilities to avoid damage to these facilities. Where it can be determined that underground facilities are likely to exist (either from the Drawings or inspection of the site), the Contractor is required to determine the exact locations of these existing installations. Damage to existing facilities, due to failure to properly accomplish the above, shall be repaired at the Contractors expense to the approval by the Architect and satisfaction of the Owner.

2. CALL AN UNDERGROUND SERVICE FIRM BEFORE TRENCHING, CALL U.S.A. (800) 624-2444.

3.5 SEALING PENETRATIONS

A. Flash and counter flash roof and wall penetrations with equipment manufactured for the purpose and as described in other Divisions of these Specifications or as Directed by the Architect. Apply mastic as required to seal absolutely watertight.

B. Conduits penetrating floor slabs or block or concrete walls shall be grouted and sealed watertight.

3.6 CUTTING AND PATCHING

A. Obtain the Architect's acceptance prior to cutting existing surfaces or surfaces under construction. All such surfaces must be repaired or patched to the satisfaction of the Architect.

3.7 EQUIPMENT ANCHORING

A. Seismic Withstand Requirements: Freestanding or wall-hung equipment shall be anchored in place by methods, which will meet the requirements of the applicable codes for seismic loads. The contractor shall submit calculations in accordance with “Contractor Submittals”, for the design of the anchoring systems for all equipment, including panels, transformers, etc. in excess of 250 pounds. Calculations shall be performed, signed and stamped by a Structural Engineer or a Civil Engineer experienced in structural design and licensed in the State of California. The calculation shall provide an analysis of lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. The calculation shall also provide an analysis of both the anchoring system and the foundation or wall system to receive the anchor loads and shall show that the foundation is capable of resisting all anchor loads. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria.

B. Seismic bracing for light fixtures cable or pendant suspended from ceiling or roof structure shall be seismically braced to prevent fixture from swaying 45 degree in either direction of suspension point. Contractor shall use same cable used to suspend light fixture. Where pendants are use the contractor shall use air craft light fixture suspension cable. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria referred to in above paragraph.

3.8 HOUSEKEEPING PADS AND FOUNDATIONS

A. Concrete work required for housekeeping pads and foundations shall be provided by General Construction Work.

B. Furnish required dimensional drawings and specify locations for all equipment pads and foundations. Minimum height of housekeeping pads shall be four inches and shall extend out six inches from the footprint of the equipment. Extend pad dimensions where required to maintain accessibility and meet all code requirements.

C. Furnish anchor bolts and sleeves, verify accuracy of installation.

D. Provide housekeeping pads for the following:

1. Outdoor switchboards.

2. Emergency and/or Stand-by generator.

3. Outdoor distribution panels.

4. Outdoor floor mounted transformers.

5. Other equipment as required or as noted on the drawings.

3.9 PROTECTION CLEANING AND REPAIRS

A. All electrical equipment shall be protected from damage or degradation during construction. Electrical equipment stored or installed shall be protected from dust, water, or damage from other sources.

B. After all other work has been accomplished, such as plastering, painting, etc., and prior to final review by the Architect; all electrical equipment, especially equipment enclosures, panelboards, switchboards, and lighting fixtures shall be thoroughly cleaned (inside and out) of all dirt, water, grease, plaster, paint, or other construction debris. All surfaces shall be clean and in "new" condition. All scratches, dents, marks, cracks, etc., shall be repaired to the satisfaction of the Architect or the equipment shall be replaced at no additional cost.

3.10 ELECTRICAL EQUIPMENT DELIVERABLES

A. Retain and safeguard all detachable and spare devices, equipment, and literature (O&M manuals, instruction books, wiring diagrams, test reports, keys, fixtures, etc.) until completion of work. At this time, all items will be delivered to the Owner as directed by the Architect.

3.11 TESTS

A. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500 volt “Megger”.

B. Take precaution during the testing period to insure the safety of personnel and equipment.

C. Test all wiring for continuity and grounds before any fixtures or equipment are connected. Where such tests indicate faulty installation or other defects, the fault(s) shall be located and repaired at the Contractor's expense. The repaired installation shall then be retested.

D. Verify rotation of all three phase motors and reconnect if necessary.

E. Verify the resistance of the grounding electrode system(s).

F. Balance all loads on each panelboard and all other types of distribution equipment as applicable.

G. Provide all site testing under provisions of Section 26 08 13.

3.12 ADJUSTING

A. Inspect all equipment and put into good working order.

3.13 CLEANING

A. Clean work under provisions of Division 1.

B. Clean all electrical items. Fixtures and equipment shall be free of dirt, dust and other construction debris.

3.14 START UP

A. Operate all electrical systems in good working order for a period of five consecutive days at a time period agreed to by the Owner's representative.

END OF SECTION 26 05 00

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Scope: furnish all labor, materials, equipment, and incidentals required to install wire and cable for a complete operable electrical system as shown on the drawings and as described in the specifications.

B. Section Includes:

1. Single conductor building wire
2. Metal-clad cable.
3. Wire and cable for 600 volts and less.
4. Wiring connectors.
5. Electrical tape.
6. Heat shrink tubing.
7. Oxide inhibiting compound.
8. Wire pulling lubricant.
9. Cable ties.
10. Firestop sleeves.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 00-Common Work Results for Electrical.

C. Section 26 05 05 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 28 46 00 - Fire Detection and Alarm: Fire alarm system conductors and cables.

G. Section 31 23 16 - Excavation.

H. Section 31 23 23 - Fill: Bedding and backfilling.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

I. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); 2008a (Validated 2019).

J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

K. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

L. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

O. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

P. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

Q. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

R. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

S. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

U. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.

3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

4. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

D. Product Data: Provide for each cable assembly type.

E. Test Reports: Indicate procedures and values obtained.

F. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

G. Field Quality Control Test Reports.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

K. Project Record Documents: Record actual locations of components and circuits.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. All wire and cable shall comply with applicable standards of the Underwriters Laboratories Inc.

C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify the Electrical Engineer or Record and obtain direction before proceeding with work.

1.9 PROJECT CONIDTIONS

A. Existing Conditions

1. Wire and cable routing shown on the Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.

2. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

B. Verify that field measurements are as shown or indicated on the Drawings.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Metal-clad cable is not permitted.

1. Where not otherwise restricted, may be used:

a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

1) Maximum Length: 6 feet.

b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.

1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

2. In addition to other applicable restrictions, may not be used:

a. Unless approved by the Owner.

b. Where not approved for use by the authority having jurisdiction.

c. Where exposed to view.

d. Where exposed to damage.

e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

g. For patient care areas of health care facilities requiring redundant grounding.

D. Concealed Dry Interior Locations: Use only building wire in raceway.

E. Exposed Dry Interior Locations: Use only building wire in raceway.

F. Above Accessible Ceilings: Use only building wire in raceway.

G. Wet or Damp Interior Locations: Use only building wire in raceway.

H. Exterior Locations: Use only building wire with Type THWN/THW insulation in raceway.

I. Underground Installations: Use only building wire with Type THWN/THW insulation in raceway.

J. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

K. Use stranded conductors for control circuits.

L. Use conductor not smaller than 12 AWG for power and lighting circuits.

M. Use conductor not smaller than 14 AWG for control circuits.

N. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

O. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 150 feet.

P. Conductor sizes are based on copper unless indicated as aluminum or "AL".

2.2 WIRE MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

A. Cerro Wire LLC: www.cerrowire.com.

B. Industrial Wire & Cable, Inc: www.iewc.com.

C. Southwire Company: www.southwire.com.

D. Or approved equal.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.3 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide conductors and cables with lead content less than 300 parts per million.

D. Provide new conductors and cables manufactured not more than one year prior to installation.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

F. Comply with NEMA WC 70.

G. Comply with FS A-A-59544 where applicable.

H. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

I. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

J. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

K. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.

L. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

M. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

N. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

O. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

2. Control Circuits: 14 AWG.

P. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

Q. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

    a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

    a. 480Y/277 V, 3 Phase, 4 Wire System:

        1) Phase A: Brown.

        2) Phase B: Orange.

        3) Phase C: Yellow.

        4) Neutral/Grounded: Gray.

    b. 208Y/120 V, 3 Phase, 4 Wire System:

        1) Phase A: Black.

        2) Phase B: Red.

        3) Phase C: Blue.

        4) Neutral/Grounded: White.

    c. Equipment Ground, All Systems: Green.

    d. Isolated Ground, All Systems: Green with yellow stripe.

    e. Travelers for 3-Way and 4-Way Switching: Pink.

    f. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

    g. For control circuits, comply with manufacturer's recommended color code.

2.4 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com/#sle.

b. Encore Wire Corporation: www.encorewire.com/#sle.

c. General Cable Technologies Corporation : www.generalcable.com/#sle.

d. Service Wire Co: www.servicewire.com/#sle.

e. Southwire Company: www.southwire.com/#sle.

f. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

a. Size 4 AWG and Larger: Type XHHW-2 or THHN/THWN.

b. Installed Underground: Type XHHW-2 or THHN/THWN.

c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

F. Conductor: Copper.

1. For Sizes Smaller Than 4 AWG: Copper.

2. For Sizes 4 AWG and Larger: Copper.

G. Insulation Voltage Rating: 600 volts.

H. Insulation: NFPA 70, Type THHN/THWN.

2.5 METAL-CLAD CABLE

A. Manufacturers:

1. AFC Cable Systems Inc: www.afcweb.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Service Wire Co: www.servicewire.com/#sle.
4. Southwire Company: www.southwire.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide oversized neutral conductors.

G. Provide dedicated neutral conductor for each phase conductor.

H. Grounding: Full-size integral equipment grounding conductor.

1. Provide additional isolated/insulated grounding conductor.

I. Armor: Steel, interlocked tape.

J. Provide PVC jacket applied over cable armor.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.

5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

6. Aluminum Conductors: Use compression connectors for all connections.

7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.

8. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Ideal Industries, Inc: www.idealindustries.com/#sle.

c. NSI Industries LLC: www.nsiindustries.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

H. Mechanical Connectors: Provide bolted type or set-screw type.

1. Manufacturers:

a. Burndy LLC: www.burndy.com/#sle.

b. Ilsco: www.ilsco.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration with prestressed insulation to equal the insulation of wire being installed. .

1. Manufacturers:

a. Burndy LLC: www.burndy.com/#sle.

b. Ilsco: www.ilsco.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

1. Manufacturers:

a. Burndy LLC: www.burndy.com/#sle.

b. Ilsco: www.ilsco.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

K. Power Conductor Splicers

1. Blackburn.

2. Burndy “Hylug”.

3. Ilso.

4. O.Z. Gedney.

2.7 ACCESSORIES

A. Electrical Tape:

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.

6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.

7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Burndy LLC: www.burndy.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

1. Manufacturers:

a. Burndy LLC: www.burndy.com/#sle.

b. Ideal Industries, Inc: www.idealindustries.com/#sle.

c. Ilsco: www.ilsco.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Wire Pulling Lubricant:

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. American Polywater Corporation: www.polywater.com/#sle.

c. Ideal Industries, Inc: www.idealindustries.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Listed and labeled as complying with UL 267.

3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

4. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

1. Manufacturers:

a. Burndy LLC: www.burndy.com/#sle.

b. Scotchflex.

c. Thomas & Betts.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

1. Products:

a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.

b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:

a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that raceway installation is complete and supported.

E. Verify that field measurements are as indicated.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.

b. Increase size of conductors as required to account for ampacity derating.

c. Size raceways, boxes, etc. to accommodate conductors.

d. Record any circuit changes on record drawings.

8. Common Neutrals: Sharing of neutral/grounded conductors among branch circuits is not permitted.

9. Provide oversized neutral/grounded conductors where indicated and as specified below.

a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.

b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

   2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

H. Terminate cables using suitable fittings.

   1. Metal-Clad Cable (Type MC):

      a. Use listed fittings.

      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

      c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.

   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

   3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

   a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

   b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

   a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

   b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

Q. Identify conductors and cables in accordance with Section 26 05 53.

R. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

U. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

V. Route wire and cable as required to meet project conditions.

1. Wire and cable routing indicated is approximate unless dimensioned.

2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.

W. Use wiring methods indicated.

X. Pull all conductors into raceway at same time.

Y. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

Z. Protect exposed cable from damage.

AA. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

BB. Use suitable cable fittings and connectors.

CC. Neatly train and lace wiring inside boxes, equipment, and panelboards.

DD. Clean conductor surfaces before installing lugs and connectors.

EE. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

FF. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

GG. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

HH. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

II. Trench and backfill for direct burial cable installation as specified in Sections 31 2316 and 31 2323. Install warning tape along entire length of direct burial cable, within 3 inches of grade, as specified in Section 26 0553.

JJ. Identify and color code wire and cable under provisions of Section 26 0553. Identify each conductor with its circuit number or other designation indicated.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect wire for physical damage and proper connections.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer’s values.

D. Perform field inspection and testing in accordance with Section 01 4000.

E. Inspect and test in accordance with NETA ATS, except Section 4.

F. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

G. Correct deficiencies and replace damaged or defective conductors and cables.

H. Perform field inspection

I. Megger test and record all feeder conductors.

1. Replace conductors failing test.

2. Test replaced conductors in same manner.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Scope: provide a complete grounding and bonding system as shown on the electrical drawings and as described in the specifications such that the entire raceway system including all equipment enclosures, data racks, telephone backboards and cabinets, fixtures, and outlets, etc. are effectively connected to ground.

B. Grounding and bonding requirements.

C. Section includes:

1. Materials and methods for grounding systems and equipment.
2. Grounding electrodes and conductors.
3. Equipment ground conductors.
4. Bonding
5. Grounding well.
6. Ground bars.
7. Chemically enhanced ground electrodes.
8. Ground plate electrodes.

D. Connectors for grounding and bonding.

E. Ground bars.

F. Ground rod electrodes.

G. Chemically-enhanced ground electrodes.

H. Ground plate electrodes.

I. Ground enhancement material.

J. Ground access wells.

K. Pre-fabricated signal reference grids.

L. Provide all components necessary to complete the grounding system(s) consisting of:

1. Metal underground water pipe.
2. Metal frame of the building.
3. Concrete-encased electrode.
4. Existing metal underground gas piping system.
5. Metal underground gas piping system.

1.2 RELATED REQUIREMENTS

A. Section 26 05 00-Common Work Results for Electrical.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

1. Includes oxide inhibiting compound.

C. Section 26 05 36 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 31 00 - Photovoltaic Collectors: Additional grounding and bonding requirements for photovoltaic systems.

F. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2024.

G. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2023.

H. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance:

1. Building grounding electrode: 10 ohms.

2. Separately Derived Sources Grounding Electrode: 10 ohms

3. Non-current carrying metal parts: 25 ohms

4. Grounds not covered above: 25 ohms

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Shop Drawings:

1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

D. Product Data: Provide for grounding electrodes and connections.

E. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Field quality control test reports.

H. Project Record Documents: Record actual locations of grounding electrode system components and connections.

I. Project Record Documents: Record actual locations of components and grounding electrodes.

J. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Electrical Engineer of Record. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

F. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

4. Concrete-Encased Electrode:

   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

5. Ground Ring:

   a. Where indicated on drawings, provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.

   b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.

   c. Provide ground enhancement material around conductor where indicated.

   d. Provide connection from ground ring conductor to:

      1) Perimeter columns of metal building frame.

      2) Ground rod electrodes located as indicated.

      3) Building structural steel.

6. Ground Rod Electrode(s):

   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

b. Space electrodes not less than 10 feet from each other and any other ground electrode.

c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

d. Provide ground enhancement material around electrode where indicated.

e. Provide ground access well for each electrode.

7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

a. Ground Bar Size: 1/4 by 4 by 12 inches unless otherwise indicated or required.

b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

G. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.

2. Provide equipment grounding conductor routed with supply conductors.

3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.

4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

I. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:

a. Transformers (except autotransformers such as buck-boost transformers).

b. Uninterruptible power supplies (UPS), when configured as separately derived systems.

c. Generators, when neutral is switched in the transfer switch.

2. Provide grounding electrode conductor to connect derived system grounded conductor to common grounding electrode conductor ground riser. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.

5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.

6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

J. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

b. Metal gas piping.

c. Metal process piping.

8. Provide bonding for interior metal air ducts.

9. Provide bonding for metal building frame.

10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.

12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

K. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.

a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.

b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.

c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

L. Cable Tray Systems: Also comply with Section 26 05 36.

M. Photovoltaic Systems: Also comply with Section 26 31 00.

N. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

a. Exceptions:

1) Use mechanical connectors for connections to electrodes at ground access wells.

3. Unless otherwise indicated, use mechanical connectors for accessible connections.

a. Exceptions:

1) Use exothermic welded connections for connections to metal building frame.

4. Manufacturers - Mechanical and Compression Connectors:

a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

b. Burndy LLC: www.burndy.com/#sle.

c. Harger Lightning & Grounding: www.harger.com/#sle.

d. Thomas & Betts Corporation: www.tnb.com/#sle.

e. Or approved equal.

f. Substitutions: See Section 01 60 00 - Product Requirements.

5. Manufacturers - Exothermic Welded Connections:

a. Burndy LLC: www.burndy.com/#sle.

b. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.

4. Manufacturers:

a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

b. Harger Lightning & Grounding: www.harger.com/#sle.

c. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.

2. Material: Copper-bonded (copper-clad) steel.

3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.

5. Manufacturers:

   a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

   b. Galvan Industries, Inc: www.galvanelectrical.com/#sle.

   c. Harger Lightning & Grounding: www.harger.com/#sle.

   d. Or approved equal.

   e. Substitutions: See Section 01 60 00 - Product Requirements.

F. Chemically-Enhanced Ground Electrodes:

1. Description: Copper tube factory-filled with electrolytic salts designed to provide a low-impedance ground in locations with high soil resistivity; straight (for vertical installations) or L-shaped (for horizontal installations) as indicated or as required.

2. Length: 10 feet.

3. Integral Pigtail: Factory-attached, sized not less than grounding electrode conductor to be attached.

4. Backfill Material: Grounding enhancement material recommended by electrode manufacturer.

5. Manufacturers:

   a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

   b. Harger Lightning & Grounding: www.harger.com/#sle.

   c. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

   d. Or approved equal.

   e. Substitutions: See Section 01 60 00 - Product Requirements.

G. Ground Plate Electrodes:

1. Material: Copper.

2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.

3. Manufacturers:

    a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

    b. Harger Lightning & Grounding: www.harger.com/#sle.

    c. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

    d. Or approved equal.

    e. Substitutions: See Section 01 60 00 - Product Requirements.

H. Ground Enhancement Material:

1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.

2. Resistivity: Not more than 20 ohm-cm in final installed form.

3. Manufacturers:

    a. Harger Lightning & Grounding: www.harger.com/#sle.

    b. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

    c. Or approved equal.

    d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.

    a. Areas Exposed to Vehicular Traffic: Rated for not less than 2000 pounds vertical design load.

2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.

    a. Round Wells: Not less than 8 inches in diameter.

    b. Rectangular Wells: Not less than 12 by 12 inches.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
    a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
    b. Harger Lightning & Grounding: www.harger.com/#sle.
    c. ThermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.
    d. Or approved equal.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

J. Oxide Inhibiting Compound: Comply with Section 26 05 19.

2.3 MANUFACTURERS

A. Cooper Power Systems: www.cooperpower.com.

B. Framatome Connectors International: www.fciconnect.com.

C. Or approved equal.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.4 ELECTRODES

A. Manufacturers:
1. Cooper Power Systems: www.cooperpower.com.
2. Framatome Connectors International: www.fciconnect.com.
3. Or approved equal.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Rod Electrodes: Copper.
1. Diameter: 3/4 inch.
2. Length: 10 feet.

C. Foundation Electrodes: 3/0 AWG. unless noted on plan.

2.5 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

B. Exothermic Connections: Weld

C. Wire: Stranded copper.

D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

E. Grounding Well:

1. Well Pipe: 8 inch by 24 inch long clay tile pipe with belled end.

2. Well Cover: Cast iron with legend "GROUND" embossed on cover.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify existing conditions prior to beginning work.

E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Electrodes: Provide a grounding electrode system in the main electrical room/space of each building as follows:

1. Provide a 2-inch x 1/4-inch copper ground bar. Length shall be a minimum of 12 inches but longer as required for the number of connections made to the bar. This bar shall serve as the connection point for all grounding electrodes in the building. Install the copper ground bar in a NEMA 1 screw cover cabinet, minimum size 18 inches x 12 inches x 6 inches.

2. Connect the copper ground bar to the underground metal pipe (other than gas).

    a. Connect to metal pipe with approved pipe clamp near the pressure reducing valve.

    b. Connect to ground bar with exothermic weld.

    c. Connect to metal pipe with copper clamp where copper water pipe occurs and with a malleable iron clamp where cast iron pipe occurs.

    d. Install grounding conductor, sized as indicated on plans, in a 3/4-inch metal conduit from the ground cabinet to the water pipe. Provide grounding bushings at each end of the conduit.

3. Connect the copper ground bar to the metal frame of the building.

    a. At all steel framed buildings, provide a connection to the closest column.

    b. Connect to column with exothermic weld.

    c. Connect to the ground bar with exothermic weld or bolted-type connector.

    d. Install grounding conductor, sized as indicated on the plans, in a 3/4-inch metal conduit from the ground cabinet to the column. Provide grounding bushing at each end of the conduit.

4. Connect the copper ground bar to a concrete-encased electrode/Ufer.

    a. Install a minimum of 20 feet of #3/0 AWG conductor (minimum unless noted otherwise) encased in a minimum of 3 inches of concrete. Provide a non-metallic protective sleeve, minimum 6 inches long (3 inches in the concrete and 3 inches out of the concrete), located where the conductor exits the concrete.

    b. Install a #3/0 conductor from the ground bar to the concrete-encased electrode in a 3/4-inch metal conduit with grounding bushings. Make connections to the concrete-encased electrode with a bolted-type connector and transition from the metal conduit and non-metallic sleeve.

    c. Connect to the ground bar with exothermic weld or bolted-type connector.

5. Provide additional ground rod or concrete-encased electrodes as required to meet the performance requirements listed in these specifications at the ground bar.

    a. Install additional ground rods a minimum of 5 feet from any other rod.

    b. Notify the Owner's Representative if performance requirements have not been met after installing 2 additional ground rods or concrete-encased electrodes.

6. Install other grounding electrodes as indicated on the single line diagram and other Contract Documents.

D. Grounding Electrode Conductor

1. Install grounding electrode conductor from the main normal and emergency power panels and each separately derived system in the building to the ground bar (grounding electrode system). Install grounding electrode conductor in steel conduit and bond grounding conductor to conduit at entrance and exit. Connect to the ground bar (grounding electrode system) with exothermic weld.

    a. Unless otherwise indicated, install main ground unspliced.

    b. Make connections easily accessible for inspection in ground bar cabinet.

2. Grounding electrode conductor shall be of the same type and quality as other conductors in the building.

3. The main neutral to ground bonding jumper will be located at the site utilities switchboard. Locate additional neutral to ground bonding jumper at separately derived systems only, or at the main service panel when the building is served from a dedicated transformer. Neutral bar with all interior secondary neutrals shall be isolated from the common equipment grounding bus at all other locations.

E. Bonding

1. Provide bonding to meet requirements of CEC.

2. Bond together metal siding not attached to grounded structure, bond to ground.

3. Bond prefabricated metal building to grounding electrode system at a minimum of one location.

4. Bond together all metallic conduit, boxes, cabinets, and enclosures.

F. Grounding Conductors

1. Provide grounding conductor for each branch circuit indicated.

2. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder circuit raceway and within each motor feeder raceway. Terminate each end on suitable lug, bus, or bushing.

3. Provide separate, isolated grounding conductor for each circuit which is installed (all or in part) in non-metallic conduit.

4. Provide separate grounding conductor for circuits installed in flexible steel conduit. Terminate each end on a suitable lug, bus or bushing.

5. Ground all conduit systems, cabinets, equipment, motor frames, etc., in accordance with CEC and applicable codes.

G. Grounding Connections

1. Ground shields of shielded power cable and signal cable at each splice or termination in accordance with recommendations of the splice or termination manufacturer.

2. Ground metal sheathing and exposed metal vertical structural elements of buildings. Ground metal fences enclosing electrical equipment. Bond any metal equipment platforms which support electrical equipment to that equipment. Provide good electrical contact between metal frames and railings supporting pushbutton stations, receptacles, instrument cabinets, etc., and raceways carrying circuits to these devices.

3. Ground all fencing as shown on the grounding details on the Drawings.

4. Bond neutrals of transformers within buildings to the system ground network, and to additional indicated grounding electrodes.

5. Unless shown otherwise, make connections of grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection point below finished grade.

6. Make connections of sections of outdoor ground mats (counterpoise) for substations or other equipment underground. Make connections of other grounding conductors generally accessible.

7. In manhole pull boxes, install ground rods with ends 4 to 6 inches above the floor with connections of grounding conductors fully visible and accessible.

8. When making thermite welds, wire brush or file the point of contact to a bare metal surface. Use thermite welding cartridges and molds in accordance with the manufacturer's recommendations. After welds have been made and cooled, brush slag from the weld area and thoroughly clean the joint. Re-galvanize area if required. For compression connectors, use homogeneous copper, anti-corrosion, surface treatment compound at connectors in accordance with connector manufacturer's recommendations. Use connectors of proper size for conductors and ground rods specified. Use connector manufacturer's compression tool. Notify the Owner's Representative prior to backfilling any ground connections.

9. Grounding pad plates shall be cast into the slab with the surface flush with the finished floor.

H. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

3. Provide ground well for future access to rod electrodes.

I. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.

J. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

K. Identify grounding and bonding system components in accordance with Section 26 05 53.

L. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

M. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.

N. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing . Bond steel together.

O. Provide bonding to meet requirements described in Quality Assurance.

P. Provide isolated grounding conductor for circuits supplying electronic cash registers and other similar electronic equipment loads. .

Q. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Site Tests:

1. Test under provisions of Section 26 08 13.

2. Notify the Owner’s Representative five days before inspection and testing.

3. Use suitable test instruments to measure resistance to ground of systems. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

4. Remove main bonding jumper at main service switchboard and at each separately derived system and test for infinite resistance between neutral and ground systems. Reconnect bonding jumper(s) after completion of testing.

5. Record test results in accordance with Section 26 05 00 and submit.

E. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

F. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 26 05 00 – Common Work Results for Electrical.

D. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

E. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

F. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

G. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

H. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.

H. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006

I. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010

J. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.

K. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.

4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

1. Fiberglass Channel/Strut Framing Systems: Include requirements for strength derating according to ambient temperature.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Design Data

1. Indicate hanger and support framing and attachment methods.

2. Submit seismic and structural calculations for proposed methods of support and attachment.

E. Derating Calculations for Fiberglass Channel/Strut Framing Systems: Indicate load ratings adjusted for applicable service conditions.

F. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

G. Installer's qualification statement.

H. Product Data: Provide manufacturer’s catalog data for fastening systems.

I. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at project site one copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications for Field Welding: See Section 05 50 00.

D. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.

a. NFPA 70.

b. Applicable building code.

c. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 25% . Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.

6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Components for Vibration Isolation and/or Seismic Controls: See Section 26 05 48.

C. Materials for Metal Fabricated Supports: See Section 05 50 00.

D. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Manufacturers:

a. ABB: www.electrification.us.abb.com/#sle.

b. Eaton Corporation: www.eaton.com/#sle.

c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.

e. nVent; Caddy: www.nvent.com/#sle.

f. Substitutions: See Section 01 60 00 - Product Requirements.

2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

3. Conduit Clamps: Bolted type unless otherwise indicated.

E. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

F. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.

2. Comply with MFMA-4.

3. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.

4. Channel Material:

    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.

    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.

6. Minimum Channel Dimensions: 1-5/8 inch width by 1-5/8 inch height.

G. Fiberglass Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, fiberglass channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.

2. Channel Material: Use polyester resin or vinyl ester resin.

3. Minimum Channel Dimensions: 1-5/8 inch wide by 1 inch high.

4. Flammability: Fire retardant with NFPA 101, Class A flame spread index, maximum of 25, when tested in accordance with ASTM E84; self extinguishing in accordance with ASTM D635.

H. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:

    a. Equipment Supports: 1/2-inch diameter.

    b. Busway Supports: 1/2-inch diameter.

    c. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.

    d. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.

    e. Trapeze Support for Multiple Conduits: 3/8-inch diameter.

    f. Outlet Boxes: 1/4-inch diameter.

    g. Luminaires: 1/4-inch diameter.

I. Nonpenetrating Rooftop Supports for Low-Slope Roofs:

1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.

2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

J. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.

5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

7. Sheet Metal: Use sheet metal screws.

8. Wood: Use wood screws.

9. Hammer-driven anchors and fasteners are not permitted.

    a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction.

    b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction.

10. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.

    b. Comply with MFMA-4.

    c. Channel Material: Use galvanized steel.

    d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.

11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

2.2 MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

A. Thomas & Betts Corporation: www.tnb.com.

B. Threaded Rod Company: www.threadedrod.com.

C. Or Approved Equal.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.3 SUPPORTS

A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.

B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods and secured thereto with nuts above and below the cross bar.

C. Factory made pipe straps shall be one hole malleable iron or two hole galvanized clamps.

D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

2.4 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:

1. Sheet Metal Screws: Steel

2. Machine Screws Bolts, Nuts and Washers: Steel

3. Precast Inserts: Suitable for the purpose.

4. Anchor Bolts, expansion type (stainless steel).
    a. Phillips Red-Head
    b. Hilti Kwik-Bolt.
    c. WEJ-IT.
5. Cast-in-Place Anchors: Suitable for the purpose (hot-dip galvanized except cadmium plated in dry locations)
6. Beam Clamps: Steel.
7. Detention Fasteners: In accordance with Section 11 19 23.

D. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.

E. Steel Structural Elements: Use beam clamps or welded fasteners.

F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.

G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.

H. Solid Masonry Walls: Use expansion anchors or preset inserts.

I. Sheet Metal: Use sheet metal screws.

J. Wood Elements: Use wood screws.

K. Fastener Types:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Other Types: As required.
6. Manufacturers:
    a. Powers Fasteners, Inc: www.powers.com.
    b. Or approved equal.

L. Formed Steel Channel as indicated on drawings.

M. Steel Spring Clips: As indicated on drawings

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. General

1. Install products in accordance with manufacturer's instructions.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

4. In Correctional Facilities, provide and install detention metal fasteners in inmate accessible areas in accordance with Section 11 19 23.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

1. Concrete – Precast inserts, cast-place anchors, or expansion type anchor bolts.

a. When installing drilled-in anchors in non-prestresses reinforced concrete, avoid the reinforcing bars.

b. When installing drilled-in anchors into prestressed concrete (Pre- or Post-tensioned) locate tendons by using a non-destructive method prior to installation. Maintain a minimum clearance of one-inch between the reinforcement and the drilled-in anchor.

2. Sheet Metal – Sheet metal screws or machine bolts, nuts, and washers.

3. Structural Steel Members – Beam clamps, machine screws, bolts, nuts, and washers.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.

I. Field Welding, Where Approved by LP Consulting Engineers, Inc.: See Section 05 50 00.

J. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height; see Section 03 30 00.

5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

6. Install surface mounted cabinets and panelboards with minimum of four anchors.

7. In wet and damp locations, use steel channel supports to stand cabinets and panelboards 13/16-inch minimum off wall.

8. Use sheet metal channels to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

9. Support equipment in accordance with manufacturer’s instructions.

10. Verify that equipment will fit support layouts indicated.

    a. Where suitable equipment is used, revise indicated supports to fit at no additional cost.

11. Arrange for necessary openings to allow entry of equipment.

    a. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves, or other devices to allow for later installation.

K. Conduit Support and Attachment

1. In damp or wet locations, space conduit support directly from concrete or metal structure out at least ¼ inch using straps with spacers or, if three (3) or more conduits are located in a parallel run, they shall be spaced out from the wall approximately 5/8 inch to 1 inch by means of a channel.

2. Runs of individual conduit suspended from the floor or ceiling shall be supported with pipe hangers. Where three (3) or more conduits are suspended from the floor or ceiling, suitable racks shall be constructed from channel material with suitable fittings.

3. Space supporting points no greater than required by CEC.

L. Sleeves

1. Set sleeves in position in formwork. Provide reinforcing around sleeves.

2. Extend sleeves through floors 1 inch above finished floor levels. Caulk sleeves full depth and provide floor plate.

3. Where raceway penetrated floor, ceiling, or wall. Close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal.

M. Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.

N. Box Support and Attachment: See Section 26 05 33.16 for additional requirements.

O. Busway Support and Attachment: See Section 26 25 13 for additional requirements.

P. Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.

Q. Exterior Luminaire Support and Attachment: See Section 26 56 00 for additional requirements.

R. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

S. Secure fasteners in accordance with manufacturer's recommended torque settings.

T. Remove temporary supports.

U. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

1. Obtain permission from the Architect and the Structural Engineer before drilling or cutting structural members.

E. All expansion anchors shall have 50 percent of the bolts (alternate bolts in any group arrangement) proof tested in tension and certified by a recognized testing agency at the values indicated in the following table, except where shown otherwise in the Contract Documents. If there are any failures, the immediately adjacent bolts must then also be tested. Anchor capacities shall not exceed 80 percent of the values in the published ICBO report.

ANCHOR CAPACITY (3,000 PSI MINIMUM STONE AGGREGATE CONCRETE)							
	1/2 inch	5/8 inch	3/4 inch	7/8 inch	1 inch	1-1/4 inches	UNITS
IN TENSION	680	960	1,360	1,900	2,700	3,600	LBS
IN SHEAR	1,170	1,680	2,420	3,500	5,020	6,700	LBS
TYPE OF TEST:							
DIRECT PULL-TENSION, LBS.	1,360	1,920	2,720	3,800	5,400	7,200	LBS
MINIMUM EMBEDMENT	3	3-3/4	4-1/2	5-1/4	6	7-1/2	INCHES

END OF SECTION 26 05 29

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Scope: Provide rigid metallic conduit, rigid non-metallic conduit, intermediate metal conduit, flexible metal conduit, electrical metallic tubing, surface metal and/or non-metallic raceways, cable tray and wireways as shown on the drawings and as described in the specifications.

1.2 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Galvanized steel intermediate metal conduit (IMC).

C. PVC-coated galvanized steel rigid metal conduit (RMC).

D. Flexible metal conduit (FMC).

E. Liquidtight flexible metal conduit (LFMC).

F. Galvanized steel electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

H. Reinforced thermosetting resin conduit (RTRC).

I. Conduit, fittings and conduit bodies.

1.3 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 84 00 - Firestopping.

C. Section 26 05 00 – Common Work Results for Electrical.

D. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

E. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

F. Section 26 05 29 - Hangers and Supports for Electrical Systems.

G. Section 26 05 33.16 - Boxes for Electrical Systems.

H. Section 26 05 33.23 - Surface Raceways for Electrical Systems.

I. Section 26 05 39 - Underfloor Raceways for Electrical Systems.

J. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

K. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

L. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

M. Section 26 27 23 - Indoor Service Poles.

N. Section 27 05 33.13 - Conduit for Communications Systems.

O. Section 31 23 16 - Excavation.

P. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

Q. Section 31 23 23 - Fill: Bedding and backfilling.

R. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes.

S. The requirements of the kitchen equipment consultan plans and specifications.

1.4 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.

D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

M. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

N. NEMA TC 14.AG - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2021).

O. NEMA TC 14.BG - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2020).

P. NEMA TC 14.XW - Extra Heavy Wall Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2021).

Q. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

S. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

T. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

U. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

X. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Y. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

Z. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

AA. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

BB. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

CC. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

DD. UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

EE. UL 2515A - Standard for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.

5. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:

1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.

2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

E. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.

F. Project Record Documents: Accurately record actual routing of conduits larger than 1 1/4 inches.

1.7 QUALITY ASSURANCE

A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.9 PROJECT CONDITIONS

A. Verify that field measurements are as shown on drawings.

B. Verify conduit routing and termination locations of conduits prior to rough in.

C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring systems.

1.10 RATED WALLS AND CEILINGS

A. Inspect architectural plans for locations and fire ratings for all walls, ceilings, and floors. Install materials as required to maintain the fire integrity of the rated assemblies.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows or PVC-coated galvanized steel rigid metal conduit elbows for bends.

6. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

D. Embedded Within Concrete:

1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.

2. Within Slab Above Ground: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.

3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit where emerging from concrete.

5. Where galvanized steel electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

b. Where exposed below 20 feet in warehouse areas.

c. In Correctional Facilities, Galvanized rigid steel only for inmate accessible areas. Locations shall be verified with the architect.

K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

M. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit.

N. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).

O. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

1. Maximum Length: 6 feet.

P. Flexible Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit (FMC).

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

3. Maximum Length: 6 feet unless otherwise indicated.

4. Vibrating equipment includes, but is not limited to:

a. Transformers.

b. Motors.

c. Engine generators.

Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

R. Freezer and Refrigeration Rooms

1. Galvanized rigid steel conduit.

2. Use sealing fittings on refrigeration and freezer room conduit runs in accordance with CEC 300-7(a).

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Electrical Service Conduits: See Section 26 21 00 for additional requirements.

D. Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.

E. Provide conduit, fittings, supports, and accessories required for complete raceway system.

F. Provide products listed, classified, and labeled as suitable for purpose intended.

G. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 1/2-inch trade size.

2. Branch Circuit Homeruns: 3/4-inch trade size.

3. Control Circuits: 1/2-inch trade size.

4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.

5. Underground, Interior: 1 inch (27 mm) trade size.

6. Underground, Exterior: 1-inch trade size.

H. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International : www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular.com/#sle.
3. Rymco USA: www.rymcousa.com/#sle.
4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
6. Or approved equal.
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
   b. Appleton.
   c. Crouse-Hinds.
   d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
   e. Or approved equal.
   f. Substitutions: See Section 01 60 00 - Product Requirements.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
4. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Where an expansion type fitting is not required, use a coupling or “Erickson” type coupling as appropriate. Threadless set screw and compression (gland) type fittings are not permitted.

6. At building expansion joints, use expansion type fittings.

7. Make connections to NEMA 12 boxes with a threaded hub.

D. Locknuts

1. Hardened Steel or malleable iron construction, electro zinc plated, capable of insuring positive bond to enclosure.

a. Non-bonding: T & B Series 142 or approved equal.

b. Bonding: T & B Series 107 or approved equal.

E. Bushings

1. Insulted: T & B Series 223 or approved equal.

2. Insulated Metallic Bushing: T & B Series 1223 or approved equal.

3. Insulated Grounding and Bonding Bushing: T & B Series 3871 or approved equal.

F. Couplings

1. Non-metallic Conduit Coupling: By non-metallic conduit manufacturer for the application.

2. Threaded Rigid Metal Conduit Couplings: By conduit manufacturer for the application.

3. Threadless Coupling: “Erickson” Type Y & B Series 676 or approved equal.

4. Expansion Type: Permit ¾ inch movement any direction.

a. Exposed: Weatherproof with external bonding jumper.

b. Embedded: Watertight with internal bonding jumper.

G. Connectors

1. Non-Metallic Conduit Connector: By conduit manufacturer for the application.

2. Threaded Hubs: Electro zinc coated with nylon insulated throat and ail/moisture resistant recessed sealing ring, raintight.

   a. Non-bonding: T & B Series 371 or approved equal.

   b. Bonding: T & B Series 371 with 107 series bonding locknut or approved equals.

H. Nipple: “Chase” Type, insulated: T & B Series 5263 or approved equal.

I. Sealing Gaskets: Oil and moisture resistant rubber bonded to metallic retainer.

   1. With rigid conduit – T & B Series 5303 or approved equal.

   2. Fittings not specifically listed but required shall be of similar style and quality.

2.4 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:

   1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.

   2. Nucor Tubular Products: www.nucortubular.com/#sle.

   3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.

   4. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

   5. Or approved equal.

   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:

   1. Manufacturers:

      a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

      b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.

4. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

D. Conduit Size: Comply with NFPA 70.

1. Exposed: Use rigid steel conduit or intermediate metal conduit for installation up to 8 feet.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com/#sle.

2. Electri-Flex Company: www.electriflex.com/#sle.

3. International Metal Hose: www.metalhose.com/#sle.

4. Or approved equal.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:

1. Manufacturers:

a. ABB; T&B: www.electrification.us.abb.com/#sle.

b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction.

E. Connectors and Fittings: NEMA FB 1.

1. Flexible metal conduit connector – Insulated throat, suitable as grounding means: T & B Serries 3115.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com/#sle.

2. Electri-Flex Company: www.electriflex.com/#sle.

3. International Metal Hose: www.metalhose.com/#sle.

4. Or approved equal.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

1. Manufacturers:

a. ABB; T&B: www.electrification.us.abb.com/#sle.

b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction with PVC jacket.

E. Fittings: NEMA FB 1.

2.7 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com/#sle.

2. Nucor Tubular Products: www.nucortubular/#sle.

3. Rymco USA: www.rymcousa.com/#sle.

4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.

5. Beck Manufacturing, Inc: www.beckmfg.com.

6. Wheatland Tube Company: www.wheatland.com/#sle.

7. Or Equal.

8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression/gland type.
    a. Do not use indenter type connectors and couplings.
    b. Do not use set-screw type connectors and couplings.
    c. EMT Coupling: Raintight T & B Series 5220 or approved equal.
    d. EMT to Rigid Metal Conduit Connector, Raintight: T & B Series 531 or approved equal.
5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.
6. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

D. Description: ANSI C80.3; galvanized tubing.

E. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
2. JM Eagle: www.jmeagle.com/#sle.
3. Or approved equal.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Manufacturers:

1. Champion Fiberglass, Inc: www.championfiberglass.com/#sle.

2. FRE Composites: www.frecompositesinc.com/#sle.

3. United Fiberglass of America, Inc: www.unitedfiberglass.com/#sle.

4. Or approved equal.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Applications:

1. Above Ground, Not Subject to Physical Damage: Use aboveground (AG), SW (Standard Wall), HW (Heavy Wall), or XW (Extra Heavy Wall) RTRC.

2. Above Ground, Subject to Physical Damage: Use aboveground (AG), XW (Extra Heavy Wall) RTRC.

3. Underground, Direct-Buried: Use belowground (BG), DB (direct-burial) RTRC or aboveground (AG) RTRC.

4. Underground, Embedded in Concrete: Use belowground (BG), EB (encased-burial) RTRC, belowground (BG), DB (direct-burial) RTRC, or aboveground (AG) RTRC.

5. Do not use RTRC in hazardous/classified locations.

C. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

1. Aboveground (AG) RTRC: Comply with NEMA TC 14.AG and list and label as complying with UL 2515.

2. Aboveground (AG), XW (Extra Heavy Wall) RTRC: Comply with NEMA TC 14.XW and list and label as complying with UL 2515A.

3. Belowground (BG) RTRC: Comply with NEMA TC 14.BG and list and label as complying with UL 2420.

D. Supports: As recommended by manufacturer.

E. Fittings: Same type and manufacturer as conduit to be connected.

1. Cement-Tight Joints: Use bonded coupling or bell and spigot.

2. Cement-Tight and Watertight Joints: Use adhesive and manufacturer's standard gaskets.

2.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

1. Internal to fittings

a. Approved by manufacturer for application.

2. Manufacturer

a. Crouse-Hinds Chico A-P and Chico X fiber.

b. O.Z. Gedney.

c. Or approved equal.

G. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.

2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

1. Products:

a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.

b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

1. Products:

a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

b. Or approved equal.

c. Substitutions: See Section 01 60 00 - Product Requirements.

J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:

a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

b. Or approved equal.

c. Substitutions: See Section 01 60 00 - Product Requirements.

K. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.

1. Products:

a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.

b. Or approved equal.

c. Substitutions: See Section 01 60 00 - Product Requirements.

L. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for casing and conduit/duct arrangement to be installed.

1. Products:

a. Advance Products & Systems, LLC; Bore Spacers: www.apsonline.com/#sle.

b. Or approved equal.

c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.

E. Install intermediate metal conduit (IMC) in accordance with NECA 101.

F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

H. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

I. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal conduits unless specifically indicated to be exposed.

4. Conduits in the following areas may be exposed, unless otherwise indicated:

a. Electrical rooms.

b. Mechanical equipment rooms.

c. Within joists in areas with no ceiling.

5. Unless otherwise approved, do not route exposed conduits:

a. Across floors.

b. Across roofs.

c. Across top of parapet walls.

d. Across building exterior surfaces.

6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.

9. Arrange conduit to provide no more than 150 feet between pull points.

10. Route conduits above water and drain piping where possible.

11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.

13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:

    a. Heaters.

    b. Hot water piping.

    c. Flues.

14. Group parallel conduits in same area on common rack.

J. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.

2. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.

3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

5. Use conduit strap to support single surface-mounted conduit.

    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

6. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.

7. Use conduit clamp to support single conduit from beam clamp or threaded rod.

8. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

9. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.

10. Use of spring steel conduit clips for support of conduits is not permitted.

    a. Support of electrical metallic tubing (EMT) up to 1-inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.

11. Use of wire for support of conduits is not permitted.

    a. For securing conduits to studs in hollow stud walls.

    b. For suspending conduits supported by spring steel conduit clips, where specifically indicated or permitted.

12. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

K. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.

7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.

8. Secure joints and connections to provide mechanical strength and electrical continuity.

L. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Provide suitable sealing system where conduits penetrate exterior wall below grade.

6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

8. Provide metal escutcheon plates for conduit penetrations exposed to public view.

9. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.

M. Underground Installation:

1. Provide trenching and backfilling; see Section 31 23 16 and Section 31 23 23.

2. Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 18 inches.

b. Under Slab on Grade: 12 inches to bottom of slab.

3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 05 53.

N. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

1. Maximum Conduit Size: 1-inch trade size unless otherwise approved.

2. Minimum Conduit Spacing: As indicated on drawings.

3. Install conduits within middle one third of slab thickness.

4. Secure conduits to prevent floating or movement during pouring of concrete.

O. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 30 00.

P. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.

4. Where conduits are subject to earth movement by settlement or frost.

Q. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

a. Where conduits enter building from outside.

b. Where service conduits enter building from underground distribution system.

c. Where conduits enter building from underground.

d. Where conduits may transport moisture to contact live parts.

2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

    a. Where conduits pass from outdoors into conditioned interior spaces.

    b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

R. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

S. Provide grounding and bonding; see Section 26 05 26.

T. Identify conduits; see Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.4 EMPTY CONDUITS

A. Certain conduits will have no conductors pulled in as a part of this contract. Identify with tags at each end of the origin and destination of each such empty conduits. Provide a permanent cap over each end of each empty conduit. Provide a nylon pull wire in each empty conduit, tie off at both ends.

3.5 TESTING AND INSPECTION

A. So not cover up conduit work until inspected. Notify the Owner’s Representative at least 3 days before desired inspection date.

3.6 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.7 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. All conduits shall be run concealed in walls and/or ceiling. Where conduits can not be run concealed in wall and/or ceiling space, the Contractor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits.

3.8 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

END OF SECTION 26 05 33.13

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Scope: Provide boxes, pull boxes, racks, and enclosures as shown on drawings or as required by code(s).

B. Section Includes:

1. Boxes and enclosures for integrated power, data, and audio/video.
2. Boxes for hazardous (classified) locations.
3. Floor boxes.
4. Underground boxes/enclosures.
5. Accessories.
6. Wall and ceiling outlet boxes.
7. Floor boxes.
8. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 07 84 00 - Firestopping.

C. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

E. Section 26 05 29 - Hangers and Supports for Electrical Systems.

F. Section 26 05 33.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.
2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

G. Section 26 05 33.23 - Surface Raceways for Electrical Systems:

1. Accessory boxes designed specifically for surface raceway systems.

2. Lay-in wireways and wiring troughs with removable covers.

H. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

I. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

J. Section 26 27 26 - Wiring Devices:

1. Wall plates.

2. Floor box service fittings.

3. Poke-through assemblies.

4. Access floor boxes.

5. Additional requirements for locating boxes for wiring devices.

K. Section 26 28 13 - Fuses: Spare fuse cabinets.

L. Section 27 10 00 - Structured Cabling: Additional requirements for communications systems outlet boxes.

M. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes: Concrete manholes for electrical systems.

N. The requirements of the kitchen equipment consultan plans and specifications.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.

J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

L. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

M. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

N. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

O. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

C. Samples:

1. Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Keys for Lockable Enclosures: Two of each different key.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.

4. Use cast aluminum boxes where aluminum rigid metal conduit is used.

5. Use nonmetallic boxes where exposed rigid PVC conduit is used.

6. Use suitable concrete type boxes where flush-mounted in concrete.

7. Use suitable masonry type boxes where flush-mounted in masonry walls.

8. Use raised covers suitable for the type of wall construction and device configuration where required.

9. Use shallow boxes where required by the type of wall construction.

10. Do not use "through-wall" boxes designed for access from both sides of wall.

11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.

14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

16. Minimum Box Size, Unless Otherwise Indicated:

    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.

    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.

    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.

17. Wall Plates: Comply with Section 26 27 26.

18. Manufacturers:

    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.

    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.

    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.

    d. O-Z/Gedney, a brand of Emerson Electric Co : www.emerson.com/#sle.

    e. Thomas & Betts Corporation: www.tnb.com/#sle.

    f. Or equal.

    g. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA 250 Environment Type, Unless Otherwise Indicated:

    a. Indoor Clean, Dry Locations: Type 1, painted steel.

    b. Outdoor Locations: Type 3R, painted steel.

    c. Kitchens and food prep. Locations: Type 4X, stainless steel, unpainted.

3. Junction and Pull Boxes Larger Than 100 cubic inches:

    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

    b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:

    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

b. Back Panels: Painted steel, removable.

c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

6. Manufacturers:

a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.

b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.

c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

d. Or equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.

1. Manufacturers:

a. Hubbell Incorporated: www.hubbell.com/#sle.

b. Or approved equal.

c. Substitutions: See Section 01 60 00 - Product Requirements.

E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.

1. Manufacturers:

a. Appleton, a brand of Emerson Electric Co: www.emerson.com/#sle.

b. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.

c. Hubbell Incorporated; Killark Products: www.hubbell-killark.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

F. Floor Boxes:

1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.

2. Use cast iron floor boxes within slab on grade.

3. Use sheet-steel or cast iron floor boxes within slab above grade.

4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).

5. Manufacturer: Same as manufacturer of floor box service fittings.

G. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.

2. Size: As indicated on drawings.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.

4. Provide logo on cover to indicate type of service.

5. Applications:

a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.

b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.

c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

    a. Manufacturers:

        1) Hubbell Incorporated; Quazite
        Products: www.hubbellpowersystems.com/#sle.

        2) MacLean Highline: www.macleanhighline.com/#sle.

        3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.

        4) Or equal.

        5) Substitutions: See Section 01 60 00 - Product Requirements.

    b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

    c. Product(s):

        1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.

            a) 11 by 18 by 12 inches nominal; Model PHA111812 (stackable).

        2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.

            a) 11 by 18 by 12 inches nominal; Model CHA111812.

        3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

            a) 30 by 48 by 18 inches nominal; Model CVA304818.

        4) Or approved equal.

2.2 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

    1. Manufacturers:

a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

b. Or approved equal.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 MANUFACTURERS

A. Appleton Electric: www.appletonelec.com.

B. Arc-Co./Division of Arcade Technology: www.arc-co.com.

C. Unity Manufacturing: www.unitymfg.com.

D. Or approved equal.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.4 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 26 2726.

2.5 FLOOR BOXES

A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.

B. Material: Cast metal.

C. Shape: Round.

D. Service Fittings: As specified in Section 26 2726.

2.6 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 26 2716.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:

1. Material: Galvanized cast iron.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:

1. Material: Galvanized cast iron.

2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.

3. Cover Legend: "ELECTRIC".

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Boxes are indicated in approximate locations only on the drawings unless specifically dimensioned. Verify all box locations prior to rough-in.

C. Verify that mounting surfaces are ready to receive boxes.

D. Verify that conditions are satisfactory for installation prior to starting work.

E. Verify locations of floor boxes and outlets prior to rough-in.

F. Verify locations of all boxes required for kitchen equipment with kithcen consultant plans and specifications.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes as required for devices installed under other sections or by others.

a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.

b. Communications Systems Outlets: Comply with Section 27 10 00.

4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.

6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.

8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.

11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:

a. Concealed above accessible suspended ceilings.

b. Within joists in areas with no ceiling.

c. Electrical rooms.

d. Mechanical equipment rooms.

I. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide required seismic controls in accordance with Section 26 05 48.

3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

5. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

M. Install boxes as required to preserve insulation integrity.

N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

P. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches deep.

2. Flush-mount enclosures located in concrete or paved areas.

3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.

4. Provide cast-in-place concrete collar constructed in accordance with Section 03 30 00, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.

5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

S. Close unused box openings.

T. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

U. Provide grounding and bonding in accordance with Section 26 05 26.

V. Identify boxes in accordance with Section 26 05 53.

W. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

X. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 72.

Y. Coordinate installation of outlet boxes for equipment connected under Section 26 2717.

Z. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

AA. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

BB. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

CC. Maintain headroom and present neat mechanical appearance.

DD. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

EE. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

FF. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

GG. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

HH. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

II. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

JJ. Use flush mounting outlet box in finished areas.

KK. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

LL. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in fire-rated and acoustic rated walls.

MM. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

NN. Use stamped steel bridges to fasten flush mounting outlet box between studs.

OO. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

PP. Use adjustable steel channel fasteners for hung ceiling outlet box.

QQ. Do not fasten boxes to ceiling support wires.

RR. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

SS. Use gang box where more than one device is mounted together. Do not use sectional box.

TT. Use gang box with plaster ring for single device outlets.

UU. Use cast outlet box in exterior locations exposed to the weather and wet locations.

VV. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

WW. Set floor boxes level.

XX. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.3 ADJUSTING

A. Adjust floor boxes flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.5 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 05 33.16

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

H. Field-painted identification of conduit.

1.2 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

B. Section 09 91 23 - Interior Painting.

C. Section 26 05 00 – Common Work Results for Electrical.

D. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

E. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.

F. Section 26 27 26 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

G. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

D. Samples:

1. Identification Nameplates: One of each type and color specified.

2. Warning Signs and Labels: One of each type and legend specified.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Conform to requirements of NFPA 70.

C. Furnish products listed and classified by UL as suitable for the purpose specified and shown.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Switchboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Use identification nameplate to identify main overcurrent protective device.

5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

c. Transformers:

1) Identify kVA rating.

2) Identify voltage and phase for primary and secondary.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify load(s) served. Include location when not within sight of equipment.

d. Enclosed switches, circuit breakers, and motor controllers:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

e. Time Switches:

1) Identify load(s) served and associated circuits controlled. Include location.

f. Enclosed Contactors:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).

4) Identify coil voltage.

5) Identify load(s) and associated circuits controlled. Include location.

g. Centralized Emergency Lighting Inverters:

1) Identify input and output voltage and phase.

2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.

3) Identify load(s) served. Include location.

h. Transfer Switches:

1) Identify voltage and phase.

2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

i. Electricity Meters:

1) Identify load(s) metered.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

3. Emergency System Equipment:

a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.

4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.

5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.

6. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.

7. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

8. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

9. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.

10. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

11. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.

    a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 and 09 91 13.

12. Available Fault Current Documentation: Comply with Section 26 05 73. Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

a. Service equipment.

b. Industrial control panels.

c. Motor control centers.

d. Elevator control panels.

e. Industrial machinery.

13. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.

14. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

15. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

16. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

17. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

C. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.

2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.

3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

    a. At each source and load connection.

    b. Within boxes when more than one circuit is present.

    c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

5. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

6. Use underground warning tape to identify direct buried cables.

D. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.

2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.

    a. Maximum Intervals: 20 feet.

    b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

        1) Field-Painting: Comply with Section 09 91 23 and 09 91 13.

        2) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.

        3) Other Owner required color coding systems.

3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.

4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

5. Use underground warning tape to identify underground raceways.

6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

E. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use voltage markers or color coded boxes to identify systems other than normal power system.

3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.. Install on back side of box cover.

   a. For exposed boxes in public areas, use only identification labels.

4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

F. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.

2. Factory Pre-Marked Wallplates: Comply with Section 26 27 26.

3. Use identification label to identify fire alarm system devices.

   a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.

4. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

   a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

5. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

6. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

G. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

H. Buried Electrical Lines: Underground warning tapes.

I. Communication Cabinets: Nameplates.

J. Conduit: Conduit markers.

K. Control Device Station: Labels.

L. Electrical Distribution and Control Equipment Enclosures: Nameplates.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

C. HellermannTyton: www.hellermanntyton.com.

D. E-Z Code by T&B.

E. Pan-Code by Panduit.

F. Or approved equal.

G. Substitutions: See Section 01 6000 - Product Requirements.

2.3 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:

a. Brimar Industries, Inc: www.brimar.com/#sle.

b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

c. Seton Identification Products: www.seton.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.

b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:

a. Brady Corporation: www.bradyid.com/#sle.

b. Brother International Corporation: www.brother-usa.com/#sle.

c. Panduit Corp: www.panduit.com/#sle.

d. Or approved equal.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

a. Use only for indoor locations.

3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:

a. System designation where applicable:

1) Emergency Power System: Identify with text "EMERGENCY".

b. Equipment designation or other approved description.

c. Other information as indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

    a. System Designation: 1/2 inch.

    b. Equipment Designation: 1/4 inch.

    c. Other Information: 1/8 inch.

    d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.

5. Color:

    a. Normal Power System: White text on black background.

        1) 480Y/277 V, 3 Phase Equipment: White text on orange background.

        2) 208Y/120 V, 3 Phase Equipment: White text on black background.

    b. Emergency Power System: White text on red background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/4 inch.

5. Color: Black text on white background unless otherwise indicated.

    a. Exceptions:

        1) Provide white text on red background for general information or operational instructions for emergency systems.

        2) Provide white text on red background for general information or operational instructions for fire alarm systems.

        3) Provide white text on black background for all other systems, unless noted otherwise.

E. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
   a. Include voltage and phase for other than 120 V, single phase circuits.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

G. Format for Control Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

H. Manufacturers:

1. Kolbi Pipe Marker Co.; Model: www.kolbipipemarkers.com.
2. Seton Identification Product; Model:: www.seton.com.
3. Or approved equal.

I. Nameplates: Engraved three-layer laminated plastic, white letters on black background, unless noted otherwiseon drawings or specifications.

J. Locations:

1. Each electrical distribution and control equipment enclosure.

2. Communication cabinets.

K. Letter Size:

1. Use 1/8 inch letters for identifying individual equipment and loads.

2. Use 1/4 inch letters for identifying grouped equipment and loads.

L. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations.

2.4 WIRE AND CABLE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.

2. Seton Identification Products: www.seton.com.

3. HellermannTyton: www.hellermanntyton.com/#sle.

4. Panduit Corp: www.panduit.com/#sle.

5. Or approved equal.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, or plastic sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

H. Description: Vinyl cloth type self-adhesive wire markers.

I. Description: Cloth type wire markers.

J. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

K. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.5 VOLTAGE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.

2. Brimar Industries, Inc: www.brimar.com/#sle.

3. Seton Identification Products: www.seton.com/#sle.

4. HellermannTyton: www.hellermanntyton.com.

5. Or approved equal.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:

1. Markers for Equipment: 1 1/8 by 4 1/2 inches.

2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.

4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

E. Legend:

1. Markers for Voltage Identification: Highest voltage present.

2. Markers for System Identification:

a. Emergency Power System: Text "EMERGENCY".

b. Other Systems: Type of service.

F. Color: Black text on orange background unless otherwise indicated.

G. Location: Furnish markers for each conduit longer than 6 feet.

H. Spacing: 20 feet on center.

I. Color:

1. Fire Alarm System: Red.

2.6 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.

2. Brimar Industries, Inc: www.brimar.com/#sle.

3. Seton Identification Products: www.seton.com/#sle.

4. HellermannTyton: www.hellermanntyton.com.

5. Or approve equal.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

E. Legend: Type of service, continuously repeated over full length of tape.

F. Color:

1. Tape for Buried Power Lines: Black text on red background.

2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.7 FLOOR MARKING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Insite Solutions, LLC: www.stop-painting.com/#sle.
4. Seton Identification Products: www.seton.com/#sle.
5. Or approved equal..
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.8 WARNING SIGNS AND LABELS

A. Manufacturers:

1. Brimar Industries, Inc: www.brimar.com/#sle.
2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
3. Insite Solutions, LLC: www.stop-painting.com/#sle.
4. Seton Identification Products: www.seton.com/#sle.
5. Or approved equal.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:

1. Materials:
   a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
   b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

a. Do not use labels designed to be completed using handwritten text.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

E. Floor Signs:

1. Materials: Use factory preprinted, self-adhesive vinyl, polyester, or rubber labels with protective overlaminate; removable.

2. Minimum Size: 17-inch diameter unless otherwise indicated.

F. Description: 3 inch wide polyethylene tape, detectable type colored red with suitable warning legend describing buried electrical lines.

G. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Enclosure front.

3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Boxes: Outside face of cover.
9. Conductors and Cables: Legible from the point of access.
10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 05 53

SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 33.13 - Conduit for Electrical Systems.

D. Section 26 05 33.16 - Boxes for Electrical Systems.

E. Section 26 27 26 - Wiring Devices.

F. Section 26 28 16.16 - Enclosed Switches.

G. Section 26 29 13 - Enclosed Controllers.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.

2. Make electrical connections before required start-up of equipment.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

4. Product: As noted on drawings or as required for the application.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Disconnect Switches: As described and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 27 26.

D. Flexible Conduit: As specified in Section 26 05 33.13.

E. Wire and Cable: As specified in Section 26 05 19.

F. Boxes: As specified in Section 26 05 33.16.

2.2 EQUIPMENT CONNECTIONS

A. Connection Types and Ratings::

1. Electrical Connection: Flexible conduit, metallic or liquid tight flexible conduit as required by the application.

2. Electrical Connection: Cord and plug (Verify NEMA configuration and rating with equipment installer at jobsite).

3. Provide field-installed disconnect switch.

4. Voltage: Verify with equipment nameplate.

5. Load rating: Verify with equipment nameplate.

6. FLA: Verify with equipment nameplate.

7. WSA: Verify with equipment nameplate.

8. Branch Circuit: Verify with equipment nameplate.

9. Location: As indicated on drawings. Verify with equipment installer at jobsite.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 26 05 83

SECTION 26 08 00 - ELECTRICAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify the Contractor's responsibilities and participation in the commissioning process relative to division 26.

B. The commissioning process is primarily the responsibility of the Commissioning Authority, with support for start-up, testing, and commissioning the responsibility of the Contractors. The commissioning process does not relieve the Contractor from participation in the process, or diminish the role and obligations to complete all portions of work in a satisfactory and fully operational manner.

C. Work of Division 26 includes:

1. Testing and start-up of the electrical equipment.

2. Providing qualified personnel to assist in commissioning tests to verify equipment/ system performance.

3. Completion and endorsement of pre-functional test checklists provided by the Commissioning Authority to assure that Division 26 equipment and systems are fully operational and ready for functional testing.

4. Providing equipment, materials, and labor necessary to correct deficiencies found during the commissioning process which fulfill contract and warranty requirements.

5. Providing training for the systems specified in Division 26 with coordination of owner by the Commissioning Authority.

1.2 RELATED WORK

A. All testing and start-up procedures and documentation requirements specified within Division 26.

B. Section 01 9100 - General Commissioning Requirements

C. Commissioning functional test procedures that require participation of the Contractors.

D. Cooperate with the Commissioning Authority in the following manner:

1. Allow sufficient time before final completion dates so that testing can be accomplished.

2. Provide labor and material to make corrections when required without undue delay.

3. Coordinate all required support of that equipment which is provided to or installed with involvement of Division 23 contractors.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Standard certified test equipment for commissioning shall be provided by the Division 26 Contractor.

B. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Authority in the commissioning process.

PART 3 - EXECUTION

3.1 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so the system can be started, tested, balanced, and otherwise commissioned. Division 26 has temporary power and start-up responsibilities with obligations to complete systems, including all sub-systems so they are functional. This includes the complete installation of all equipment and materials per the contract documents and related directives, clarifications, change orders, etc.

B. The Commissioning Authority will develop a Commissioning Plan. Upon request of the Commissioning Authority, the Contractor shall provide assistance and consultation. The Commissioning Plan will be developed prior to completion of the installation. The Contractor is obligated to assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation.

C. Specific pre-commissioning responsibilities of Division 26 are as follows:

1. Normal start-up services required to bring each system into a fully operational state. The Commissioning Authority will not begin the commissioning process until each system is complete and documented, including normal contractor start-up.

2. The Contractor shall perform pre-functional tests on the equipment and systems as noted in section 01 9100 General Commissioning Requirements.

3. Contractor start-up forms may be substituted for the pre-functional test forms with prior approval by the Commissioning Authority.

4. Pre-functional test forms will be kept in the Contractors job trailer in a Commissioning Field Notebook provided by the Commissioning Authority.

5. Factory start-up services will be provided for key equipment and systems specified in Division 26. The Contractor shall coordinate this work with the manufacturer and the Commissioning Authority.

D. Commissioning is intended to begin upon completion of a system. Commissioning may proceed prior to the completion of systems and/or sub-systems, if expediting this work is in the best interests of the Owner. Commissioning activities and schedule will be coordinated with the Contractor. Start of commissioning before system completion will not relieve the Contractor from completing those systems as per the schedule.

E. The Field Commissioning Notebook will be used to identify and track all pertinent commissioning documentation required during the Installation phase. This Notebook will be assembled by the Commissioning Authority and maintained by the Contractor. The Notebook provides a central location for the Commissioning Authority to identify, copy and organize all pertinent information and will include the following format:

1. Summary describing Notebook contents and use.

2. Copy of Commissioning Plan for contractor field reference.

3. Listing of all specification documentation requirements listed by specification section, with sign off spots for appropriate contractors.

4. Tabs for each specification section with copies of pre-functional test check sheets provided by coordination of subcontractors and Commissioning Authority for contractor completion and space for related contractor-supplied documents.

5. Prior to functional testing the Commissioning Authority will use this book to verify that all appropriate contractors have completed their work and signed off that they have done so. Once the Commissioning Authority is satisfied that all components of a system are complete functional testing will begin.

3.2 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up and debug all systems within the division of work. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested by the Commissioning Authority and coordinated by the Contractor. Contractor will ensure the qualified technician(s) are available and present during the agreed-upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. The Commissioning Authority reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment, and an attitude/willingness to work with the Commissioning Authority to get the job done. A liaison or intermediary between the Commissioning Authority and qualified factory representatives does not constitute the availability of a qualified technician for purposes of this work.

3.3 WORK TO RESOLVE DEFICIENCIES

A. Maladjustments, misapplied equipment, and/or deficient performance under varying loads will result in a system that does not meet the original design intent. Correction of work will be completed under the direction of the Architect, with input from the Contractor, equipment supplier, and Commissioning Authority. Whereas all members will have input and the opportunity to discuss, debate, and work out problems, the Architect/Engineer of Record will have final jurisdiction on the necessary work to be done to achieve performance and or design intent.

3.4 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The Contractor, suppliers, and Commissioning Authority shall include a reasonable reserve to complete this work as part of their standard contractual obligations.

3.5 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

A. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial commissioning will be done as soon as contract work is completed regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. The Contractor will be responsible to participate in the initial and the alternate peak season test of the systems required to demonstrate performance.

C. Subsequent commissioning may be required under conditions of minimum and/or maximum occupancy or use. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance. The Contractor will be responsible to participate in the occupancy sensitive testing of systems to provide verification of adequate performance.

3.6 TRAINING

A. The Contractor will be required to participate in the training of the Owner's engineering and maintenance staff for each mechanical system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

B. Training will be conducted jointly with the Commissioning Authority, the design engineers, the equipment vendors, and the Contractor. The Contractor will be responsible for the generic training, as well as instructing the Owner's staff on the system peculiarities specific to this project.

3.7 SYSTEMS DOCUMENTATION

A. Contract Documents to incorporate field changes and revisions to system designs to account for actual constructed configurations will be addressed as required in Division 1. All drawings should be red-lined on two sets. Division 26 as-built drawings should include updated architectural floor plans, and the individual electrical systems in relation to actual building layout.

B. Maintain as-built red-lines on the job site as required in Division 1.

C. In addition to the stated requirements for operation and maintenance data, provide one copy of equipment technical literature, operation and maintenance literature, and shop drawings to the Commissioning Authority as soon as they are available. This requirement is for review of these documents prior to distribution of multiple copies for the Owner's final use.

END OF SECTION 26 08 00

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor motion sensors.

C. Time switches.

D. In-wall time switches.

E. In-wall interval timers.

F. Outdoor photo controls.

G. Daylighting controls.

H. Lighting contactors.

I. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies.

F. Section 26 09 18 - Remote Control Switching Devices: Remotely controlled devices for lighting control, including networked lighting controls, programmable relay panels, and remote control switching relays.

G. Section 26 2716 - Electrical Cabinets and Enclosures.

H. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1. Includes finish requirements for wall controls specified in this section.

2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.

I. Section 26 28 13 - Fuses.

J. Section 26 51 00 - Interior Lighting.

K. Section 26 56 00 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.

C. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2020.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

H. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

I. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

J. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.

M. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

N. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

O. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

P. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

Q. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

R. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.

4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

5. Notify the Architect and/or the Electrical Engineer of Record of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:

   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

   2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

D. Samples:

   1. Occupancy Sensors: One for each type and color specified.

   2. In-Wall Time Switches: One for each type and color specified.

   3. In-Wall Interval Timers: One for each type and color specified.

   4. Daylighting Control Photo Sensors: One for each type and color specified.

E. Field Quality Control Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include detailed information on device programming and setup.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

   1. See Section 01 60 00 - Product Requirements, for additional provisions.

   2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.

   3. Electronic Trip Circuit Breakers: Provide one portable test set.

   4. Indicating Lights: Two of each different type.

I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. General Requirements

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

3. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2 OCCUPANCY SENSORS

A. Manufacturers:

1. Acuity Brands, Inc: www.acuitybrands.com/#sle.

2. Hubbell Incorporated: www.hubbell.com/#sle.

3. Intermatic, Inc: www.intermatic.com/#sle.

4. Legrand North America, Inc: www.legrand.us/#sle.

5. Lutron Electronics Company, Inc: www.lutron.com/#sle.

6. RAB Lighting, Inc: www.rablighting.com/#sle.

7. Or approved equal..

8. Substitutions: See Section 01 60 00 - Product Requirements.

9. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.

2. Sensor Technology:

a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.

b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.

c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.

d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.

4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.

5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.

6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.

7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

8. Sensitivity: Field adjustable.

9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.

10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.

11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

14. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.

15. Wireless Sensors:

    a. RF Range: 30 feet through typical construction materials.

    b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.

    c. Power: Battery-operated with minimum ten-year battery life.

C. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:

    a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

    b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.

    c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.

    d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

    e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

    f. Provide selectable audible alert to notify occupant of impending load turn-off.

    g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

    h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.

4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:

1. General Requirements:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.

b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

e. Provide field adjustable dimming preset for occupied state.

f. Provide fade-to-off operation to notify occupant of impending load turn-off.

g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

E. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:

a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Provide field selectable setting for disabling LED motion detector visual indicator.

d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

e. Finish: White unless otherwise indicated.

2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

3. Ultrasonic Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.

4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.

F. Directional Occupancy Sensors:

1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.

a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

b. Provide field selectable setting for disabling LED motion detector visual indicator.

c. Finish: White unless otherwise indicated.

2. Passive Infrared (PIR) Directional Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet at a mounting height of 10 feet.

c. High Bay Sensors: Capable of detecting motion within a distance of 50 feet at a mounting height of 30 feet.

3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

G. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.

1. Fluorescent High Bay Luminaire Mounted Occupancy Sensors: Passive infrared (PIR) type with a field of view of 360 degrees unless otherwise indicated.

    a. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.

    b. Finish: White unless otherwise indicated.

    c. Circular Coverage Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 20 feet.

    d. Linear Aisle Coverage Sensors: Capable of detecting motion within an area of 20 feet wide by 60 feet long at a mounting height of 40 feet.

    e. Accessories:

        1) Provide mounting bracket for lowering occupancy sensor such that luminaire does not block sensor field of view where required.

H. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.

2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.

4. Load Rating: As required to control the load indicated on drawings.

I. Power Packs for Wireless Occupancy Sensors:

1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.

2. Input Supply Voltage: Dual rated for 120/277 V ac.

3. Load Rating: As required to control the load indicated on drawings.

4. Provide auxiliary contact closure output where indicated.

5. Rated Life of Relay: One million cycles.

J. Accessories:

1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated on plans.

K. OUTDOOR MOTION SENSORS

1. Manufacturers:

   a. Acuity Brands, Inc: www.acuitybrands.com/#sle.

   b. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.

   c. Legrand North America, Inc: www.legrand.us/#sle.

   d. RAB Lighting, Inc: www.rablighting.com/#sle.

   e. Or approved equal.

   f. Substitutions: See Section 01 60 00 - Product Requirements.

   g. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.

3. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.

4. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.

5. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.

6. Integral Photocell: For dusk to dawn operation.

7. Manual Override: Activated by switching power off to unit and then back on.

8. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.

9. Coverage: Capable of detecting motion within a distance of 50 feet at a mounting height of 8 feet, with a field of view of 270 degrees.

10. Finish: Color to be selected by architect.

11. Provide integral lamp holders suitable for two 150 watt PAR 38 lamps.

L. TIME SWITCHES

1. Manufacturers:

a. Intermatic, Inc: www.intermatic.com/#sle.

b. Tork, a division of NSI Industries LLC: www.tork.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

e. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2. Digital Electronic Time Switches:

a. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.

b. Program Capability:

1) 24-Hour Time Switches: Single channel, with same schedule for each day of the week and skip-a-day feature to omit selected days.

2) 7-Day Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days.

3) Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.

c. Schedule Capacity: Not less than 16 programmable on/off operations.

d. Provide automatic daylight savings time and leap year compensation.

e. Provide power outage backup to retain programming and maintain clock.

f. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.

g. Provide remote photocell input with light level adjustment.

h. Input Supply Voltage: As indicated on the drawings.

i. Output Switch Configuration: As required to control the load indicated on drawings.

j. Output Switch Contact Ratings: As required to control the load indicated on drawings.

k. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:

1) Indoor clean, dry locations: Type 1.

2) Outdoor locations: Type 3R.

l. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

3. Electromechanical Time Switches:

a. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.

b. Program Capability:

1) 24-Hour Time Switches: With same schedule for each day of the week and skip-a-day feature to omit selected days.

2) 7-Day Time Switches: Capable of different schedule for each day of the week.

3) Astronomic Time Switches: With same schedule for each day of the week and skip-a-day feature to omit selected days with automatic adjustment for seasonal changes in sunrise and sunset times.

c. Schedule Capacity:

1) 24-Hour Time Switches: Accommodating not less than 12 pairs of selected on/off operations per day.

2) 7-Day Time Switches: Accommodating not less than two pairs of selected on/off operations per day.

3) Astronomic Time Switches: Capable of turning load on at sunset and off at either sunrise or selected fixed time.

d. Provide spring reserve backup to maintain clock during power outage.

e. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.

f. Input Supply Voltage: As indicated on the drawings.

g. Output Switch Configuration: As required to control the load indicated on drawings.

h. Output Switch Contact Ratings: As required to control the load indicated on drawings.

i. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:

1) Indoor clean, dry locations: Type 1.

2) Outdoor locations: Type 3R.

j. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

M. IN-WALL TIME SWITCHES

1. Manufacturers:

a. Intermatic, Inc: www.intermatic.com/#sle.

b. Tork, a division of NSI Industries LLC: www.tork.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

e. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2. Digital Electronic In-Wall Time Switches:

a. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.

b. Program Capability:

1) 7-Day Time Switches: Capable of different schedule for each day of the week.

2) Astronomic Time Switches: Capable of different schedule for each day of the week and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.

c. Schedule Capacity: Not less than 40 programmable on/off operations.

d. Provide automatic daylight savings time compensation.

e. Provide power outage backup to retain programming and maintain clock.

f. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.

g. Switch Configuration: Suitable for use in either SPST or 3-way application.

h. Contact Ratings: As required to control the load indicated on drawings.

3. Electromechanical In-Wall Time Switches:

a. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, suitable for mounting in standard wall box, and listed and labeled as complying with UL 917.

b. Program Capability: 24-hour time switch with same schedule for each day of the week.

c. Schedule Capacity: Accommodating not less than 24 selected on/off operations per day.

d. Manual override: Capable of permanently overriding current schedule.

e. Switch Configuration: SPST.

f. Contact Ratings: As required to control the load indicated on drawings.

N. IN-WALL INTERVAL TIMERS

1. Manufacturers:

   a. Intermatic, Inc: www.intermatic.com/#sle.

   b. Tork, a division of NSI Industries LLC: www.tork.com/#sle.

   c. Or approved equal.

   d. Substitutions: See Section 01 60 00 - Product Requirements.

   e. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2. Digital Electronic In-Wall Interval Timers:

   a. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.

   b. Program Capability: Designed to turn load off at end of preset time interval.

   c. Time Interval: Field selectable range of presets available up to 12 hours.

   d. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.

   e. Provide power outage backup to retain programming and maintain clock.

   f. Manual override: Capable of both turning load off and resetting timer to original preset time interval.

   g. Switch Configuration: Suitable for use in either SPST or 3-way application.

   h. Contact Ratings: As required to control the load indicated on drawings.

3. Spring Wound In-Wall Interval Timers:

a. Description: Factory-assembled controller with mechanical spring wound timing mechanism requiring no electricity to operate; suitable for mounting in standard wall box; rotary control operator with matching wall plate factory marked with time interval units; listed and labeled as complying with UL 916 or UL 917.

b. Program Capability: Designed to turn load off at end of preset time interval.

c. Time Interval: User selectable from zero up to 15 minutes.

d. Manual override: Provide hold feature to disable timer for constant on operation.

e. Switch Configuration: SPST.

f. Contact Ratings: As required to control the load indicated on drawings.

O. OUTDOOR PHOTO CONTROLS

1. Manufacturers:

a. Intermatic, Inc: www.intermatic.com/#sle.

b. Tork, a division of NSI Industries LLC: www.tork.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

d. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2. Stem-Mounted Outdoor Photo Controls:

a. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.

b. Housing: Weatherproof, impact resistant polycarbonate.

c. Photo Sensor: Cadmium sulfide.

d. Provide external sliding shield for field adjustment of light level activation.

e. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

f. Voltage: As required to control the load indicated on the drawings.

g. Failure Mode: Fails to the on position.

h. Load Rating: As required to control the load indicated on the drawings.

i. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

3. Locking Receptacle-Mounted Outdoor Photo Controls

a. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.

b. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.

c. Photo Sensor: Cadmium sulfide.

d. Light Level Activation: 1 to 3 footcandles turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.

e. Voltage: As required to control the load indicated on the drawings.

f. Failure Mode: Fails to the on position.

g. Load Rating: As required to control the load indicated on the drawings.

h. Surge Protection: 160 joule metal oxide varistor.

i. Provide the following accessories where indicated or as required to complete installation:

1) Receptacle: Complying with ANSI C136.10.

2) Mounting Bracket.

3) Shorting Cap: Suitable for replacing locking photo control to complete circuit.

4. Button Type Outdoor Photo Controls

a. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.

b. Housing: Weather resistant polycarbonate.

c. Photo Sensor: Cadmium sulfide.

d. Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

e. Voltage: As required to control the load indicated on the drawings.

f. Failure Mode: Fails to the on position.

g. Load Rating: As required to control the load indicated on the drawings.

P. DAYLIGHTING CONTROLS

1. Manufacturers:

a. Hubbell Control Solutions: www.hubbell.com/hubbellcontrolsolutions/en/#sle.

b. Lutron Electronics Company, Inc: www.lutron.com/#sle.

c. Sensor Switch Inc: www.sensorswitch.com/#sle.

d. WattStopper: www.wattstopper.com/#sle.

e. Or approved equal.

f. Substitutions: See Section 01 60 00 - Product Requirements.

g. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

3. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.

a. Sensor Type: Filtered silicon photo diode.

b. Sensor Range:

1) Indoor Photo Sensors: 5 to 100 footcandles.

2) Outdoor Photo Sensors: 5 to 250 footcandles.

3) Atrium Photo Sensors: 200 to 2,500 footcandles.

4) Skylight Photo Sensors: 1,000 to 6,000 footcandles.

5) Open Loop Photo Sensors: 3 to 6,000 footcandles.

c. Finish: White unless otherwise indicated.

4. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.

5. Wireless Daylighting Control Photo Sensors:

a. RF Range: 30 feet through typical construction materials.

b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.

c. Power: Battery-operated with minimum ten-year battery life.

6. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.

7. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.

a. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.

b. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.

c. Control Capability:

1) Single Zone Switching Modules: Capable of controlling one programmable channel.

2) Multi-Zone Switching Modules: Capable of controlling up to three separately programmable channels.

Q. Daylighting Control Switching Modules for Wireless Sensors:

1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.

2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.

3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.

4. Control Capability: Capable of controlling one programmable channel.

5. Input Supply Voltage: Dual rated for 120/277 V ac.

6. Load Rating: As required to control the load indicated on drawings.

7. Provide auxiliary contact closure output where indicated.

8. Rated Life of Relay: One million cycles.

9. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.

   a. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.

   b. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.

   c. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.

   d. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.

   e. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.

   f. Output Voltage: Compatible with specified dimming ballasts.

R. Daylighting Control Dimming Modules for Wireless Sensors:

1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.

2. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.

3. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.

4. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.

5. Power Packs for Low Voltage Daylighting Control Modules:

    a. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.

    b. Input Supply Voltage: Dual rated for 120/277 V ac.

6. Load Ratings: As required to control the load indicated on drawings.

7. Accessories:

    a. Where indicated, provide compatible accessory wall switches for manual override control.

8. Where indicated, provide compatible accessory wireless controls for manual override control.

S. LIGHTING CONTACTORS

1. Manufacturers:

    a. ABB/GE: www.geindustrial.com/#sle.

    b. Eaton Corporation: www.eaton.com/#sle.

    c. Rockwell Automation Inc; Allen-Bradley Products: ab.rockwellautomation.com/#sle.

d. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

e. Siemens Industry, Inc: www.usa.siemens.com/#sle.

f. Or approved equal.

g. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

3. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.

   a. Disconnects: Circuit breaker type.

      1) Disconnect Switches: Fusible type unless otherwise indicated.

      2) Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.

      3) Provide auxiliary interlock for disconnection of external control power sources where applicable.

4. Short Circuit Current Rating:

   a. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

5. Enclosures:

   a. Comply with NEMA ICS 6.

   b. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

      1) Indoor Clean, Dry Locations: Type 1 or Type 12.

      2) Outdoor Locations: Type 3R or Type 4.

   c. Finish: Manufacturer's standard unless otherwise indicated.

T. ACCESSORIES

1. Auxiliary Contacts:

   a. Comply with NEMA ICS 5.

   b. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

2. Pilot Devices:

   a. Comply with NEMA ICS 5; heavy-duty type.

   b. Nominal Size: 30 mm.

   c. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.

   d. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.

   e. Indicating Lights: Push-to-test type unless otherwise indicated.

   f. Provide LED lamp source for indicating lights and illuminated devices.

3. Control and Timing Relays:

   a. Comply with NEMA ICS 5.

   b. Provide number and type of relays indicated or required to perform necessary functions.

   c. Timing Relays: Electronic or pneumatic as indicated.

      1) Adjustable Timing Range: As indicated on drawings.

4. Fire-Rated Device Enclosures:

   a. Manufacturers:

      1) Fire Rated Product Specialties Corp: www.frpsonline.com/#sle.

      2) Or approved equal.

      3) Substitutions: See Section 01 60 00 - Product Requirements.

b. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with CEC 2007.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated

C. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.

1. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

2. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect and/or Owner's Representative to obtain direction prior to proceeding with work.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

H. Provide required supports in accordance with Section 26 05 29.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

J. Identify lighting control devices in accordance with Section 26 05 53.

K. Occupancy Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

L. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

M. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

N. Daylighting Control Photo Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.

2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

O. Combination Enclosed Lighting Contactors:

1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

2. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.

P. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

Q. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

R. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

S. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

T. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 05 33.16 for mounting of lighting control device system components.

U. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 2716 for mounting of lighting control device system components.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by manufacturer.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Owner's Representative.. Record settings in written report to be included with submittals.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by LP Consulting Engineers, Inc..

G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Ownere's Representative.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 COMMISSIONING

A. See Section 01 91 13 - General Commissioning Requirements for commissioning requirements.

3.8 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to District Representative, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's (Owner's) personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.

4. Location: At project site.

END OF SECTION 26 09 23

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Load centers.

D. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

G. Section 26 22 00 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

H. Section 26 27 13 - Electricity Metering: For interface with equipment specified in this section.

I. Section 26 43 00 - Surge Protective Devices.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 1 - Panelboards; 2011.

H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.

I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

M. UL 67 - Panelboards; Current Edition, Including All Revisions.

N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

S. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

4. Include documentation of listed series ratings upon request.

5. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

F. Field Quality Control Test Reports.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

J. Maintenance Materials: Furnish the following for Owner's (Owner's) use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Panelboard Keys: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Conform to requirements of NFPA 70.

C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Or approved equivalent subject to substitution process

F. Substitutions: See Section 01 60 00 - Product Requirements.

G. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

    a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Listed series ratings are not acceptable, except where pre-appoved by the Owner and LP Consulting Engineers, Inc.

3. Label equipment utilizing series ratings as required by NFPA 70 where permitted.

E. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

G. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

H. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.

3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    a. Indoor Clean, Dry Locations: Type 1.
    b. Outdoor Locations: Type 3R.
2. Boxes: Galvanized steel unless otherwise indicated.
    a. Provide wiring gutters sized to accommodate the conductors to be installed.
    b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
    c. Provide removable end walls for NEMA Type 1 enclosures.
    d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
3. Fronts:
    a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated. Provide door-in-door construction.

K. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

L. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.

M. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
    1. Ampere Rating: Not less than ampere rating of panelboard bus.

2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.

3. Coil Voltage: As required for connection to control system indicated.

N. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.

a. Use zero sequence ground fault detection method unless otherwise indicated.

b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.

O. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

P. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

Q. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.

2. Sub-feed lugs.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

a. Provide an individual terminal or lug for each neutral wire.

C. Bussing:

1. Phase and Neutral Bus Material: Copper.

2. Ground Bus Material: Copper.

D. Circuit Breakers:

1. Provide bolt-on type.

2. Provide thermal magnetic circuit breakers unless otherwise indicated.

3. Provide electronic trip circuit breakers where indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures unless otherwise indicated.

2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

3. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

4. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

5. Provide clear plastic circuit directory holder mounted on inside of door.

6. Painted gray over rust inhibiting primer.

F. Description: NEMA PB 1, circuit breaker type.

G. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

H. Minimum integrated short circuit rating: As indicated or as required by the short circuit study.

1. 240 Volt Panelboards: amperes rms symmetrical per plan.

2. 480 Volt Panelboards: amperes rms symmetrical per plan.

I. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.

J. Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower, with bimetal overload relay.

1. Coil operating voltage: 120 volts, 60 Hz.

2. Size as shown on Drawings.

K. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

L. Enclosure: NEMA PB 1, Type 1, 6 inches deep, 20 inches wide, cabinet box.

M. Cabinet Front: Surface type, fastened with screws, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

N. Nameplate: Provide factory nameplate to include the following:

1. Manufacturer.

2. Order number.

3. Panelboard Type.

4. System Voltage.

5. Bus ampacity.

6. Short circuit bracing rating.

7. UL label.

8. Service entrance label. (if applicable)

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Suitable for terminating aluminum or copper conductors. .

2. Main and Neutral Lug Type: Mechanical.

a. Provide an individual terminal or lug for each neutral wire.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Copper.

3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

4. Provide clear plastic circuit directory holder mounted on inside of door.

F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

G. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

H. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard ; provide insulated ground bus where scheduled.

I. Minimum Integrated Short Circuit Rating: As indicated or as required by the short circuit study.

1. 240 Volt Panelboards: 10,000 amperes rms symmetrical.

2. 480 Volt Panelboards: 14,000 amperes rms symmetrical.

J. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.

1. Type SWD for lighting circuits.

2. Type HACR for air conditioning equipment circuits.

3. Class A ground fault interrupter circuit breakers where scheduled.

4. Do not use tandem circuit breakers.

K. Enclosure: NEMA PB 1, Type 1.

L. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.

M. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

N. Special Features:

1. Provide blocking clips or lock-off devices on circuit breakers as indicated on the drawings.

2. Provide barriered space for mounting contactors and control devices with a hinged door and lock, where shown or required.

3. Provide neutral bars with terminal for all active, spare, and inactive circuits.

4. Provide feed-thru lugs or sub-feed lugs for 2 and 3 section panels.

5. Equip bus bars for panelboard with main lugs, main fused switch, or main circuit breaker, capacity as required or as indicated.

6. Provide special features such as split bus, lighting contactors, extra-wide gutters as required or as indicated.

7. Provide panels with individual branch circuit power metering where noted on plans for connections to Facility Energy Management System. Provide Square D type NFMVP, NQMVP or approved equal.

2.5 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

1. Load centers are permitted only where called for specifically on the drawings

B. Manufacturers:

1. Square D.
2. Siemens.
3. Cutler-Hammer.
4. Or approved equal.
5. Substitutions: See Section 01 60 00 - Product Requirements.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic plug-in type, quantity and ratings as indicated on drawings..

E. Enclosures:

1. Provide flush-mounted enclosures unless otherwise indicated.
2. Fronts: Provide cover without door to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
3. Fronts: Provide hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
4. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.
5. Provide NEMA 3R enclosure where installed outdoors.

2.6 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Provide required seismic controls in accordance with Section 26 05 48.

G. Install panelboards plumb and when recessed, flush with wall finishes. Provide all backing for equipment support. Fasten all free-standing equipment to concrete slab. Mounting bolts on floor mounted panels shall extend into pads only and shall not be in direct contact with building structural members.

H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

J. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

K. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

L. Provide grounding and bonding in accordance with Section 26 05 26.

1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

M. Install all field-installed branch devices, components, and accessories.

N. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

O. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

P. Set field-adjustable circuit breaker tripping function settings as indicated.

Q. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

R. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

S. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

T. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

U. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

V. Provide filler plates to cover unused spaces in panelboards.

W. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:

1. Emergency and night lighting circuits.

2. Fire detection and alarm circuits.

3. Communications equipment circuits.

4. Intrusion detection and access control system circuits.

5. Video surveillance system circuits.

X. Identify panelboards in accordance with Section 26 05 53.

Y. Provide computer-generated circuit directory card for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

Z. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

AA. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

BB. Provide arc flash warning labels in accordance with NFPA 70.

CC. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

1. Minimum spare conduits: 6 empty 1 inch.

DD. Ground and bond panelboard enclosure according to Section 26 05 26.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform field inspection and testing in accordance with Section 01 40 00.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakes larger than 100 amperes.. Tests listed as optional are not required.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

F. Test GFCI circuit breakers to verify proper operation.

G. Test AFCI circuit breakers to verify proper operation.

H. Test shunt trips to verify proper operation.

I. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

J. Correct deficiencies and replace damaged or defective panelboards or associated components.

K. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Fan speed controllers.

D. Receptacles.

E. Wall plates and covers.

F. Floor box service fittings.

G. Poke-through assemblies.

H. Access floor boxes.

I. Occupancy sensors

1.2 RELATED REQUIREMENTS

A. Section 09 69 00 - Access Flooring.

B. Section 26 05 00 – Common Work Results for Electrical.

C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

E. Section 26 05 33.16 - Boxes for Electrical Systems.

F. Section 26 05 39 - Underfloor Raceways for Electrical Systems.

G. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

H. Section 26 05 83 - Wiring Connections: Cords and plugs for equipment.

I. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h, with Amendments (2017).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2014g, with Amendment (2017).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

O. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify the Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1. Wall Dimmers: Include derating information for ganged multiple devices.
2. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.

C. Samples: One for each type and color of device and wall plate specified.

D. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data:

1. Wall Dimmers: Include information on operation and setting of presets.

2. GFCI Receptacles: Include information on status indicators.

3. Surge Protection Receptacles: Include information on status indicators.

H. Project Record Documents: Record actual installed locations of wiring devices.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.

3. Extra Keys for Locking Switches: Two of each type.

4. Extra Surge Protection Receptacles: Two of each type.

5. Extra Wall Plates: One of each style, size, and finish.

6. Extra Flush Floor Service Fittings: Two of each type.

7. Extra Poke-Through Core Hole Closure Plugs: Two for each core size.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Wiring Devices: www.cooperwiringdevices.com.

B. GE Industrial: www.geindustrial.com.

C. Leviton Manufacturing, Inc: www.leviton.com.

D. Pass & Seymore.

E. Hubbell.

F. Bryant.

G. Arrow-Hart.

H. Or approved equal.

2.2 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather-resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations. Receptacles to be clearly identified as weather resistant as required by CEC.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Provide isolated ground receptacles for receptacles serving computers and electronic cash registers.

I. Unless noted otherwise, do not use combination switch/receptacle devices.

J. For flush floor service fittings, use tile rings for installations in tile floors.

K. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.3 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.

D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

F. Isolated Ground Convenience Receptacles: Orange.

G. Surge Protection Receptacles: Blue.

H. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.

I. Clock Hanger Receptacles: Brown with stainless steel wall plate.

J. Above-Floor Service Fittings: Gray wiring devices with satin aluminum housing.

K. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

L. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.

M. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

2.4 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.5 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20and where applicable FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

1. Products:

a. Single-pole: Hubbell #1221-I, Bryant #4901-GI, Pass & Seymour #20AC1-I.

b. Double-pole: Hubbell #1222-I, Brant #4902-GI, Pass & Seymour #20AC2-I.

c. Three-way: Hubbell #1223-I, Bryant #4903-GI, Pass & Seymour #20AC3-I.

d. Four-way: Hubbell #1224-I, Bryant #4904-GI, Pass & Seymour #20AC4-I.

e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

1. Products:

a. Hubbell #1221-PLR, Bryant #4901-PLR, Pass & Seymour #20AC1-PLR.

b. Or approved equal.

c. Substitutions: See Section 01 60 00 - Product Requirements.

E. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with barrel type keyed switch actuator and maintained contacts; switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

F. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

G. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; switches keyed alike; single pole double throw, off with switch actuator in center position.

H. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.

1. Body and Handle: white plastic with toggle handle.

2. Indicator Light: Lighted handle type switch; red handle.

3. Locator Light: Lighted handle type switch; red color handle.

4. Ratings:

a. Voltage: 120 and 277 volts, AC.

b. Current: 20 amperes.

I. Switch Types: Single pole, double pole, and 3-way.

2.6 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

1. Incandescent: 600 W.
2. Magnetic Low-Voltage: 600 VA.
3. Electronic Low-Voltage: 400 VA.
4. Fluorescent: 600 VA.
5. LED: 600 VA

D. Provide locator light, illuminated with load off.

E. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

F. Incandescent Wall Dimmers: Semiconductor dimmer for incandescent lamps, Type as indicated on drawings, complying with NEMA WD 6 and WD 1.

1. Body and Handle: white plastic with linear slide control.
2. Voltage: 120 and 277 volts.
3. Power Rating: 600 watts.

G. LED Wall Dimmers: NEMA WD 1, Type II semiconductor dimmer for LED lamps.

1. Power rating to match load shown on the drawings.
2. Voltage as required for controlled LED fixtures.

H. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.7 FAN SPEED CONTROLLERS

A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.

1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

2.8 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

B. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.

3. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.

4. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

5. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

6. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

7. Illuminated Convenience Receptacles: Hospital grade, 20A, 125V, NEMA 5-20R; illuminated face or indicator light to indicate power is being supplied to receptacle; single or duplex as indicated on the drawings.

C. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

   a. Provide test and reset buttons of same color as device.

2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

D. USB Charging Devices:

1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.

   a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.

   b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.

2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

3. USB Charging Noncombination Devices: Four-port (Type A); rectangular decorator style.

E. Surge Protection Receptacles:

1. Surge Protection Receptacles - General Requirements: Listed and labeled as complying with UL 1449, Type 2 or 3.

a. Energy Dissipation: Not less than 240 J per mode.

b. Protected Modes: L-N, L-G, N-G.

c. UL 1449 Voltage Protection Rating (VPR): Not more than 700 V for L-N, L-G modes and 1200 V for N-G mode.

d. Diagnostics:

1) Visual Notification: Provide indicator light to report functional status of surge protection.

2) Audible Notification: Provide switchable audible alarm to report that surge protection is not functional.

2. Standard Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Isolated Ground Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, with ground contacts isolated from mounting strap.

F. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

G. Clock Hanger Receptacles: Single, 15A, 125V, NEMA 5-15R.

H. Special Purpose Receptacle Outlet: .20A, 250V, 3 pole, 4 wire, 3 phase grounding, single: NEMA 15-20R; black (Hubbell 8420).

I. Special Purpose Receptacle Outlet: 20A, 125/250V, 3 pole, 4 wire, 1 phase grounding, single: NEMA 14-20R; black (Hubbell 8410).

J. Special Purpose Receptacle Outlet: 30A, 125V, 2 pole, 3 wire grounding, single; NEMA 5-30R; black (Hubbell 9308).

K. Special Purpose Receptacle Outlet: 30A, 250V, 2 pole, 3 wire grounding, single; NEMA 6-30R; black (Hubbell 9330).

L. Special Purpose Receptacle Outlet: 30A, 250V, 3 pole, 4 wire, 3 hose, grounding, single; NEMA 15-30R; black (Hubbell 8430A).

M. Special Purpose Receptacle Outlet: 30A, 125/250V, 3 pole, 4 wire, 1 phase grounding, single; NEMA 14-30 R; black (Hubbell 9430A).

N. Special Purpose Receptacle Outlet: 30A, 250V, 2 pole, 3 wire, 1 phase grounding, single, twist-lock; NEMA L6-30R; black (Hubbell 2620).

O. Special Purpose Receptacle Outlet: 30A, 250V, 3 pole, 4 wire, 3 phase, grounding, single, twist-lock; NEMA L15-30R; black (Hubbell 2720).

P. Special Purpose Receptacle Outlet: 50A, 250V, 2 pole, 3 wire, 1 phase, grounding, single; NEMA 6-50R; black (Hubbell 9367).

Q. Special Purpose Receptacle Outlet: 50A, 250V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; black (Hubbell 25505), with wall plate per NFPA 56A. Portable x-ray receptacle.

R. Special Purpose Receptacle Outlet: 20A, 250V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; NEMA L6-20R; black (Hubbell 2320).

S. Special Purpose Receptacle Outlet: 50A, 125/250V, 3 pole, 4 wire, 1 phase, grounding, single; NEMA 14-50R; black (Hubbell 9450A).

T. Special Receptacle: 20A, 4 pole, 5 wire, 3 phase Y, 120/208V; NEMA L21-20; black (Hubbell 2510).

U. Special Receptacle: 30A, 4 pole, 5 wire, 3 phase Y, 120/208V; NEMA L21-30; black (Hubbell 2810).

V. Special Purpose Receptacle Outlet: 15A, 125V, 2 pole, 3 wire, isolated ground, duplex; NEMA 5-15R; orange (Hubbell IG-5262).

W. Special Purpose Receptacle Outlet: 20A, 125V, 2 pole, 3 wire, isolated ground, duplex; NEMA 5029R; orange (Hubbell IG-5362).

X. Special Purpose Receptacle Outlet: 30A, 125V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; NEMA L5-30R; black (Hubbell 2610).

Y. Special Purpose Receptacle Outlet: 20A, 125V, 2 pole, 3 wire, single, twist-lick; NEMA L5-20R; black.

Z. Special Receptacle Outlet: 30A, 250V, 2 pole, 3 wire, 1 phase grounding, single, twist lock, isolated ground; NEMA L6-30R; orange (Hubbell IG-2620).

AA. Special Receptacle Outlet: 30A, 4 pole, 5 wire, 3 phase Y, 277/408V; NEMA L22-30, black.

BB. Special Receptacle Outlet: 60A, 3 pole, 4 wire, 3 phase, 480V; watertight pin and sleeve type; red, Hubbell 460R7W with BB601W 15 degree angle back box.

CC. Special Receptacle Outlet: 60A, 277/480V, 4 pole, 5 wire, single pin and sleeve.

1. Manufacturers

a. Appleton.

b. Hubbell; Model 560R7W.

c. Or approved equal.

DD. Special Receptacle Outlet: 60A, 250V, 3 pole, 4 wire, 3 phase, grounding, single; NEMA 15-60R; black.

1. Manufacturers

a. Bryant; Model 8460.

b. Hubbell; Model 8460A.

c. Pass & Seymour; Model 5760-BL.

d. Or approved equal.

EE. Other receptacle types as indicated on the drawings and/or as required for connection of designated equipment.

2.9 WALL PLATES AND COVERS

A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.

3. Screws: Metal with slotted heads finished to match wall plate finish.

4. Provide screwless wallplates with concealed mounting hardware where indicated.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Brass Wall Plates: Brushed satin finish, factory-coated to inhibit oxidation.

E. Aluminum Wall Plates: Smooth satin finish, clear anodized, factory-coated to inhibit oxidation.

F. Chrome Wall Plates: Smooth finish, chrome plated steel.

G. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

H. Pre-marked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.

I. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

J. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

K. Decorative Cover Plates: white, nylon, verify color with architect .

L. Jumbo Cover Plates: white, nylon, verify color with architect.

M. Weatherproof Cover Plates: Gasketed cast metal with hinged.

N. Inmate Areas: In Correctional Facilities

1. Minimum Level Device Plate: Type 430 stainless steel, flush, satin finish, approximately 20 gauge.

    a. Hollow Metal Jamb Posts: Arrow-Hart #T-1650; Bryant, Stainless Steel.

2. Medium Level Device Plate: Stainless steel; Type 430.

3. Maximum Level Device Plate:

    a. Back Plate: Cold rolled steel; 10 gauge, prime painted.

    b. Cover Plate: Steel; 10 gauge, prime painted.

    c. Fasteners: Minimum for security fasteners.

    d. Manufacturers: Hubbell, Fail-Safe, Mark.

e. Cast Metal Plate for Surface Type Boxes: Corrosive resistant, cast ferrous metal, designed for the application.

f. Plastic Device Plates: Not permitted.

g. Fasteners: Tamper proof metal fasteners under provisions of Section 05 05 23.

h. Device Plates Installed in Housing Units: Patient Cells, Holding Cells, and Receiving Tanks shall be maximum level device plates.

i. Device Plates Installed In Mechanical Rooms, Electrical Rooms, Control Rooms and areas 12 feet of more above finished floor shall be minimum level device plates.

j. Device plates installed in other areas shall be Medium level device plates.

2.10 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

B. Above-Floor Service Fittings:

1. Single Service Pedestal Convenience Receptacles:

a. Configuration: One standard convenience duplex receptacle.

2. Single Service Pedestal Communications Outlets:

a. Configuration: One 1 inch bushed opening.

b. Voice and Data Jacks: As specified in Section 27 30 00.

3. Single Service Pedestal Furniture Feed:

a. Configuration: One 3/4 inch knockout.

4. Dual Service Pedestal Combination Outlets:

a. Configuration:

1) Power: One standard convenience duplex receptacle.

2) Communications: One 1 inch bushed opening.

3) Voice and Data Jacks: As specified in Section 27 30 00.

b. Provide barrier to separate line and low voltage compartments.

C. Flush Floor Service Fittings:

1. Single Service Flush Convenience Receptacles:

a. Cover: Rectangular.

b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).

2. Single Service Flush Communications Outlets:

a. Cover: Rectangular.

b. Voice and Data Jacks: As specified in Section 27 30 00.

3. Single Service Flush Furniture Feed:

a. Cover: Rectangular.

b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).

4. Dual Service Flush Combination Outlets:

a. Cover: Rectangular.

b. Configuration:

1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).

2) Voice and Data Jacks: As specified in Section 27 30 00.

5. Dual Service Flush Furniture Feed:

a. Cover: Rectangular.

b. Configuration:

1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).

2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).

6. Accessories:

a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.

b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

2.11 POKE-THROUGH ASSEMBLIES

A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

B. Above-Floor Service Fittings:

1. Single Service Pedestal Convenience Receptacles:

a. Configuration: One standard convenience duplex receptacle.

2. Single Service Pedestal Communications Outlets:

a. Configuration: One 1 inch bushed opening.

b. Voice and Data Jacks: As specified in Section 27 30 00.

3. Single Service Pedestal Furniture Feed:

a. Configuration: One 3/4 inch knockout.

4. Dual Service Pedestal Combination Outlets:

a. Configuration:

1) Power: One standard convenience duplex receptacle.

2) Communications: One 1 inch bushed opening.

3) Voice and Data Jacks: As specified in Section 27 30 00.

b. Provide barrier to separate line and low voltage compartments.

C. Flush Floor Service Fittings:

1. Single Service Flush Convenience Receptacles:

a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).

2. Single Service Flush Communications Outlets:

a. Voice and Data Jacks: As specified in Section 27 30 00.

3. Single Service Flush Furniture Feed:

a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).

4. Dual Service Flush Combination Outlets:

a. Cover: Hinged door(s).

b. Configuration:

1) Power: One standard convenience duplex receptacle(s).

2) Voice and Data Jacks: As specified in Section 27 10 00.

5. Dual Service Flush Furniture Feed:

a. Configuration:

1) Power: One 3/4 inch threaded opening(s).

2) Communications: Two 1/2 inch threaded opening(s).

6. Accessories:

a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

2.12 ACCESS FLOOR BOXES

A. Manufacturers - Access Floor Boxes with Pre-wired Connectors for Manufactured Wiring Systems:

1. AFC Cable Systems Inc: www.afcweb.com/#sle.

2. RELOC Wiring Solutions, a brand of Acuity Brands, Inc: www.relocwiring.com/#sle.

3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.

4. Or approved equal.

5. Substitutions: See Section 01 60 00 - Product Requirements.

6. Source Limitations: Provide access floor boxes with pre-wired connectors produced by the same manufacturer as the manufactured wiring system used for this project.

B. Description: Metallic multi-service box suitable for mounting in access floor system specified in Section 09 69 00.

C. Access floor boxes with pre-wired connectors for manufactured wiring systems are permitted only where manufactured wiring systems are permitted as specified in Section 26 05 19.

D. Configuration:

1. Power: Two standard convenience duplex receptacle(s) unless noted otherwise on drawings.

2. Voice and Data Jacks: As specified in Section 27 30 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that core drilled holes for poke-through assemblies are in proper locations.

H. Verify that openings in access floor are in proper locations.

I. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, except for mounting heights specified in those standards.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1, except for mounting heights specified in that standard.

C. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Owner to obtain direction prior to proceeding with work.

4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

D. Install wiring devices in accordance with manufacturer's instructions.

E. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

F. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

G. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

I. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

J. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

K. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

L. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

M. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

N. Install wiring devices plumb and level with mounting yoke held rigidly in place.

O. Install wall switches with OFF position down.

P. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

Q. Do not share neutral conductor on branch circuits.

R. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.

S. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

T. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

U. Identify wiring devices in accordance with Section 26 05 53.

V. Install identification label for wall switches and wall dimmers in accordance with Section 26 0526 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.

W. Install identification label for all receptacles in accordance with Section 26 0526 indicating serving branch circuit.

X. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

Y. Install receptacles with grounding pole on bottom.

Z. Connect wiring device grounding terminal to outlet box with bonding jumper.

AA. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

BB. Connect wiring devices by wrapping conductor around screw terminal.

CC. Use jumbo size plates for outlets installed in masonry walls.

DD. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

EE. Install protective rings on active flush cover service fittings.

3.4 CONSTRUCTION

A. Interface with Other Work

1. Coordinate locations of outlet boxes to obtain mounting heights specified unless otherwise indicated on drawings. All dimensions are to the center of the item.

2. Install convenience receptacle four inches above backsplash of counters or four inches above counter if no backsplash. Mount horizontal where indicated

3. Install electric water cooler outlet boxes centered behind unit, behind electric water cooler cover. Coordinate with equipment installer.

B. Locate wall switches on the strike side of door with edge of wall plate three inches from edge of door frame. Where locations are indicated otherwise, notify the Electrical Engineer of Record to obtain direction prior to proceeding with work.

3.5 FIELD QUALITY CONTROL

A. Site Test

1. Test under provisions of Section 01 45 00.

2. See Section 01 40 00 - Quality Requirements, for additional requirements.

3. Operate each wall switch, wall dimmer and fan speed control with circuit energized and verify proper operation.

4. Test each receptacle to verify operation and proper polarity.

5. Verify that each receptacle is energized.

6. Test each GFCI receptacle for proper tripping operation and proper polarity.

7. Inspect each surge protection receptacle to verify surge protection is active.

B. Inspect each wiring device for damage and defects.

C. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Owner's Representative.

3.7 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 27 26

SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.2 RELATED REQUIREMENTS

A. Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 05 73 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.

D. Section 26 24 13 - Switchboards: Fusible switches.

E. Section 26 24 16 - Panelboards: Fusible switches.

F. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses; Current Edition, Including All Revisions.

F. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

G. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

H. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.

a. Fusible Enclosed Switches: See Section 26 28 16.16.

2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

3. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1. Spare Fuse Cabinet: Include dimensions.

C. Maintenance Materials: Furnish the following for Owner's (Owner's) use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Fuses: Three set(s) of three for each type and size installed.

3. Fuse Pullers: One set(s) compatible with each type and size installed.

4. Spare Fuse Cabinet Keys: Two.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience and with service facilities within 100 miles of Project.

D. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Bussmann

B. Ferraz Shawmut, Inc

C. Littelfuse

D. Gould

E. Or approved equal.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 APPLICATIONS

A. Service Entrance:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. Feeders:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

C. General Purpose Branch Circuits: Class RK1, time-delay.

D. Individual Motor Branch Circuits: Class RK1, time-delay.

E. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

F. Primary Protection for Control Transformers: Class CC, time-delay.

G. HVAC equipment: Provide fuses, size, type, and ratings in accordance with equipment nameplate data to be field verified by contractor.

2.3 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

1. Class RK1, Time-Delay Fuses:

a. Products:

1) Bussmann, “Low-Peak”; 250V KTN-RK and 600V LPS-RK.

2) Littlefuse, “Little-Peak” 250V LLN-RK and 600V LLS-RK.

3) Gould “AMPTRAP II” 250V A2D-R and 600V A6D-R.

4) Substitutions: See Section 01 60 00 - Product Requirements.

2. Class RK1, Fast-Acting, Non-Time-Delay Fuses:

a. Products:

1) Bussmann “Limitron”, 250V KTN-RK and 600V KTS-RK..

2) Littlefuse 250V RLN-R and 600V RLS-R.

3) Gould “AMPTRAP” 250V A2K-R and 600V A6K-R..

4) Substitutions: See Section 01 60 00 - Product Requirements.

3. Class RK5, Time-Delay Fuses:

a. Products:

1) Bussmann “Fusetron” 250V FRN-RK and 600V FRS-RK.

2) Littlefuse “SLO-BLO” 250V FLN-R and 600V FLS-R.

3) Gould “TRI-ONIC” 250V TR-R and 600V TRS-R.

4) Substitutions: See Section 01 60 00 - Product Requirements.

4. Class RK5, Fast-Acting, Non-Time-Delay Fuses:

a. Products:

1) Bussmann 300V “T-Tron” JJN, 600V “Limitron” JKS.

2) Substitutions: See Section 01 60 00 - Product Requirements.

H. Class J Fuses: Comply with UL 248-8.

1. Class J, Time-Delay Fuses:

a. Products:

1)

2) Substitutions: See Section 01 60 00 - Product Requirements.

2. Class J, Fast-Acting, Non-Time-Delay Fuses:

a. Products:

1) Bussmann 300V JJN, 600V JKS.

2) Substitutions: See Section 01 60 00 - Product Requirements.

I. Class L Fuses: Comply with UL 248-10.

1. Class L, Time-Delay Fuses:

a. Products:

1) Bussmann “Hi-Cap” 600V, 601-6000A, Type KRP-C.

2) Littlefuse “HI-INT” 600V, 601-6000A, Type KLP-C.

3) Gould “AMPTRAP” 600V, 200-600A, Type A4BY.

4) Substitutions: See Section 01 60 00 - Product Requirements.

2. Class L, Fast-Acting, Non-Time-Delay Fuses:

a. Products:

1) Bussmann 300V KTN-R, 600V KTS-R.

2) Substitutions: See Section 01 60 00 - Product Requirements.

J. Class T Fuses: Comply with UL 248-15.

1. Products:

a. Bussmann 300V JJN, 600V JJS.

b. Substitutions: See Section 01 60 00 - Product Requirements.

K. Class CC Fuses: Comply with UL 248-4.

1. Class CC, Time-Delay Fuses:

a. Products:

1) Bussmann 600V LP-CC.

2) Substitutions: See Section 01 60 00 - Product Requirements.

2. Class CC, Fast-Acting, Non-Time-Delay Fuses:

a. Products:

1) Bussmann 600v, KTK-R.

2) Substitutions: See Section 01 60 00 - Product Requirements.

L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

M. Provide the following accessories where indicated or where required to complete installation:

1. Fuseholders: Compatible with indicated fuses.

2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

2.4 SPARE FUSE CABINET

A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.

B. Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

C. Doors: Hinged, with hasp for Owner's (Owner's) padlock.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that mounting surfaces are ready to receive spare fuse cabinet.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet in convenient location in main electrical room unless otherwise indicated on drawings.

D. Identify spare fuse cabinet in accordance with Section 26 05 53.

E. Provide identification nameplate for spare fuse cabinet in accordance with Section 26 05 53.

END OF SECTION 26 28 13

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Drivers.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Additional requirements for support of ceiling mounted fixtures.

B. Section 09 5100 - Acoustical Ceilings: Additional requirements for support of ceiling mounted fixtures.

C. Section 23 36 00 - Air Terminal Units: Air distribution accessories for air handling luminaires.

D. Section 26 05 00 – Common Work Results for Electrical.

E. Section 26 05 29 - Hangers and Supports for Electrical Systems.

F. Section 26 05 33.16 - Boxes for Electrical Systems.

G. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

H. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

I. Section 26 09 23 - Lighting Control Devices.

1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

2. Includes lighting contactors.

J. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

K. Section 26 56 00 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

C. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

D. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

E. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

F. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

G. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

I. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

J. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

K. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

L. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

P. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

Q. UL 1598 - Luminaires; Current Edition, Including All Revisions.

R. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect and/or Owner of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution.

3. Provide shop drawings for continuous row luminaires.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

   1. LED Luminaires:

      a. Include estimated useful life, calculated based on IES LM-80 test data.

      b. Include IES LM-79 test report upon request.

   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

   3. Drivers: Include wiring diagrams and list of compatible lamp configurations.

   4. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

   5. Air Handling Luminaires: Include air handling performance data.

D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

E. Samples:

   1. Provide one sample(s) of each specified luminaire where indicated.

   2. Provide one sample(s) of each custom luminaire.

   3. Provide one sample(s) of each luminaire proposed for substitution upon request.

   4. Provide one sample(s) of each product finish illustrating color and texture upon request.

F. Field quality control reports.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

I. Maintenance Materials: Furnish the following for Owner's (Owmer's) use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.

3. Extra LED Drivers: Two percent of total quantity installed for each type, but not less than one of each type.

J. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC, and ICBO.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Conform to requirements of NFPA 70 and NFPA 101.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

D. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

E. Provide 3-year full warranty for fluorescent emergency power supply units.

F. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS - LUMINAIRES

A. Furnish products as indicated in Lighting Fixture Schedule included on the Drawings

1. General: Lighting fixtures as hereinafter specified are identified by type as noted on drawings. Fixture specifications are based on construction and performance. Manufacturer’s catalog numbers are of general nature and indicate the level of quality required, but do not necessarily reflect complete options and accessories required. Approval shall be based on description and specification of fixture as well as catalog number indicated. Verify fixture voltage requirements with circuitry shown on drawings and provide appropriate equipment.

2.2 OWNER-FURNISHED PRODUCTS

A. New Products: As indicated on drawings.

B. Existing Products: As indicated on drawings.

2.3 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 LUMINAIRES

A. Manufacturers:

1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
2. Alloy LED; www.alloyled.com/#sle.
3. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
4. Electro-Matic Visual, Inc; www.empvisual.com/#sle.
5. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
6. Lutron Electronics Company, Inc: www.lutron.com/#sle.
7. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.
8. Other manufacturers as indicated in the fixture schedule on the drawings.
9. Or approved equal.
10. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, drivers, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.
2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
4. Air-Handling Recessed Fluorescent Luminaires: Suitable for air supply/return, heat removal, or combination as indicated.
    a. Luminaires for Air Supply/Return: Provide air control blades where indicated.
    b. Luminaires for Heat Removal: Provide heat removal dampers where indicated.

J. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

K. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

L. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
1. LED Tape - General Requirements:
    a. Listed.
    b. Designed for field cutting in accordance with listing.
    c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.
2. White LED Tape:
    a. Correlated Color Temperature (CCT): 3500 K unless otherwise indicated.
    b. Color Rendering Index (CRI): Not less than 90.

M. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.

N. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.5 EMERGENCY LIGHTING UNITS

A. Manufacturers:

1. Acuity Brands, Inc: www.acuitybrands.com/#sle.

2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.

3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.

4. Or approved equal.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:

1. Sealed maintenance-free lead calcium unless otherwise indicated.

2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

G. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

H. Where indicated, provide units with integral time delay to maintain emergency illumination for 15 minutes after restoration of normal power source.

I. Accessories:

1. Provide compatible accessory mounting brackets where indicated or required to complete installation.

2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.

3. Provide compatible accessory wire guards where indicated.

4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.6 EXIT SIGNS

A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.

B. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

C. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

1. Manufacturers:

a. Acuity Brands, Inc: www.acuitybrands.com/#sle.

b. Cooper Lighting, a division of Cooper Industries;: www.cooperindustries.com/#sle.

c. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.

d. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.

e. Or approved equal.

f. Substitutions: See Section 01 60 00 - Product Requirements.

D. Accessories:

1. Provide compatible accessory high-impact polycarbonate vandal shields where indicated.

2. Provide compatible accessory wire guards where indicated.

E. Manufacturers: Furnish products as indicated in Lighting Fixture Schedule included on the Drawings

F. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.

1. Provide fixtures complying with NFPA 101.

2. Lamps: LED.

3. Directional Arrows: Universal type for field adjustment.

4. Mounting: Universal, for field selection.

5. Battery: 6 or 12 volt, nickel-cadmium type, with 1.5 hour capacity.

6. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.

7. Lamps: Manufacturer's standard.

2.7 BALLASTS AND DRIVERS

A. Manufacturers:

1. Alloy LED; www.alloyled.com/#sle.

2. General Electric Company/GE Lighting: www.gelighting.com/#sle.

3. Lutron Electronics Company, Inc: www.lutron.com/#sle.

4. OSRAM Sylvania, Inc: www.osram.us/ds/#sle.

5. Philips Lighting North America Corporation; www.usa.lighting.philips.com/#sle.

6. Or approved equal.

7. Substitutions: See Section 01 60 00 - Product Requirements.

8. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

C. LED Drivers:

1. Luminaires shall be equipped with an LED driver(s) that accepts the voltage as indicated on the Fixture Schedule on the drawings. Individual driver(s) shall be replaceable

2. Driver(s) shall be UL8750 class 2 compliant for their intended use.

3. Total harmonic distortion (THD) for current: ≤ 20%.

4. Driver(s) shall be rated to operate between -30 degrees C to 50 degrees C minimum.

5. Individual drivers shall be equipped with surge protection (6kV minimum) in accordance with IEEE/ANSI C62.4.1. Driver(s) shall be protected against damage due to either an open circuit or short circuit fault condition on the driver output.

6. Driver(s) shall have a minimum efficiency of 85 percent.

7. LED driver(s) shall have a minimum lifetime of 50,000+ hours at 40 degrees C and shall have a minimum efficiency of 80 lumens per watt.

8. LED dies shall be tested in accordance with I.E.S.N.A. LM-80-08 standards.

9. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

10. Dimming Range: Continuous dimming from 100 percent to ten percent relative light output unless dimming capability to lower level is indicated, without flicker.

11. Control Compatibility: Fully compatible with the dimming controls to be installed.

    a. Wall Dimmers: See Section 26 27 26.

b. Daylighting Controls: See Section 26 09 23.

c. Network Lighting Controls: See Section 26 09 43.

12. Product(s):

a. Lutron Hi-Lume Premier 0.1% Constant Voltage (L3D0-Series): 3-wire and digital control; 0.1 percent dimming with Soft-On and Fade-to-Black low end performance; www.lutron.com/#sle.

b. Lutron Hi-Lume 1% (LTE-Series): Forward phase (neutral wire required); one percent dimming; www.lutron.com/#sle.

c. Lutron Hi-Lume 1% (L3D-Series): 3-wire and digital control; one percent dimming; www.lutron.com/#sle.

d. Lutron 5-Series (LDE5-Series): Digital control; five percent dimming; www.lutron.com/#sle.

e. Lutron Hi-Lume 1% Soft-on Fade-to-Black (LDE1-Series): Digital control; one percent dimming with Soft-On and Fade-to-Black low end performance; www.lutron.com/#sle.

f. Or approved equal.

2.8 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Provide wire guards for lighting fixtures and equipment where indicated on the drawings.

E. Tube Guards for Linear Fluorescent Lamps: Provide clear virgin polycarbonate sleeves with endcaps where indicated.

1. Product: As indicated in the Fixture Schedule on the drawings.

a. Substitutions: See Section 01 60 00 - Product Requirements.

F. Fire-Rated Luminaire Enclosures:

1. Manufacturers:

a. Fire Rated Product Specialties Corp: www.frpsonline.com/#sle.

b. Specialty Products & Insulation (SPI); SafeLite: www.spi-co.com/#sle.

c. Or approved equal.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Provide as required to preserve fire resistance rating of building elements.

2.9 SPARE PARTS

A. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5 percent spare LED driver assemblies and light engines for each LED fixture type. LED drivers shall be turned over to the Owner's Representative in their manufacturer's protective packaging. LED drivers not in their protective packaging will not be acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Provide required seismic controls in accordance with Section 26 05 48.

G. Provide seismic sway bracing restraints when an installed suspended luminaire's distance from the nearest permanent object (structural, mechanical, etc.) is less than 0.707 of the total suspension cable (stem) length.

H. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

I. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.

4. Secure pendant-mounted luminaires to building structure.

5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

J. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

4. Install recessed luminaires to permit removal from below.

5. Install clips to secure recessed grid supported luminaires in place. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.

K. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.

4. Install canopies tight to mounting surface.

5. Unless otherwise indicated, support pendants from swivel hangers.

6. Provide seismic sway bracing where indicated or as required by the application.

L. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

M. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

N. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

O. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

P. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

Q. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.

R. Install wall mounted luminaires and exit signs at height as indicated on Drawings.

S. Install accessories furnished with each luminaire.

T. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

U. Connect luminaires and exit signs to branch circuit outlets provided under Section 26 0537 using flexible conduit.

V. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

W. Bond products and metal accessories to branch circuit equipment grounding conductor.

X. Install specified lamps in each exit sign and luminaire.

Y. Air Handling Luminaires: Interface with air handling accessories furnished and installed under Section 23 36 00.

Z. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

2. Install lock-on device on branch circuit breaker serving units.

AA. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

2. Install lock-on device on branch circuit breaker serving units.

3. Install pendant exit signs at height indicated. Where not indicated, mount 90 inches above finished floor in space over door frame where applicable

BB. Remote Drivers: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.

CC. Identify luminaires connected to emergency power system in accordance with Section 26 05 53.

DD. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by LP Consulting Engineers, Inc..

G. Re-lamp luminaires that have failed lamps at substantial completion.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by LP Consulting Engineers, Inc.. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by LP Consulting Engineers, Inc. or authority having jurisdiction.

C. Air-Handling Luminaires with Air Control Blades or Heat Removal Dampers: Adjust as indicated or as required for proper airflow as directed by LP Consulting Engineers, Inc..

D. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by LP Consulting Engineers, Inc. or authority having jurisdiction.

E. Aim and adjust fixtures as indicated and/or as directed by the Architect or Electrical Engineer of Record.

F. Position exit sign directional arrows as indicated.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean finishes and touch up damage.

E. Clean photometric control surfaces as recommended by manufacturer.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to LP Consulting Engineers, Inc. or designated representative, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.9 SCHEDULE - SEE DRAWINGS

END OF SECTION 26 51 00

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts and Drivers.

C. Poles and accessories.

D. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 00 – Common Work Results for Electrical.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.16 - Boxes for Electrical Systems.

F. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

G. Section 26 09 23 - Lighting Control Devices.

1. Includes automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.

2. Includes lighting contactors.

H. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.

I. Section 26 28 13 - Fuses.

J. Section 26 51 00 - Interior Lighting.

1.3 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2022).

B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.

C. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.

D. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

E. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

F. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

G. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

H. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

I. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

J. IES RP-8 - Recommended Practice: Lighting Roadway and Parking Facilities; 2022.

K. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

L. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

M. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

N. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

Q. UL 1598 - Luminaires; Current Edition, Including All Revisions.

R. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.

2. Notify Architect and/or District Representative of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Coordination: Furnish bolt templates and pole mounting accessories to installer of pole foundations.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution.

3. Provide structural calculations for each pole proposed for substitution.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

b. Include IES LM-79 test report upon request.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

3. LED Retrofit Luminaire Conversion Kits: Include list of compatible luminaires and/or criteria for compatibility.

4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

E. Samples:

1. Provide one sample(s) of each specified luminaire where indicated.

2. Provide one sample(s) of each luminaire proposed for substitution upon request.

3. Provide one sample of each product finish illustrating color and texture upon request.

F. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

G. Field Quality Control Reports.

1. Include test report indicating measured illumination levels.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

J. Maintenance Materials: Furnish the following for Owner's (Owner's) use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.

3. Touch-Up Paint: 2 gallons, to match color of pole finish.

K. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.6 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 LUMINAIRES

A. Manufacturers:

1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
2. Alloy LED; www.alloyled.com/#sle.
3. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
4. Electro-Matic Visual, Inc; www.empvisual.com/#sle.
5. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
6. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.
7. Or approved equal.
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

J. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.
2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

K. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

L. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

M. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

N. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.

1. LED Tape - General Requirements:
   a. Listed.
   b. Designed for field cutting in accordance with listing.
   c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.
2. White LED Tape:
   a. Correlated Color Temperature (CCT): 4000 K unless otherwise indicated.
   b. Color Rendering Index (CRI): Not less than 90.

O. Exposed Hardware: Stainless steel.

P. Finish: To be verified with the architect by contractor prior to ordering.

2.3 BALLASTS AND DRIVERS

A. Manufacturers:

1. General Electric Company/GE Lighting: www.gelighting.com/#sle.
2. OSRAM Sylvania, Inc: www.osram.us/ds/#sle.
3. Philips Lighting North America Corporation; www.usa.lighting.philips.com/#sle.
4. Or approved equal.
5. Substitutions: See Section 01 60 00 - Product Requirements.
6. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
7. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

C. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 POLES

A. Manufacturers:

1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
2. Cooper Lighting, a division of Cooper Industries : www.cooperindustries.com/#sle.
3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.

4. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.

5. Or approved equal.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

2. Structural Design Criteria:

a. Comply with AASHTO LTS.

b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.

1) Design Wind Speed: 100 miles per hour, with gust factor of 1.3.

c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.

d. Include structural calculations demonstrating compliance with submittals.

3. Material: Steel, unless otherwise indicated.

4. Shape: Square straight, unless otherwise indicated.

5. Finish: Match luminaire finish, unless otherwise indicated.

6. Mounting Height: as indicated on the drawings.

7. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

8. Unless otherwise indicated, provide with the following features/accessories:

a. Top cap.

b. Handhole, standard size.

c. Anchor bolts with leveling nuts or leveling shims.

d. Anchor base cover.

e. Provision for pole-mounted weatherproof GFI receptacle where indicated.

f. Brackets: As required by manufacturer.

g. Hinged base.

h. Pole-top tenon, as indicated on the drawings.

C. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

2.5 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Poles: Per drawing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires in accordance with NECA/IESNA 501.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Provide required seismic controls in accordance with Section 26 05 48.

G. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

H. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

I. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.

4. Install canopies tight to mounting surface.

5. Unless otherwise indicated, support pendants from swivel hangers.

J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

K. Pole-Mounted Luminaires:

1. Maintain the following minimum clearances:
    a. Comply with IEEE C2.
    b. Comply with utility company requirements.
2. Foundation-Mounted Poles:
    a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
        1) Install anchor bolts plumb per template furnished by pole manufacturer.
        2) Position conduits to enter pole shaft.
    b. Install foundations plumb.
    c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
    d. Tighten anchor bolt nuts to manufacturer's recommended torque.
    e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
    f. Install anchor base covers or anchor bolt covers as indicated.
3. Embedded Poles: Install poles plumb as indicated.
4. Grounding:
    a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
    b. Provide supplementary ground rod electrode as specified in Section 26 05 26 at each pole bonded to grounding system as indicated.
5. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
6. Install non-breakaway in-line fuse holders and fuses complying with Section 26 28 13 in pole handhole or transformer base for each ungrounded conductor.
7. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 27 26 in designated poles.

L. Install accessories furnished with each luminaire.

M. Bond products and metal accessories to branch circuit equipment grounding conductor.

N. Provide concrete bases for lighting poles at locations indicated, in accordance with detail on drawing and Section 03 3000.

O. Install poles plumb.

1. Provide shims to adjust plumb.

2. Grout around each base.

P. Install lamps in each luminaire.

Q. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by LP Consulting Engineers, Inc..

F. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

G. Measure illumination levels to verify conformance with performance requirements. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by LP Consulting Engineers, Inc.. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by LP Consulting Engineers, Inc..

3.6 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean finishes and touch up damage.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to LP Consulting Engineers, Inc., and correct deficiencies or make adjustments as directed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 56 00

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STRUCTURAL CALCULATIONS

Rio City Café Deck
Sacramento, CA

January 26, 2024

01/26/24

LIONAKIS Project No. 019124.02

LIONAKIS

ENGINEERING CALCULATIONS

Project:	**Rio City Café Deck**
Location:	**Sacramento, CA**
Project No:	**019124.02**
Design Engineer:	**KLS**
Date:	**12/13/2023**
Building Code:	**2022 CBC**
Regulatory Agency:	**City of Sacramento**
Project Scope:	Remodel of (E) exterior wood deck over supported by concrete piles over river

STRUCTURAL CALCULATIONS CONTENTS

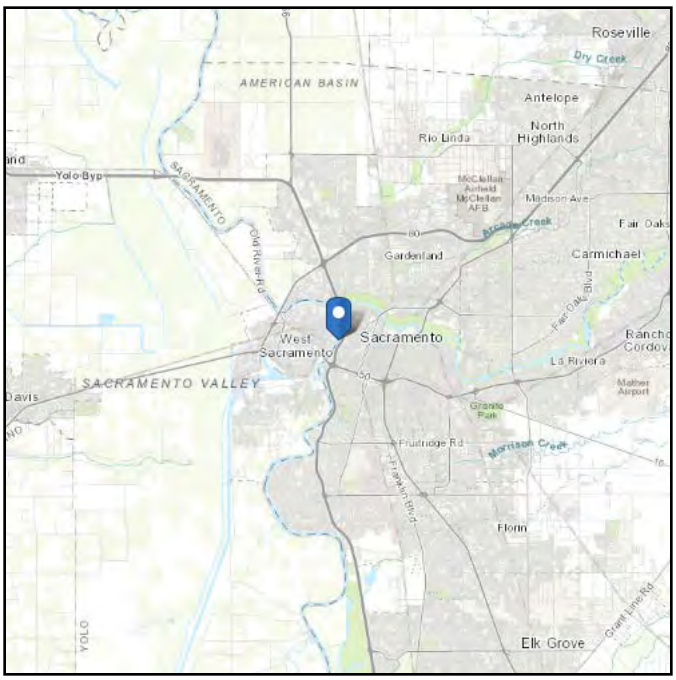
DESCRIPTION	PAGE NUMBER FROM	TO
Structural Design Criteria	**1**	**9**
Deck Boards	D1	D1
Roof Framing	R1	R4
Deck Framing/RISA Model	**F 1**	**F32**
Anchorage to (E) Concrete	**G 1**	**G20**
Seismic Joint	S1	S1
Temporary Shoring	T1	T27

ASCE 7 Hazards Report

Address:
1110 Front St
Sacramento, California
95814

Standard: ASCE/SEI 7-16
Risk Category: III
Soil Class: D - Default (see Section 11.4.3)

Elevation: 20.03 ft (NAVD 88)
Latitude: 38.581796
Longitude: -121.506807



Wind

Results:

Wind Speed	100 Vmph
10-year MRI	65 Vmph
25-year MRI	71 Vmph
50-year MRI	76 Vmph
100-year MRI	80 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1C and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Fri Nov 04 2022

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (annual exceedance probability = 0.000588, MRI = 1,700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

ASCE
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Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	0.576	S_{D1} :	N/A
S_1 :	0.255	T_L :	12
F_a :	1.339	PGA :	0.242
F_v :	N/A	PGA_M :	0.328
S_{MS} :	0.772	F_{PGA} :	1.358
S_{M1} :	N/A	I_e :	1.25
S_{DS} :	0.515	C_v :	1.084

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Fri Nov 04 2022

Date Source: USGS Seismic Design Maps

Snow

Results:

Ground Snow Load, p_g: 0 lb/ft^2

Elevation: 20.0 ft

Data Source: ASCE/SEI 7-16, Table 7.2-8

Date Accessed: Fri Nov 04 2022

Values provided are ground snow loads. In areas designated "case study required," extreme local variations in ground snow loads preclude mapping at this scale. Site-specific case studies are required to establish ground snow loads at elevations not covered.

Rain

Results:

15-minute Precipitation Intensity: 2.44 in./h

60-minute Precipitation Intensity: 1.18 in./h

Data Source: NOAA National Weather Service, Precipitation Frequency Data Server, Atlas 14 (https://www.nws.noaa.gov/oh/hdsc/)

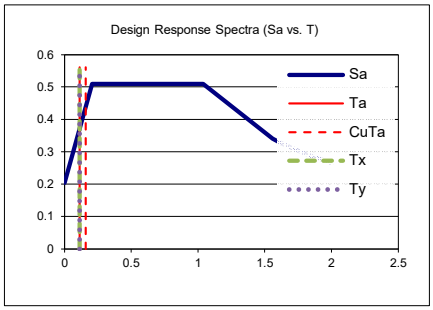
Date Accessed: Fri Nov 04 2022

SEISMIC DESIGN

Description of Vertical Load System: Cantilevered Column Systems w/ Detailing Per
Description of Lateral System: Steel ordinary cantilever column systems

Risk Category:	III	2022 CBC Table 1604.5	
Importance Factor, I_e =	1.25		1925 Magdalena Avenue, Chula Vista, CA 91913
Spectral Response Acceleration:			*Note: All references from ASCE 7-16 or 2022 CBC*
At 0.2 sec, S_s =	0.58 g	Figures	Site Latitude: 38.582 deg
At 1.0 sec, S_1 =	0.26 g	1613.2.1(1-10)	Site Longitude: -121.507 deg
Site Class: Per Geotech	D	1613.2.2-3	
F_a =	1.34	Table 1613.2.3(1)	
F_v =	2.09	Table 1613.2.3(2)	

Based on ASCE 7-16 11.4.8, Risk Targeted Ground Motion MCEr is Required
Utilize 11.4.8 Exceptions? * **Yes**



Spectral Repsonse Acceleration Adjusted for Site Class:

$S_{MS} = F_a S_s$ =	0.77 g	Eqn 16-20	
* $S_{M1} = F_v S_1$ x1.5 =	0.80 g	Eqn 16-21	
Design Spectral Repsonse Acceleration:			
$S_{DS} = 2/3 S_{MS}$ =	0.51 g	Eqn 16-22	
$S_{D1} = 2/3 S_{M1}$ =	0.53 g	Eqn 16-23	
$T_S = S_{D1}/S_{DS}$ =	1.04 s	11.4.6	
Seismic Design Category:	D		
Short Period:	D	Table 1613.2.5(1)	
1-Second Period:	D	Table 1613.2.5(2)	
R =	1 1/4	Table 12.2-1	
$\Omega_{o\text{-rigid}}$=	1 1/4	Table 12.2-1	
$\Omega_{o\text{-flexible}}$=	1 1/4	Table 12.2-1 (footnote g)	
C_d =	1 1/4	Table 12.2-1	

Static Force Procedure - Design Base Shear

	X-Dir	*Y-Dir*	
$C_s = S_{DS}/(R/I_e)$ =	0.51	0.51	Eqn 12.8-2
$C_{s\text{-max-drift}} = S_{D1}/[(R/I_e)T]$ =	4.71	4.71	Eqn 12.8-3
$C_{s\text{-max-stress}} = S_{D1}/[(R/I_e)T]$ =	4.71	4.71	Eqn 12.8-3
$C_{s\text{-min}} = 0.044 S_{DS} I_e \geq 0.01$ =	0.03	0.03	Eqn 12.8-5
~~$C_{s\text{-min}} = 0.5 S_1/(R/I_e)$ =~~	~~0.13~~	~~0.13~~	~~Eqn 12.8-6~~

Approximate Period 12.8.2.1

C_t =	0.020
x =	0.75
C_u =	1.4
h_n =	10 ft
$T_a = C_t(h_n)^x$ =	0.11 sec

Base Shear for Drift

* **$V_{x\text{-drift}} = C_{sx}W$ =**	**0.51 W**
* **$V_{y\text{-drift}} = C_{sy}W$ =**	**0.51 W**

Design Periods (Drift)

T_x =	0.11 sec
T_y =	0.11 sec

Base Shear for Stress

* **$V_x = C_{sx}W$ =**	**0.51 W**
* **$V_y = C_{sy}W$ =**	**0.51 W**

Design Periods Limited to $C_u T_a$ (Stress)

T_x =	0.11 sec
T_y =	0.11 sec

Earthquake Loads

Redundancy Factor 12.3.4

$E_{hx} = \rho_x V_x$ =	0.51 W		ρ_x = 1.0
$E_{hy} = \rho_y V_y$ =	0.51 W		ρ_y = 1.0
$E_v = 0.2 S_{DS} D$ =	0.10 D		
E_v =	0 D	Per 12.4.2.2, Exception 2b, When evaluating soil-structure interface for E = Eh-Ev	

Allowable Drift

Δ_a =	0.015 h_{sx}	Table 12.12-1	
Δ_a/ρ_x =	0.015 h_{sx}	12.12.1.1	
Δ_a/ρ_y =	0.015 h_{sx}		
$\delta_{xe\text{-allow-x}} = (\Delta_a/\rho_x)I/C_d$ =	0.0150 h_{sx}	Eqn 12.8-15	
$\delta_{xe\text{-allow-y}} = (\Delta_a/\rho_y)I/C_d$ =	0.0150 h_{sx}		

Elastic Analysis Limits

Level	*Story Elevation (ft)*	*$\Delta_{xe\text{-}x}$ (in)*	*$\Delta_{xe\text{-}y}$ (in)*
Roof	10.0	1.800	1.800
Base	0.0	0.000	0.000

WIND DESIGN - MWFRS (Per ASCE 7-16 Chapter 27 Part 1, Directional Procedure - All Heights)

Risk Category:	III	Table 1.5-1	Basic Wind Speed, V =	105 mph	Figure 26.5-1 A, B, C, D
Wind Direction Factor, K_d =	0.85	Table 26.6-1	Internal Pressure, GC_{pi}=	0.55 +/-	Table 26.13-1
Exposure Category:	C	Section 26.7	$q_z/K_z=0.00256\ K_{zt}\ K_d\ K_e\ V^2$:	24.0 psf	Equation 26.10-1
Topographic Factor, K_{zt} =	1.0	Figure 26.8-1	**MWFRS Pressure (psf)**		
Gust Factor, G =	0.85	Section 26.11	$p = qGC_p - q_i(GC_{pi})$		(Eqn 27.3-1)
Ground Elevation, z_g (ft) =	0	Section 26.9	**MWFRS OParapet Pressure (psf)**		
Elevation Factor, K_e =	1.00	Table 26.9-1	$p_p = q_p(GC_{pn})$		(Eqn 27.3-1)
Enclosure Class:	Partially Enclosed	Section 26.2/26.12			

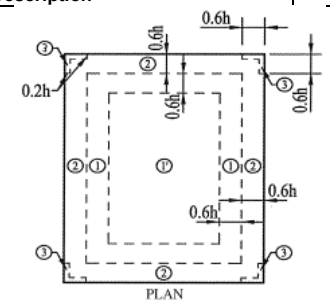
Structure or Part Thereof	Description		K_z	0.85	0.90	0.95	0.98	1.04	1.09
			h	0-15	20	25	30	40	50
Main Wind Force Resisting System	**Walls:** a		C_p						
	Windward wall		0.8	25.0	26.6	27.9	29.0	30.8	32.3
	Leeward wall, where	L/B = 0-1	-0.5	2.5	2.7	2.8	2.9	3.1	3.3
		L/B = 2	-0.3	6.0	6.4	6.7	7.0	7.4	7.7
		L/B ≥ 4	-0.2	7.7	8.2	8.6	9.0	9.5	10.0
	Roofs: a		C_p	Pressures shown below are for $+GC_{pi}$ / $-GC_{pi}$ with corresponding - / + C_p values					
	Wind Normal to ridge for θ < 10° and Parallel to ridge for all θ								
	h/L ≤ 0.5								
	(from windward edge) 0 to h		-0.9 -0.18	-26.8 / 8.1	-28.5 / 8.6	-29.8 / 9.0	-31.0 / 9.4	-32.9 / 9.9	-34.5 / 10.4
	h to 2h		-0.5 -0.18	-19.9 / 8.1	-21.1 / 8.6	-22.1 / 9.0	-23.0 / 9.4	-24.4 / 9.9	-25.6 / 10.4
	> 2h		-0.3 -0.18	-16.4 / 8.1	-17.4 / 8.6	-18.3 / 9.0	-19.0 / 9.4	-20.2 / 9.9	-21.1 / 10.4
	h/L ≥ 1.0								
	(from windward edge) 0 to h/2		-1.3 -0.18	-33.7 / 8.1	-35.8 / 8.6	-37.5 / 9.0	-39.0 / 9.4	-41.4 / 9.9	-43.4 / 10.4
	> h/2		-0.7 -0.18	-23.3 / 8.1	-24.8 / 8.6	-26.0 / 9.0	-27.0 / 9.4	-28.7 / 9.9	-30.0 / 10.4
	Overhangs (Add to Roof Pressures)								
	External Pressure at Underside		0.8	25.0	26.6	27.9	29.0	30.8	32.3

WIND DESIGN - COMPONENTS & CLADDING (Per ASCE 7-16 Chapter 30, Part 1: Low-Rise Buildings w/ h ≤ 60')

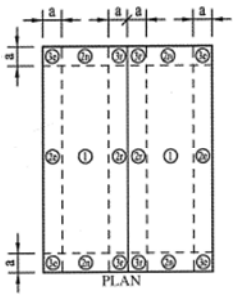
Risk Category:	III	Table 1.5-1	Basic Wind Speed, V =	105 mph	Figure 26.5-1 A, B, C, D
Wind Direction Factor, K_d =	0.85	Table 26.6-1	Internal Pressure, GC_{pi}=	0.55 +/-	Table 26.11-1
Exposure Category:	C	Section 26.7	$q_z/k_z=0.00256\ K_{zt}\ K_d\ V^2$=	24.0 psf	Equation 26.10-1
Topographic Factor, K_{zt} =	1.0	Figure 26.8-1	**Components & Cladding Pressure (psf)**		
Gust Factor, G =	0.85	Section 26.11	$\mathbf{p = q_h[(GC_p - (GC_{pi})]}$		(Eqn 30.4-1)
Ground Elevation, z_g (ft) =	0	Section 26.9			
Elevation Factor, K_e =	1.00	Table 26.9-1			
Enclosure Class:	Partially Enclosed	Section 26.2/26.12			

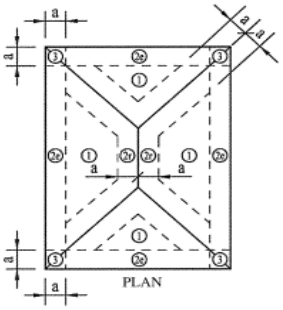
Structure or Part Thereof	Description	K_z	0.85	0.90	0.95	0.98	1.04	1.09
		h	0-15	20	25	30	40	50

Components & Cladding - Loading Diagrams

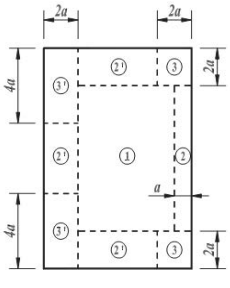


Gable θ<7° Monoslope θ≤3°

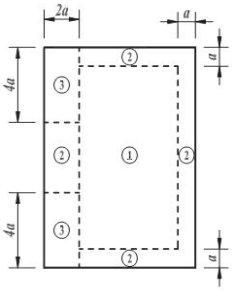




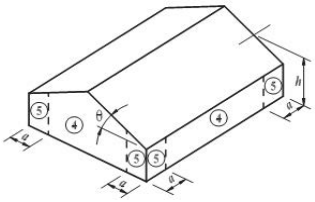
Gable/Hip 7°<θ≤27° (45° Max Gable)



Monoslope 3°<θ≤10°



Monoslope 10°<θ≤30°



Walls

a: 10% of least horizontal dimension or 0.4h, whichever is smaller, but not less than either 4% of least horizontal dimension or 3 ft.

WIND DESIGN - COMPONENTS & CLADDING (Per ASCE 7-16 Chapter 30, Part 1: Low-Rise Buildings w/ h ≤ 60')

Risk Category:	III	Table 1.5-1	Basic Wind Speed, V =	105 mph	Figure 26.5-1 A, B, C, D
Wind Direction Factor, K_d =	0.85	Table 26.6-1	Internal Pressure, GC_{pi}=	0.55 +/-	Table 26.11-1
Exposure Category:	C	Section 26.7	$q_z/k_z=0.00256\ K_{zt}\ K_d\ V^2$=	24.0 psf	Equation 26.10-1
Topographic Factor, K_{zt} =	1.0	Figure 26.8-1	**Components & Cladding Pressure (psf)**		
Gust Factor, G =	0.85	Section 26.11	**$p = q_h[(GC_p - (GC_{pi})]$**		(Eqn 30.4-1)
Ground Elevation, z_g (ft) =	0	Section 26.9			
Elevation Factor, K_e =	1.00	Table 26.9-1			
Enclosure Class:	Partially Enclosed	Section 26.2/26.12			

Structure or Part Thereof	Description		GC_p		K_z	0.85	0.90	0.95	0.98	1.04	1.09
					h	0-15	20	25	30	40	50
Components and Cladding - Roofs						Pressures shown below are for -GCpi / +GCpi with corresponding + / - GCp values					
	Gable Roof w/ Slope θ ≤ 7° & Monoslope Roofs w/ Slope θ ≤ 3°										
	Zone 1'										
	Main Zone	≤ 10 sf	0.3	-0.9		17.3 / -29.5	18.4 / -31.4	19.3 / -32.9	20.0 / -34.2	21.3 / -36.3	22.3 / -38.0
		≤ 100 sf	0.2	-0.9		15.3 / -29.5	16.2 / -31.4	17.0 / -32.9	17.7 / -34.2	18.8 / -36.3	19.7 / -38.0
		≥ 1000 sf	0.2	-0.4		15.3 / -19.3	16.2 / -20.6	17.0 / -21.5	17.7 / -22.4	18.8 / -23.8	19.7 / -24.9
	Overhang	≤ 10 sf		-1.7		-45.8	-48.7	-51.0	-53.0	-56.3	-59.0
		≤ 100 sf		-1.6		-43.8	-46.5	-48.8	-50.7	-53.8	-56.4
		≥ 500 sf		-1.0		-31.6	-33.5	-35.1	-36.5	-38.8	-40.7
	Zone 1										
	Main Zone	≤ 10 sf	0.3	-1.7		17.3 / -45.8	18.4 / -48.7	19.3 / -51.0	20.0 / -53.0	21.3 / -56.3	22.3 / -59.0
		≤ 100 sf	0.2	-1.3		15.3 / -37.7	16.2 / -40.0	17.0 / -42.0	17.7 / -43.6	18.8 / -46.3	19.7 / -48.5
		≥ 500 sf	0.2	-1.0		15.3 / -31.6	16.2 / -33.5	17.0 / -35.1	17.7 / -36.5	18.8 / -38.8	19.7 / -40.7
	Overhang	≤ 10 sf		-1.7		-45.8	-48.7	-51.0	-53.0	-56.3	-59.0
		≤ 100 sf		-1.6		-43.8	-46.5	-48.8	-50.7	-53.8	-56.4
		≥ 500 sf		-1.0							
	Zone 2										
	Main Zone (Parapets > 3')	≤ 10 sf	0.9	-2.3		29.5 / -58.0	31.4 / -61.7	32.9 / -64.6	34.2 / -67.2	36.3 / -71.4	38.0 / -74.8
		≤ 100 sf	0.74	-1.8		26.2 / -47.9	27.9 / -50.8	29.2 / -53.3	30.4 / -55.4	32.2 / -58.8	33.8 / -61.7
		≥ 500 sf	0.6	-1.4		24.0 / -39.7	25.5 / -42.2	26.8 / -44.2	27.8 / -46.0	29.5 / -48.8	31.0 / -51.2
	Main Zone	≤ 10 sf	0.3	-2.3		17.3 / -58.0	18.4 / -61.7	19.3 / -64.6	20.0 / -67.2	21.3 / -71.4	22.3 / -74.8
		≤ 100 sf	0.2	-1.8		15.3 / -47.9	16.2 / -50.8	17.0 / -53.3	17.7 / -55.4	18.8 / -58.8	19.7 / -61.7
		≥ 500 sf	0.2	-1.4		15.3 / -39.7	16.2 / -42.2	17.0 / -44.2	17.7 / -46.0	18.8 / -48.8	19.7 / -51.2
	Overhang	≤ 10 sf		-2.3		-58.0	-61.7	-64.6	-67.2	-71.4	-74.8
		≤ 100 sf		-1.6		-43.8	-46.5	-48.8	-50.7	-53.8	-56.4
		≥ 500 sf		-1.1		-33.6	-35.7	-37.4	-38.9	-41.3	-43.3
	Zone 3										
	Main Zone (Parapets > 3')	≤ 10 sf	0.9	-2.3		29.5 / -58.0	31.4 / -61.7	32.9 / -64.6	34.2 / -67.2	36.3 / -71.4	38.0 / -74.8
		≤ 100 sf	0.74	-1.8		26.2 / -47.9	27.9 / -50.8	29.2 / -53.3	30.4 / -55.4	32.2 / -58.8	33.8 / -61.7
		≥ 500 sf	0.6	-1.4		24.0 / -39.7	25.5 / -42.2	26.8 / -44.2	27.8 / -46.0	29.5 / -48.8	31.0 / -51.2
	Main Zone	≤ 10 sf	0.3	-3.2		17.3 / -76.4	18.4 / -81.1	19.3 / -85.0	20.0 / -88.4	21.3 / -93.9	22.3 / -98.4
		≤ 100 sf	0.2	-2.2		15.3 / -56.0	16.2 / -59.5	17.0 / -62.4	17.7 / -64.8	18.8 / -68.8	19.7 / -72.2
		≥ 500 sf	0.2	-1.4		15.3 / -39.7	16.2 / -42.2	17.0 / -44.2	17.7 / -46.0	18.8 / -48.8	19.7 / -51.2
	Overhang	≤ 10 sf		-3.2		-76.4	-81.1	-85.0	-88.4	-93.9	-98.4
		≤ 100 sf		-2.0		-51.9	-55.2	-57.8	-60.1	-63.8	-66.9
		≥ 500 sf		-1.1		-33.6	-35.7	-37.4	-38.9	-41.3	-43.3

LIONAKIS

Project # 019124.02 Sheet # 8

Project Rio City Café Deck

Professional KLS Date 10/26/23

STRUCTURAL LOADS - ROOF

Location: **Typ Roof**

		Deck	Beam	Truss	Column	Self Wt
Dead Load						
Roofing:	3-Ply w/re-roof	3				
Insulation:	1" Rigid	0.5				
Decking:	3/4" Plywood	2.3				
	1/2" DensDeck	2				
Fireproofing:						
Fire Sprinklers:			2			
Ceiling Backing/Suppo	-	0				
Ceiling:	-	0				
Mech. & Elec.:			2			
Beam:			3			Yes
Girder:				5		Yes
Column:					1	Yes
Other:						
Misc.:		4.2				
Mech. Equip.						
Total Dead Load Excluding Self Weight		12	16	16	16	
Total Dead Load		**12**	**19**	**24**	**25**	
Live Load		**20**	**20**	**20**	**20**	
Dead + Live Load		**32**	**39**	**44**	**45**	

STRUCTURAL LOADS - FLOOR

Location: **Ext Deck**

		Deck	Beam	Girder	Column	Self Wt
Dead Load						
Flooring	Carpet/Pads	2				
Flooring Underlaymen	-	0				
Insulation:	-	0				
Decking:	4x Wood Deck	11				
Addl. Conc.						
Fireproofing:						
Fire Sprinklers:						
Ceiling Backing/Suppc	-	0				
Ceiling:	-	0				
Mech. & Elec.:		2				
Beam:			7			Yes
Girder:				5		Yes
Column:					1	Yes
Other:						
Misc.:		1				
Total Dead Load Excluding Self Weight		**16**	**16**	**16**	**16**	
Dead Load	**(psf)**	**16**	**23**	**28**	**29**	
Live Load	**(psf)**	**100**	**100**	**100**	**100**	
Partition Load	**(psf)**	**0**	**0**	**0**	**0**	
Total Load	**(psf)**	**116**	**123**	**128**	**129**	

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Project # 019124.02 Sheet # D1

Project RIO CITY CAFE

Professional KJV Date 12/1/20

- DECK BOARDS – SPAN = 4'

$q = 15^{D} + 100^{L}$ PSF

USE 4X8 W/ AIRGAP BTWN FOR DURABILITY & TO ALLOW FOR RECESSED CONNS TO SUPPORTS BLW

$M = (15+100)(8/12)(4')^2/8 = 153$ 1#

$f_b = 153(12)/14.80 = 124$ PSI OK

$I_{req} = (15+100)(8/12)(4')^3/2370 = 2.07\ in^4$ @ $\ell/360$

$I = 25.9$ OK

LIONÄKIS

Project # 019124.02 Sheet #
Project BIO CITY CAFÉ
Professional KJV Date 12/1/20

- ROOF RAFTERS SPAN = 10'-0 MAX

$W = (24^D + 20^L)\,2'\ TRIB = 48^D, 40^L\ PLF$

$f_b = [(48^D + 40^L)(10')^2(12)/8]/17.64 = 748\ PSI$

$I_{req'd}\ @ L/240 = (48^D + 40^L)(10^3)/3778 = 23.3\ in^4$

4X6 P.T. DF #NO 1 @24"OC

$R = (48^D + 40^L)\,10'/2 = 240^D\#, 200^L\#$

- ROOF TRUSSES @10'OC SPAN = 18'

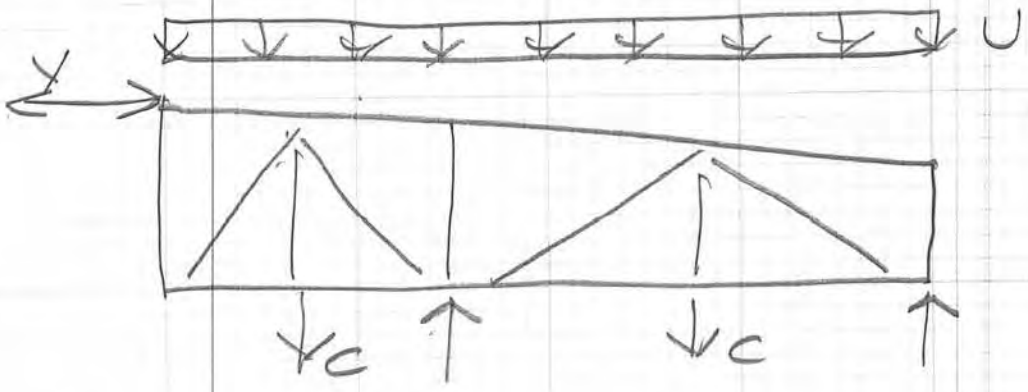
USE PRE-FAB TRUSSES W/ MIN 4X6 MEMBERS

$W = (24^D + 20^L)(10') = 240^D\ PLF, 200^L\ PLF$

$R = (240^D + 200^L)\,18'/2 = 2160^D\#, 1800^L\#$

TRUSS LOAD DIAGRAMS

- TRUSS 1



CD=250#

$U L_r = 20(9.29') = 186$ PLF

$UD = 24(9.29') = 223$ PLF

$UW_m = -23(9.29') = -214$ PLF

$UW_m = 9.4(9.29') = 87$ PLF

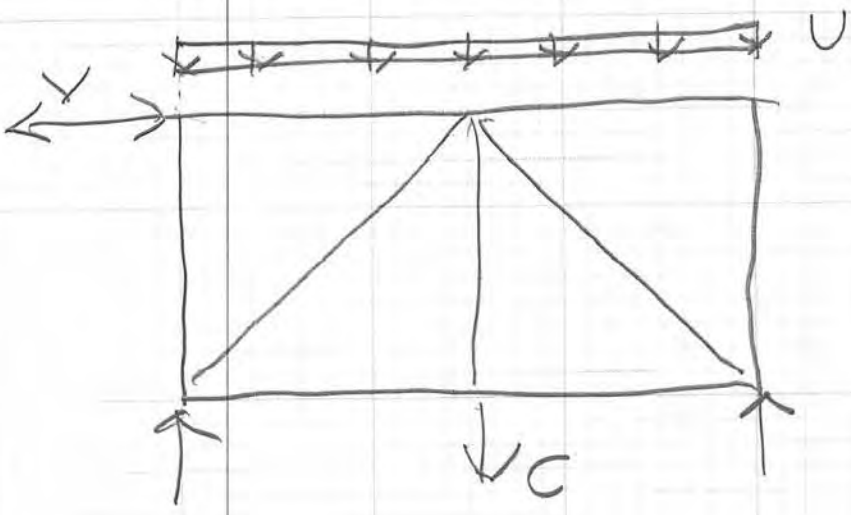
$UW_c = 17.7(9.29') = 164$ PLF

$UW_c = -55.4(9.29') = -515$ PLF

$VE = 13(9.29')(2)(30') = 7246\#$

$VW_m = 323(9.29')(2) = 6001\#$

- TRUSS 2



CD = 25 0#

$UL_r = 20\ (4\frac{1}{2}+1') = 60$ PLF

$U_D = 24\ (4\frac{1}{2}+1') = 72$ PLF

$UW_m = -23\ (4\frac{1}{2}+1') = -69$ PLF

$UW_m = 9.4\ (4\frac{1}{2}+1') = 28$ PLF

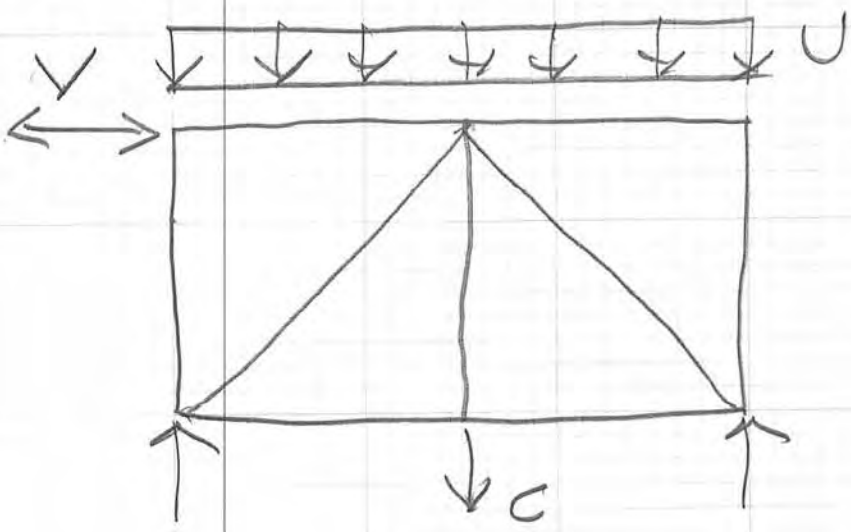
$UW_c = 17.7\ (4\frac{1}{2}+1') = 53$ PLF

$UW_c = -55.4\ (4\frac{1}{2}+1') = -166$ PLF

$VE = 13(9.29')(2)(0.29) = 1520\#$

$VW_m = 323\ (0.29')(9.29')(2)/07.03' = 503\#$

- TRUSS 3



CD = 250#
UL_r = 20 (4') = 80 PLF
UD = 24 (4') = 96 PLF
UW_M = -23 (4') = -92 PLF
UW_M = 9.4 (4') = 38 PLF
UW_C = 17.7 (4') = 71 PLF
UW_C = -55.4 (4') = -222 PLF
VE = 13 (9.29') (2) (23.21') = 5606#
VW_M = 323 (23.21') (9.29') (2) / 67.03 = 2078#

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Project # 019124.02 Sheet # 1

Project Rio City Cafe Deck

Professional KLS Date 12/12/2023

Lateral Loads

Seismic:
See design criteria for Cs factor
Ex = Ey = 0.51W

@ Roof:
Distribute to top of each column as point load in model
Ex_rf = 0.51(25psf) = 13psf x (Col line Trib Area)/4
Ey_rf = 0.51(25psf) = 13psf x (Col line Trib Area)/2

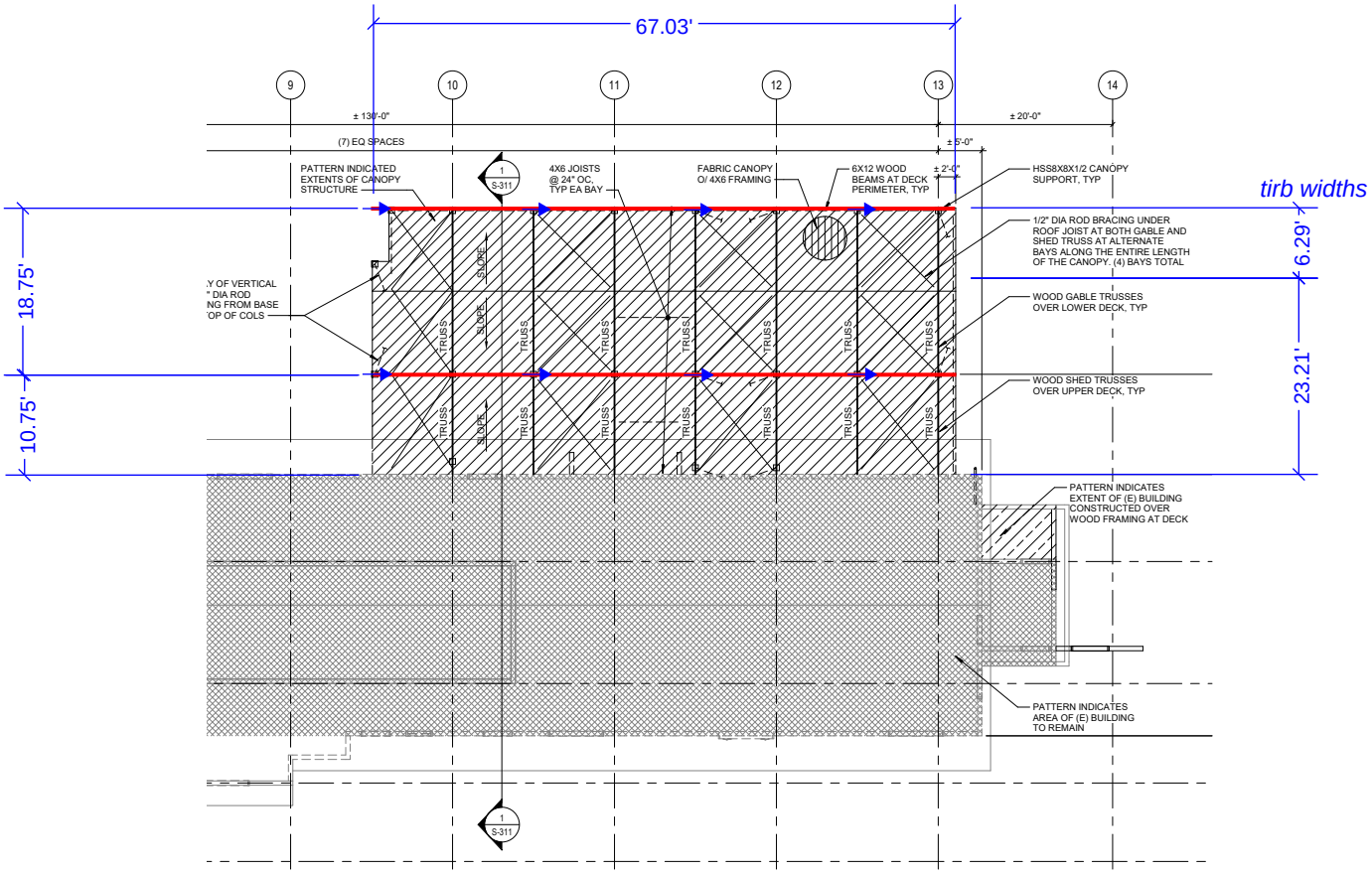
@ Floor:
Apply as uniform load over deck
Ex_flr = Ey_flr = 0.51(29psf) = 15psf

Wind (MWFRS):
See design criteria for uniform loads

@ Roof:
Distribute to top of each column as point load in model
+X & -X dir: Wx_rf = (29psf+9psf)(9'/2+4') = 323plf x (col bay width)/4
+Y dir: W+y_rf = 9psf(9'/2+4') = 77plf x (col bay width)/2
-Y dir: W-y_rf = 29psf(9'/2+4') = 247plf x (col bay width)/2

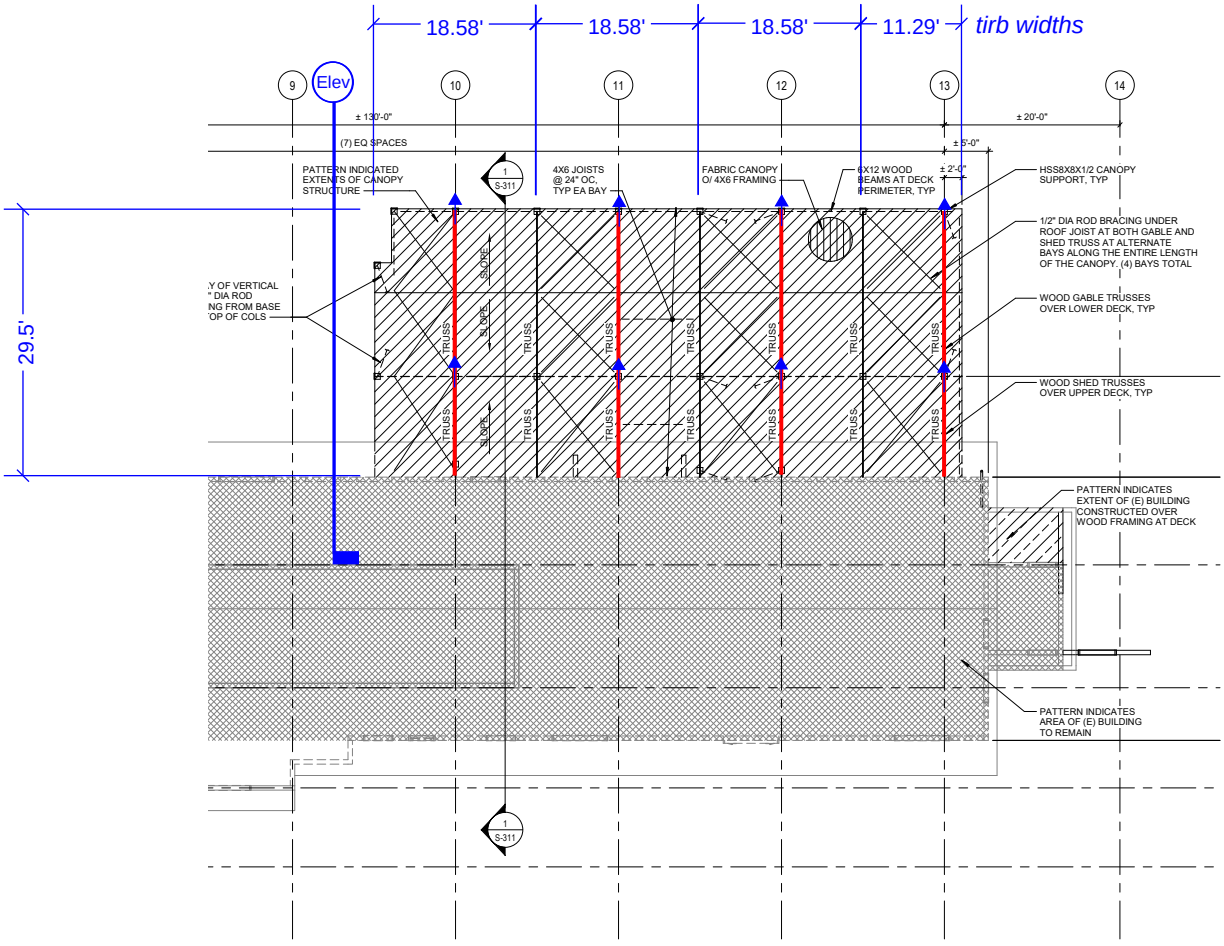
@ Floor:
Apply as line load at edge deck
Leeward @ covered section: W_flr = 9psf(9'/2+1.5') = 54plf
Windward @ covered section: W_flr = 29psf(9'/2+1.5') = 174plf

Leeward @ uncovered section: W_flr = 9psf(1.5') = 14plf
Windward @ uncovered section: W_flr = 29psf(1.5') = 44plf



ROOF LFRS E/W (TRIB AREAS)

Lateral Loads Cont'd



ROOF LFRS N/S (TRIB AREAS)

Wind (MWFRS), vertical loading:
See design criteria for uniform loads
Apply "overhang" pressures to flr deck simultaneously with roof uplift/downward wind loads.
Roof slope less than 10deg. MWFRS wind roof loads shall be combined with wind loads in both x and y dir.

@ covered areas:
W_uplift and W_downward = -23psf/9.4psf x (col tirb area)
W_underside = +/-29psf

@ uncovered deck:
W_uplift = (-23psf - 29psf) = -52psf
W_downward = (9.4psf + 29psf) = 38psf

LIONAKIS

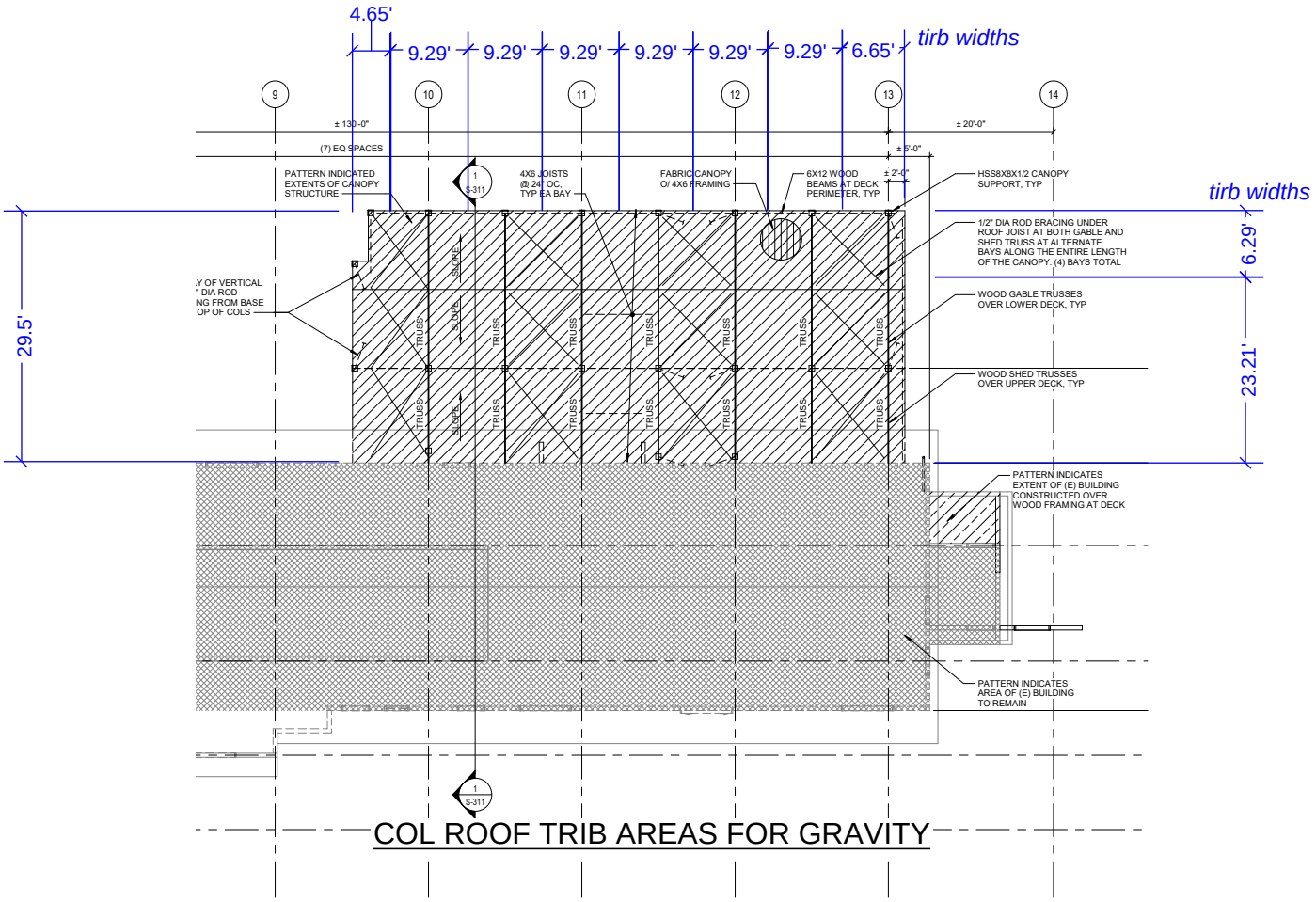
Project # 019124.02 Sheet # 3

Project Rio City Cafe Deck

Professional KLS Date 12/12/2023

Roof Gravity Loads

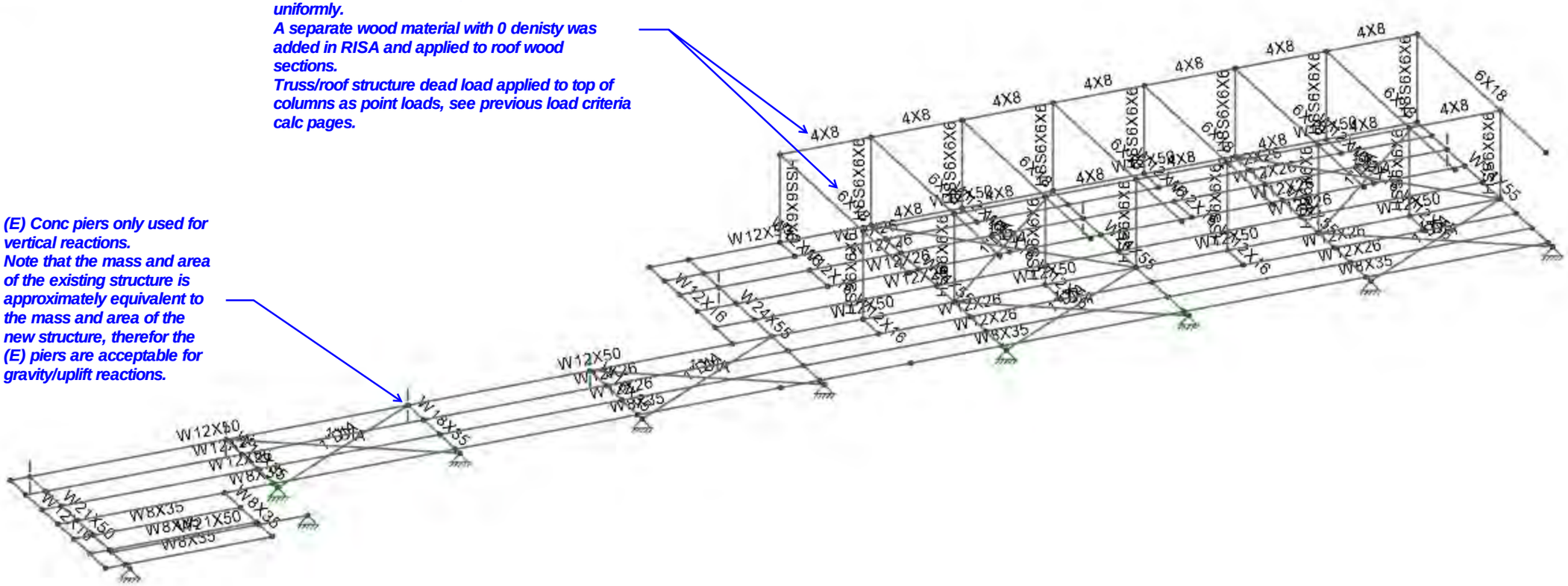
Roof loads applied as point loads to top of columns
DL = 24psf x (col trib area)
Lr = 20psf x (col trib area)



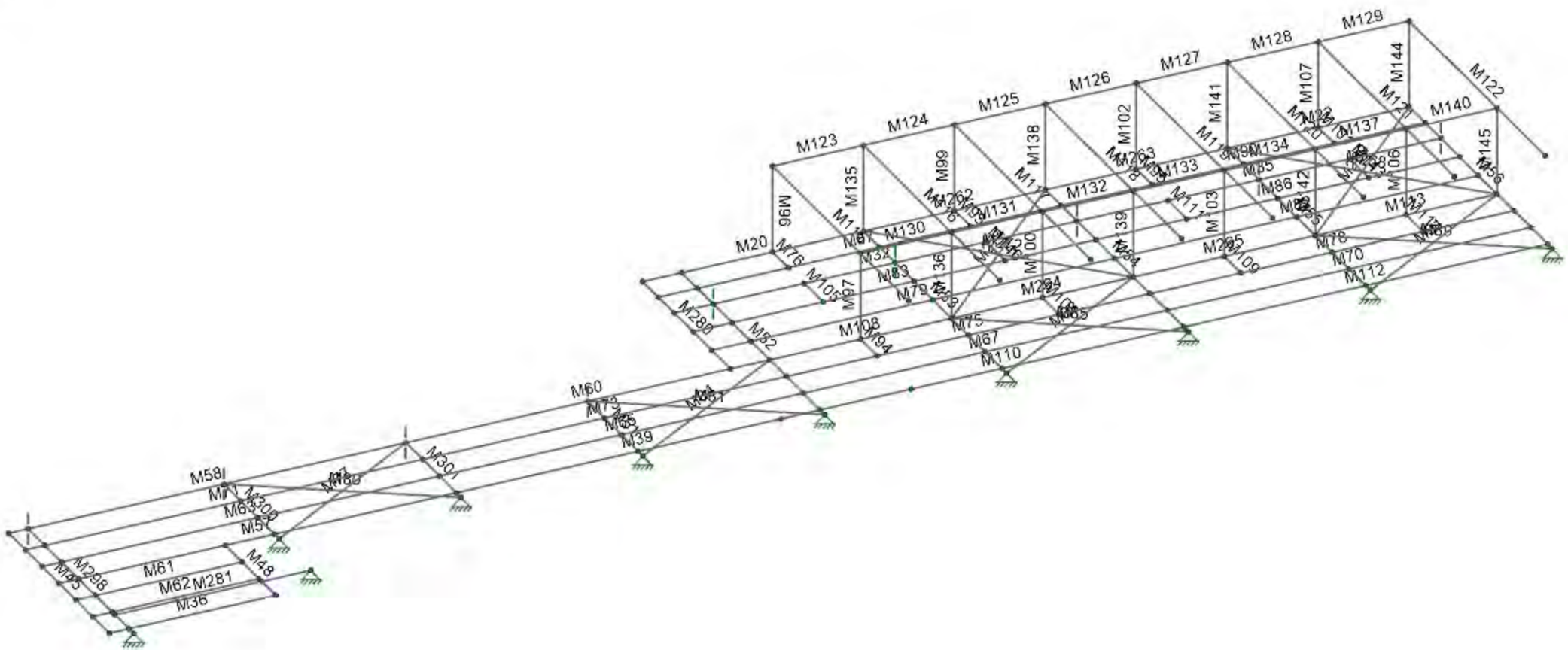
COL ROOF TRIB AREAS FOR GRAVITY

Roof framing by others.
Wood sections were added to model to provide stiffness to simulate the actual top of column condition with columns expected to deflect uniformly.
A separate wood material with 0 denisty was added in RISA and applied to roof wood sections.
Truss/roof structure dead load applied to top of columns as point loads, see previous load criteria calc pages.

(E) Conc piers only used for vertical reactions.
Note that the mass and area of the existing structure is approximately equivalent to the mass and area of the new structure, therefor the (E) piers are acceptable for gravity/uplift reactions.



Lionakis		SK-1
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



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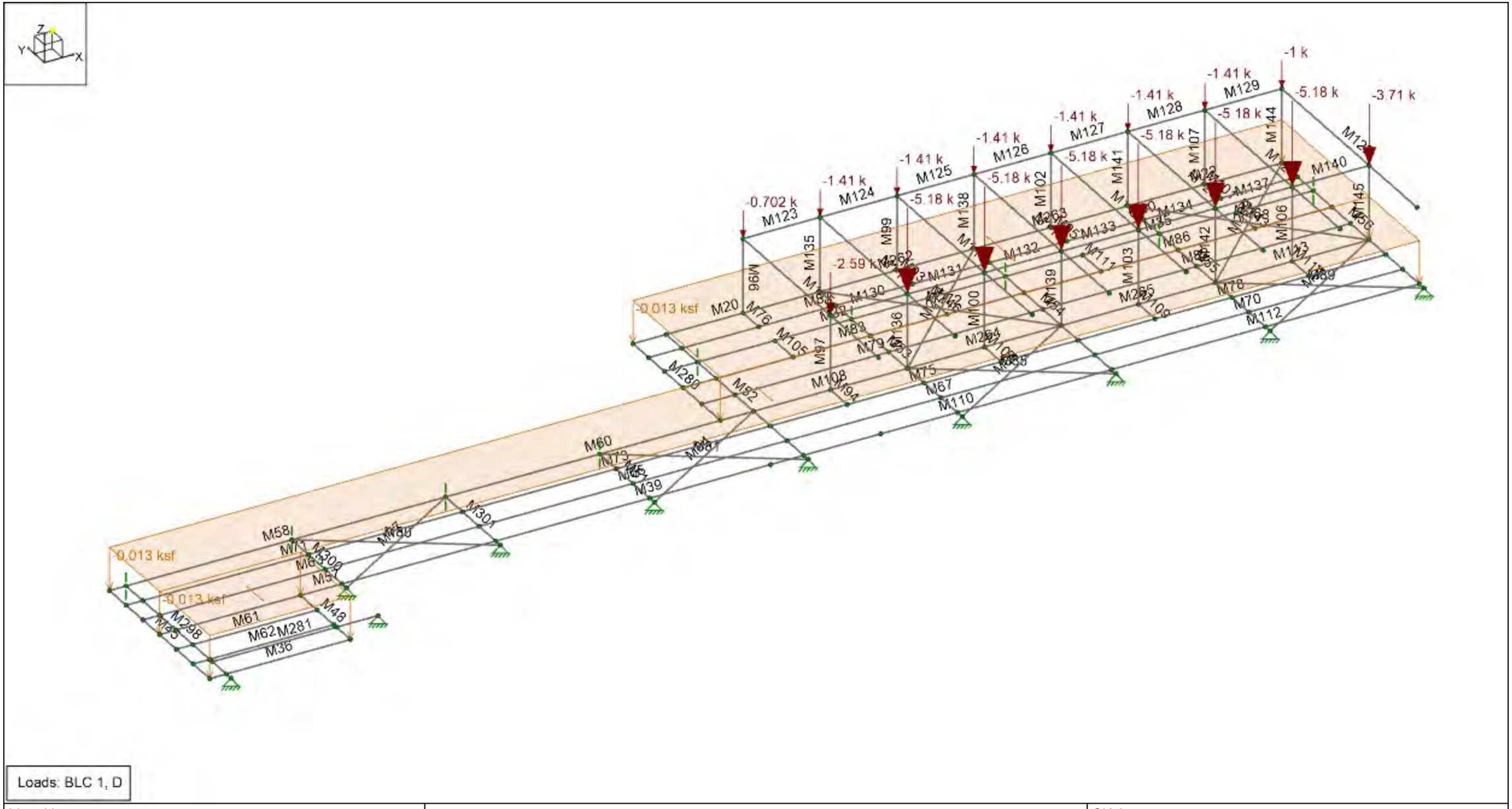
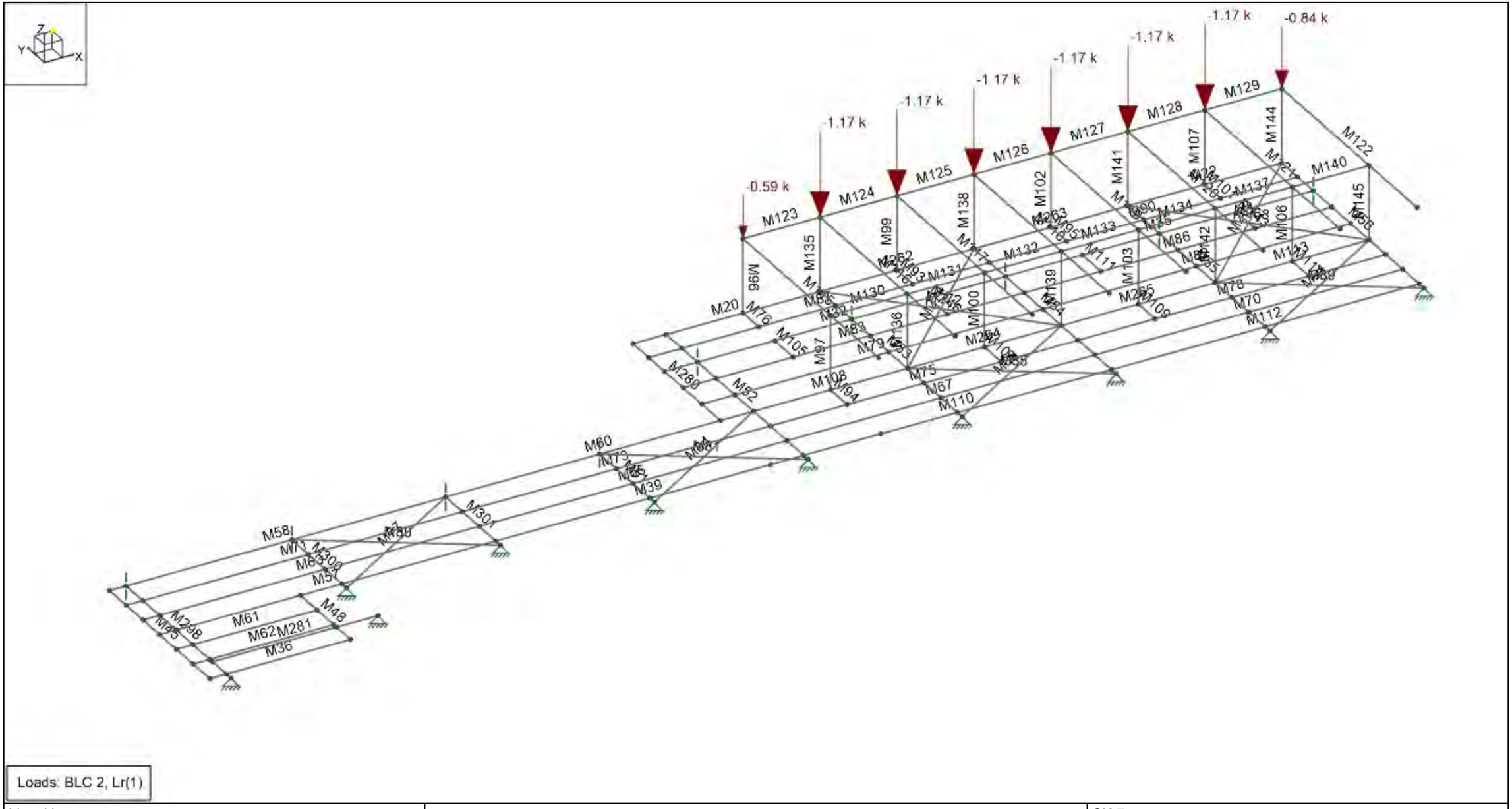
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



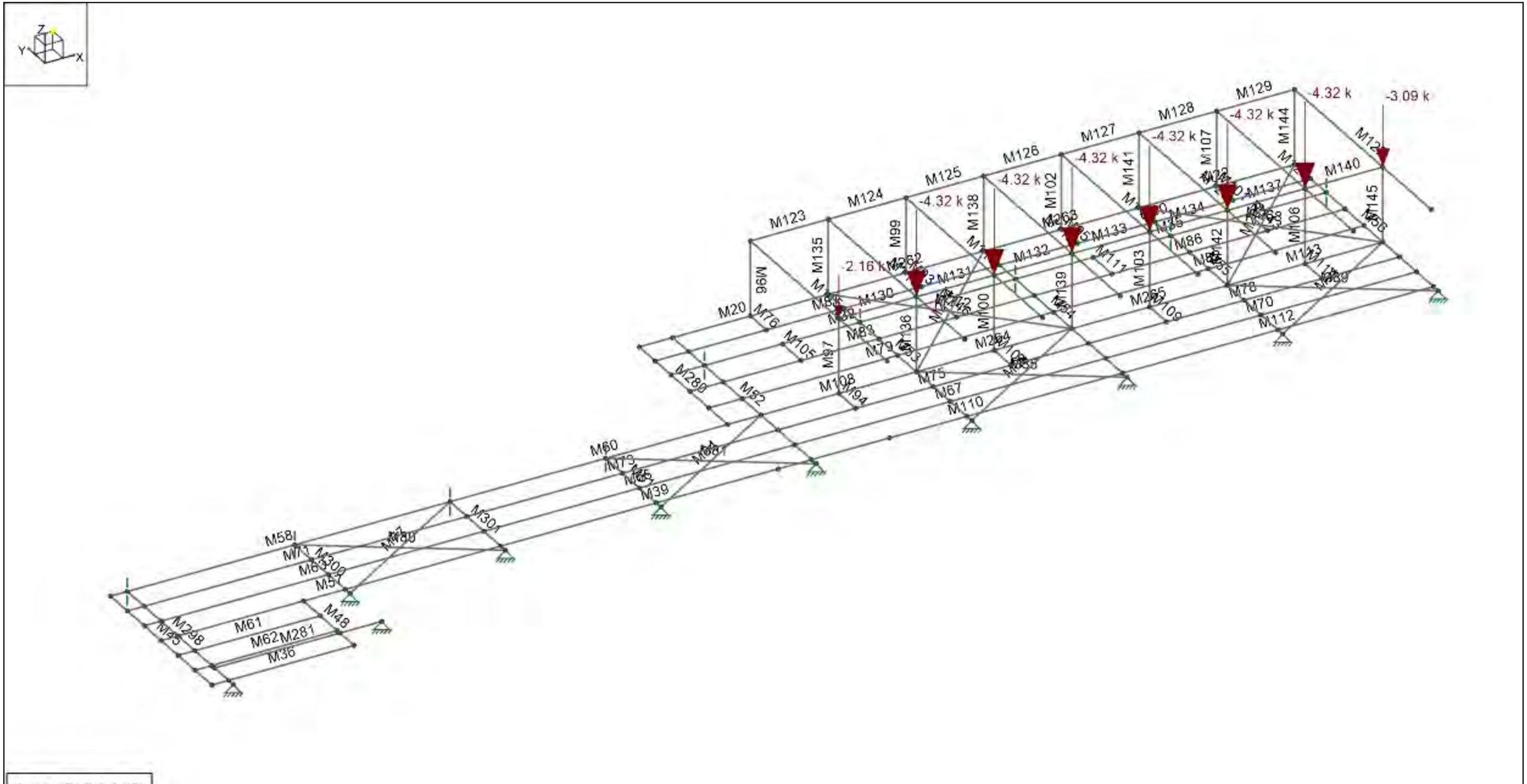
Loads: BLC 1, D

Lionakis		SK-6
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d

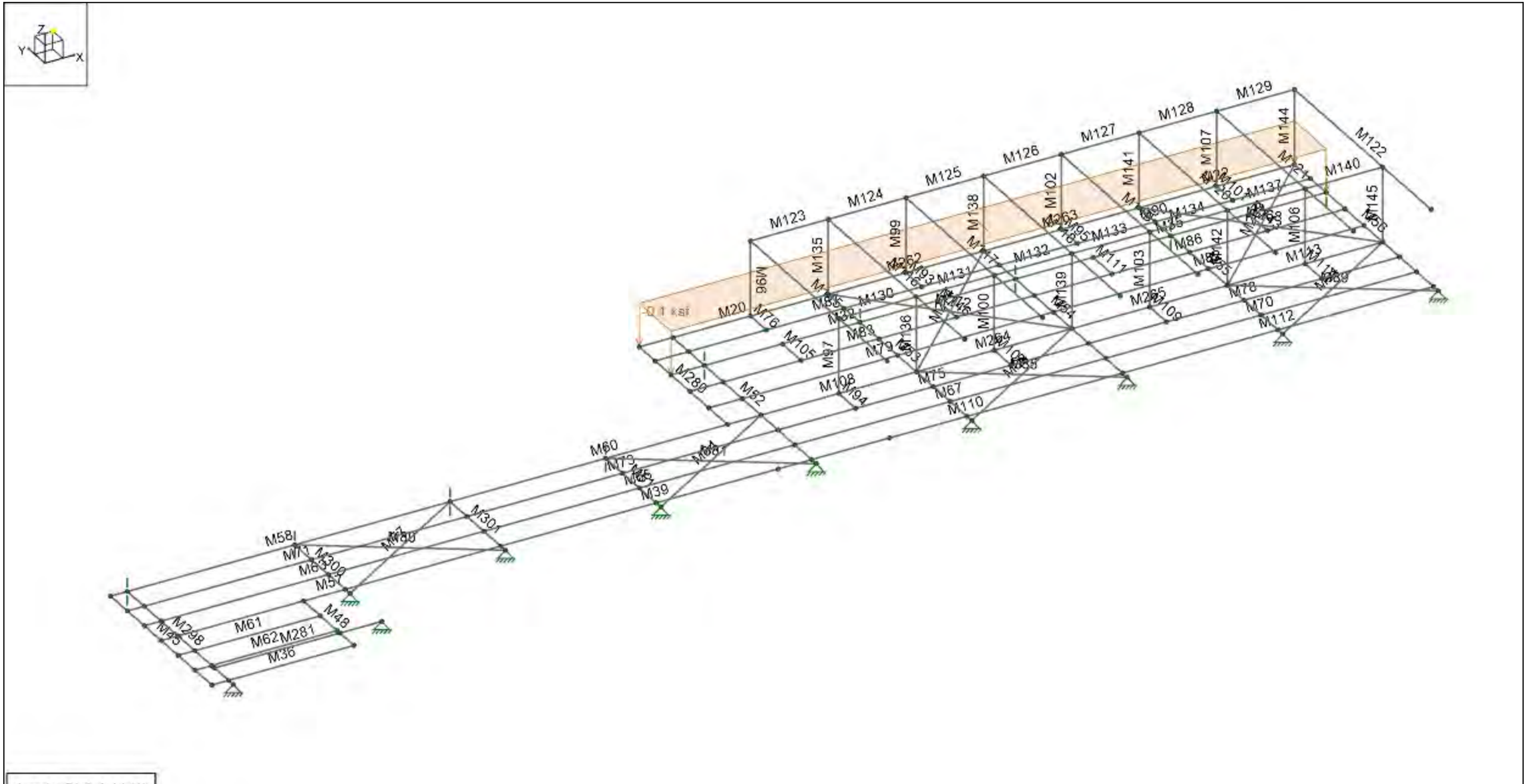


Loads: BLC 2, Lr(1)

Lionakis		SK-7
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d

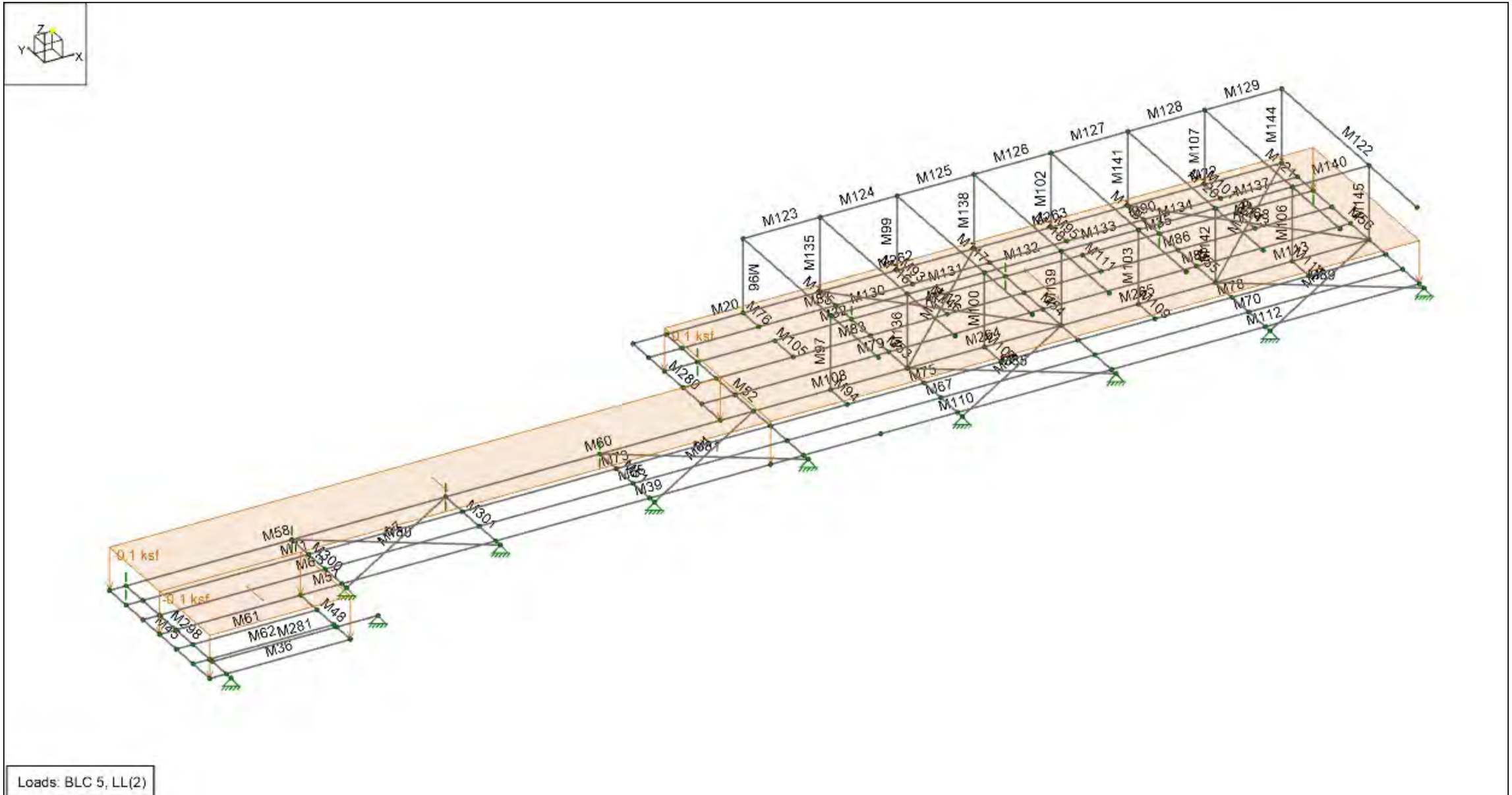


Lionakis		SK-8
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



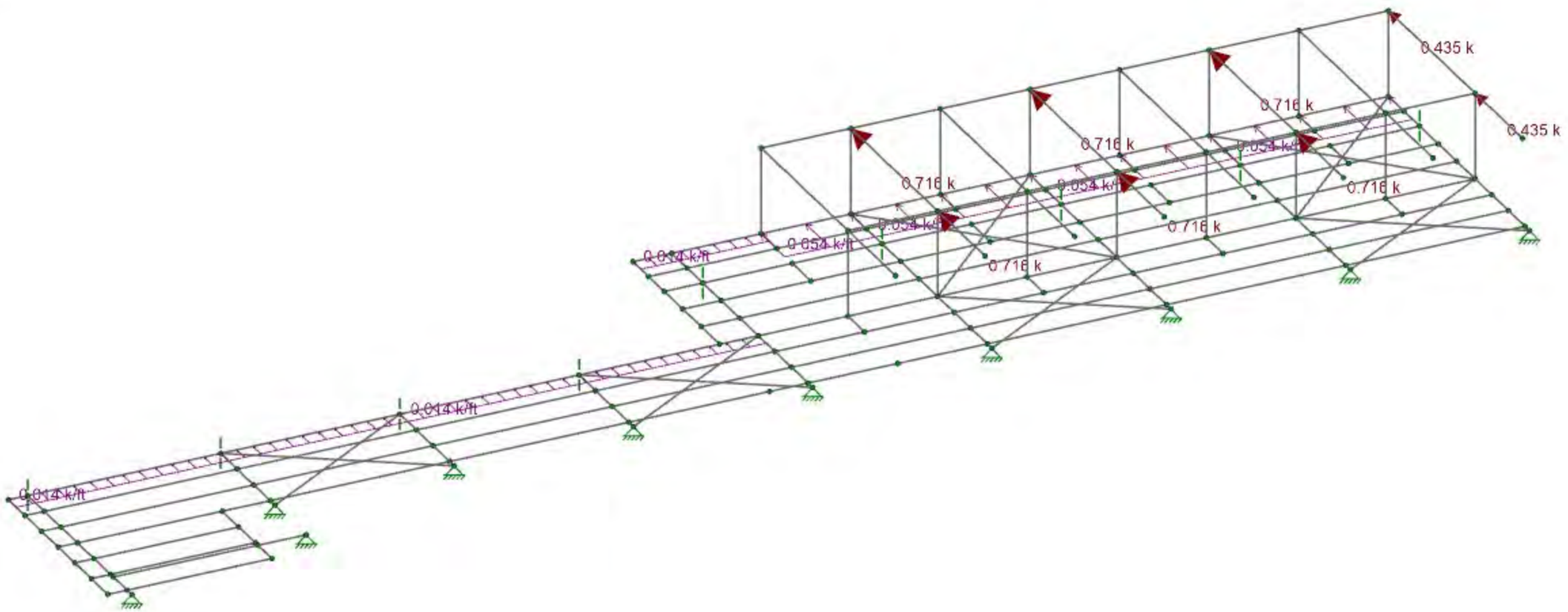
Loads: BLC 4, LL(1)

Lionakis		SK-9
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



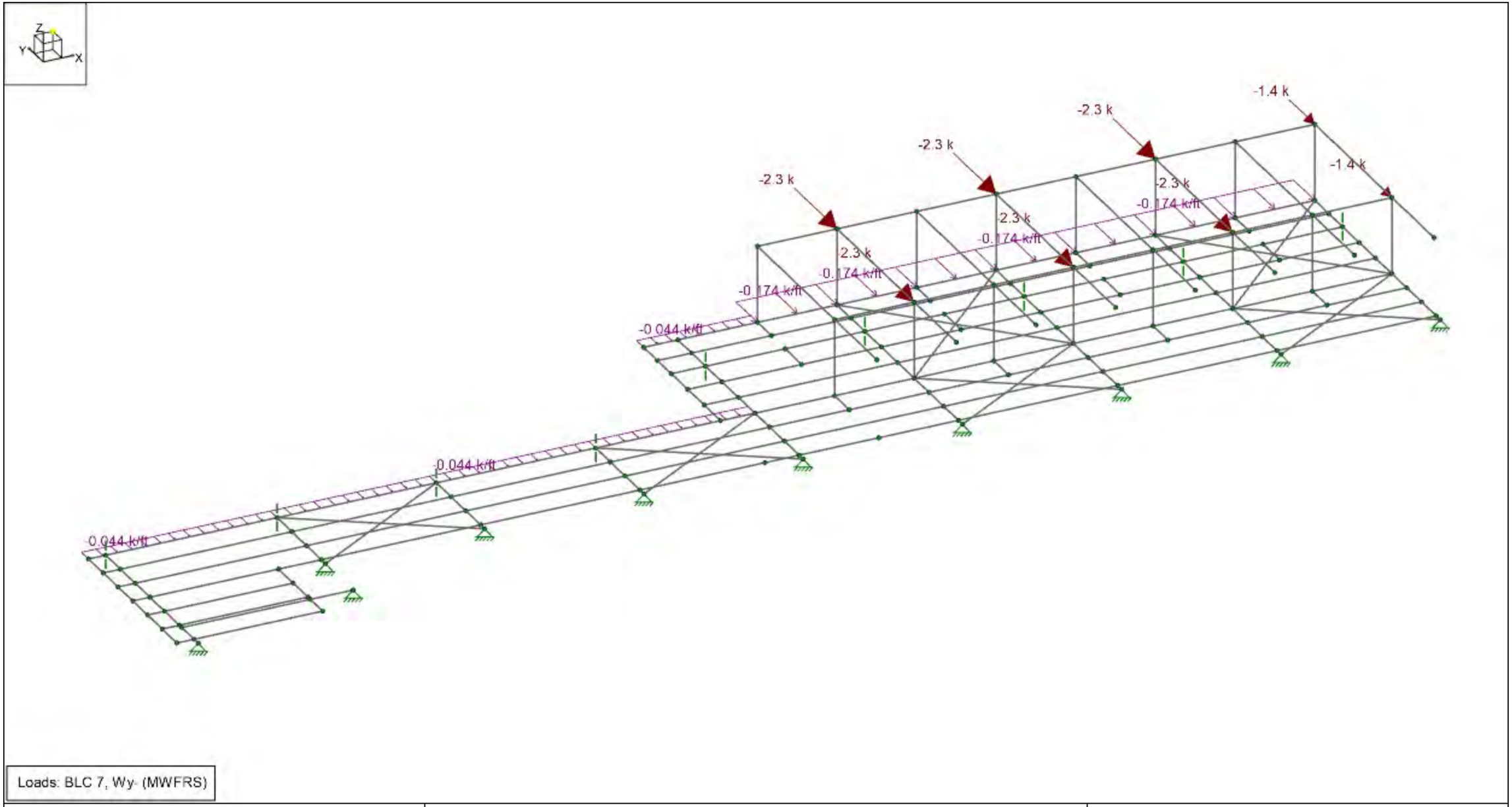
Loads: BLC 5, LL(2)

Lionakis		SK-10
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



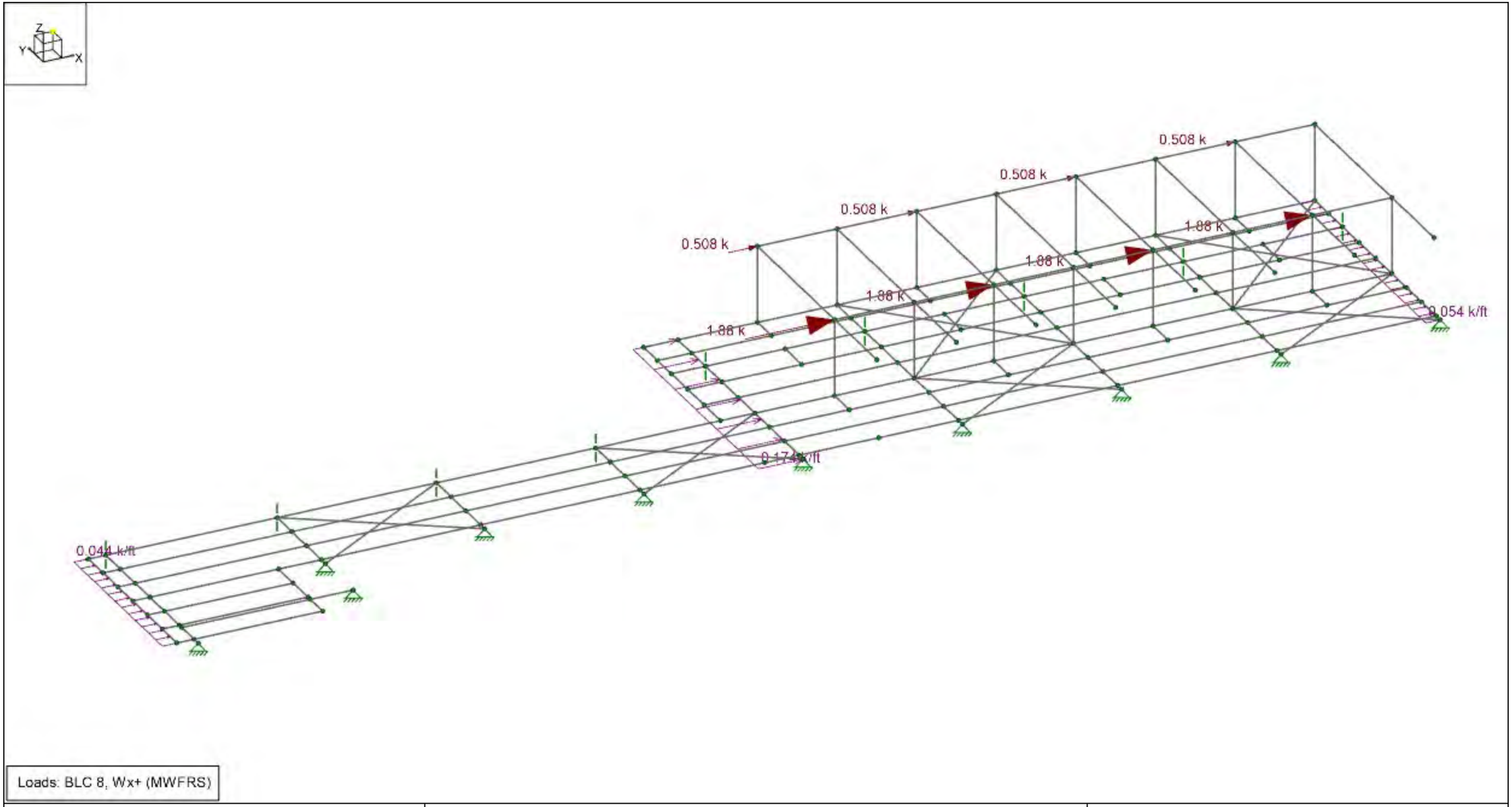
Loads: BLC 6, Wy+ (MWFRS)

Lionakis		SK-11
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



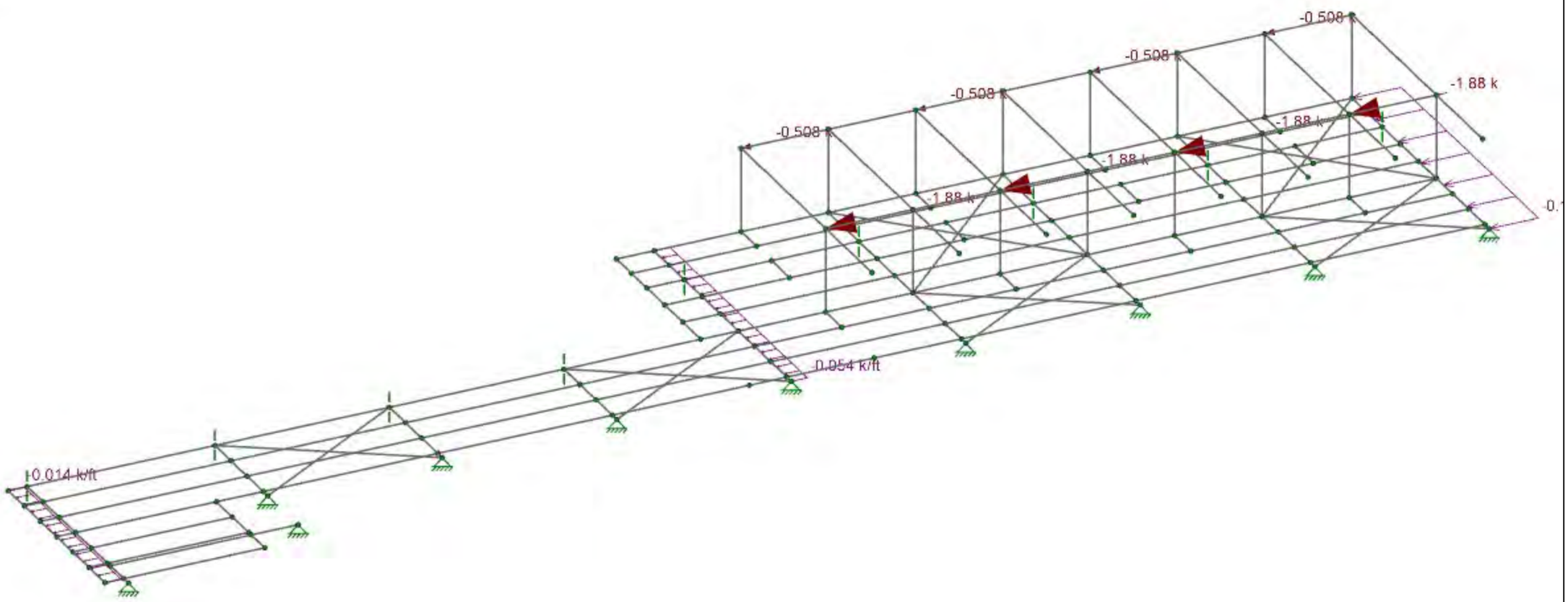
Loads: BLC 7, Wy- (MWFRS)

Lionakis		SK-12
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



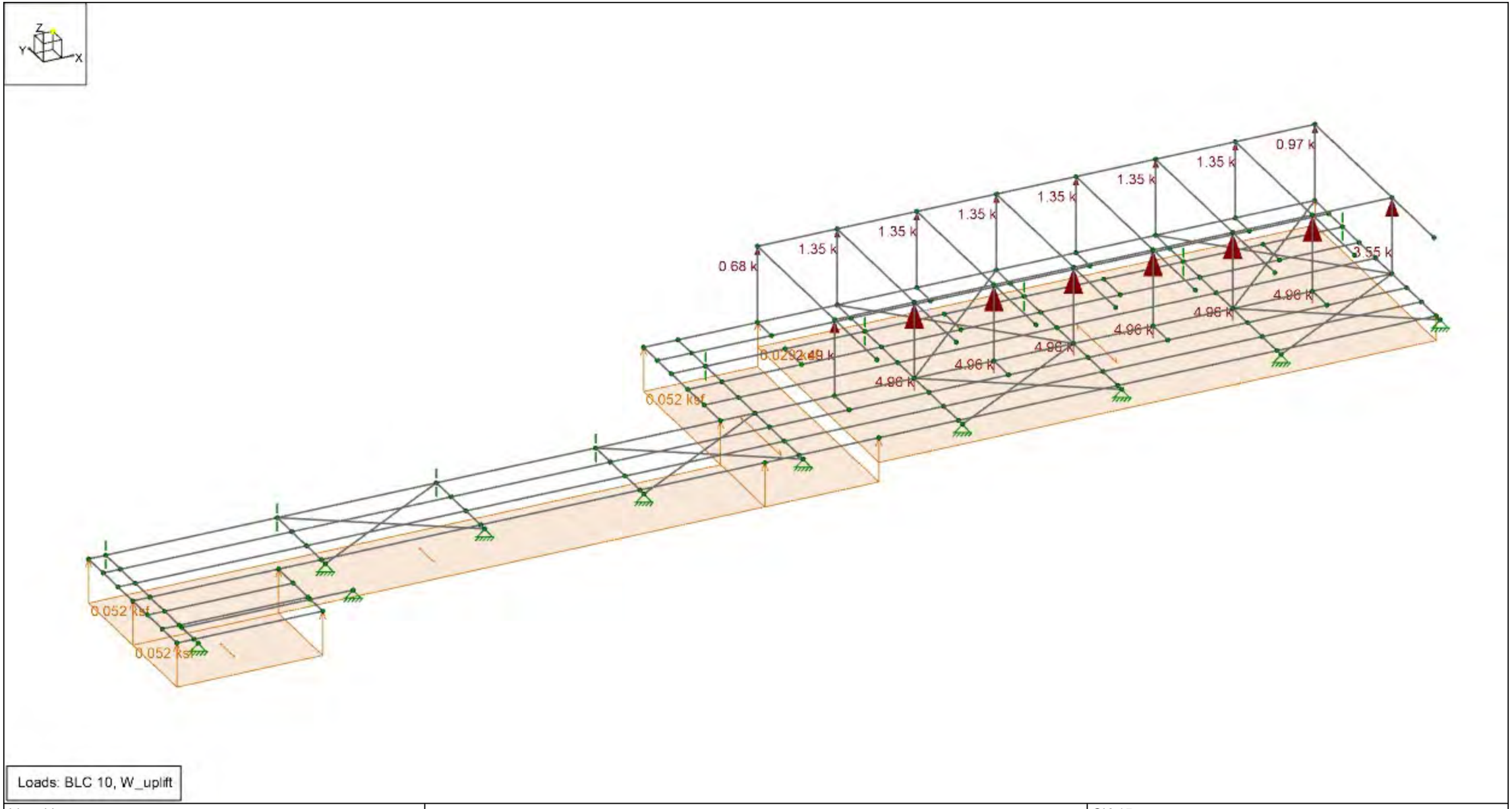
Loads: BLC 8, Wx+ (MWFRS)

Lionakis		SK-13
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



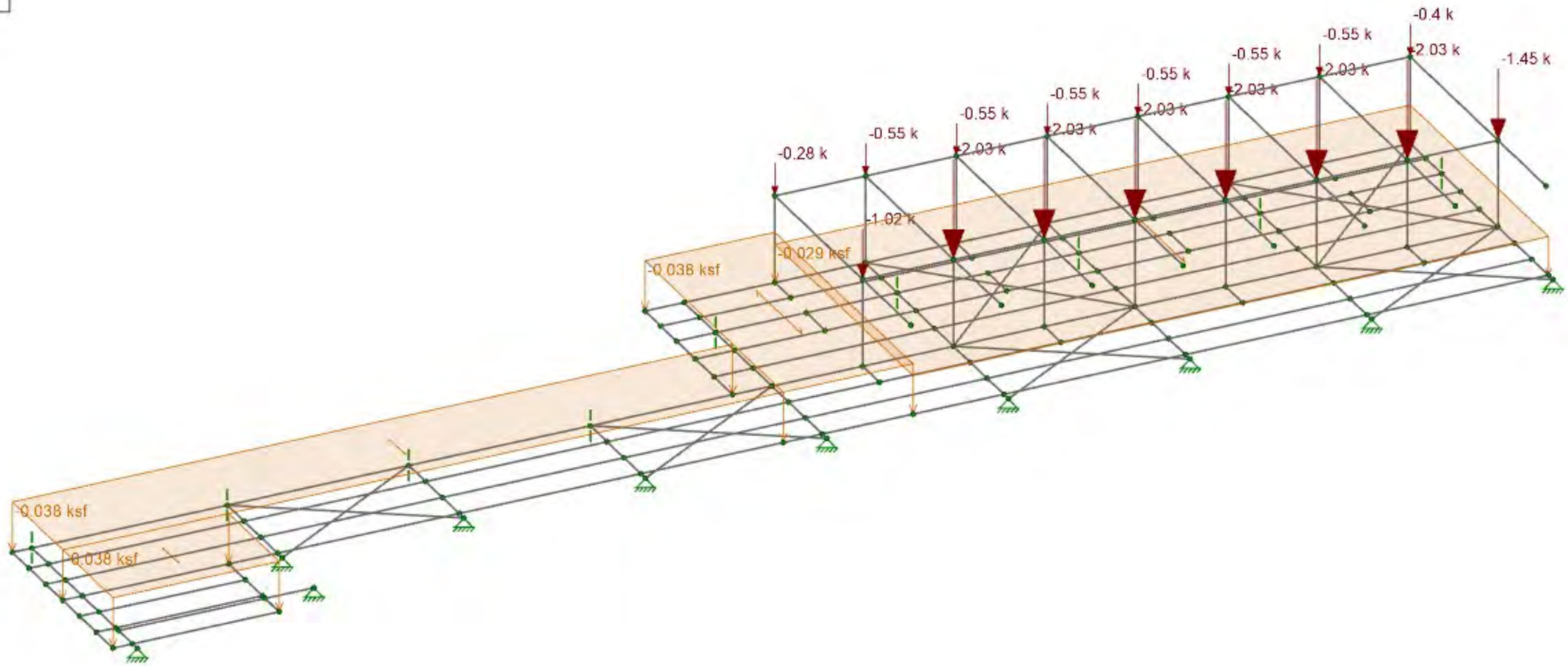
Loads: BLC 9, Wx- (MWFRS)

Lionakis		SK-14
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



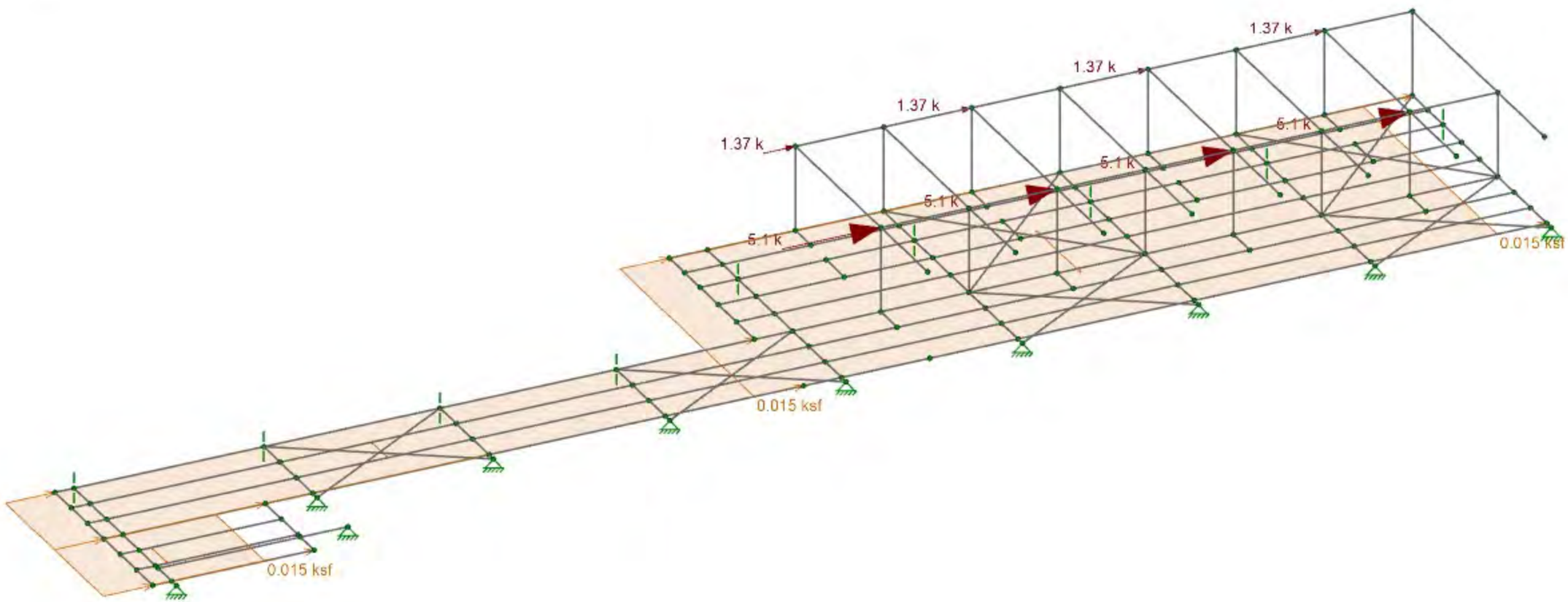
Loads: BLC 10, W_uplift

Lionakis		SK-15
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



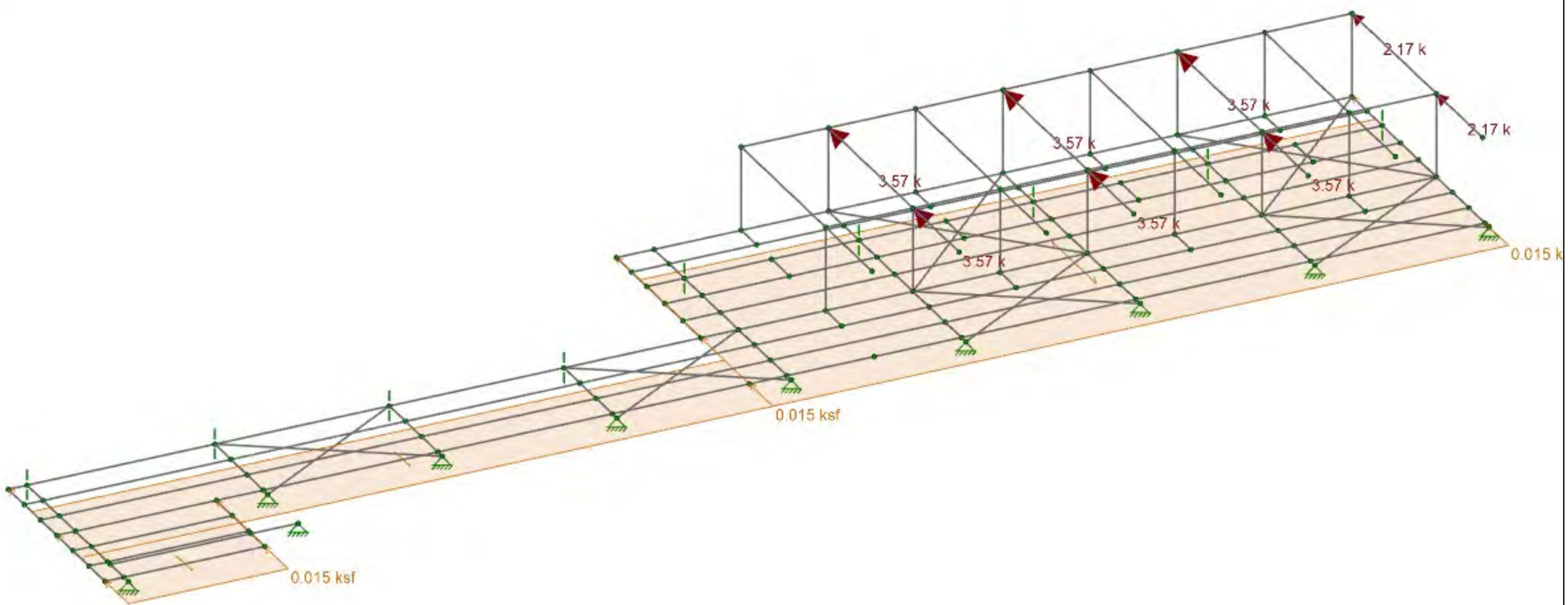
Loads: BLC 11, W_downward

Lionakis		SK-16
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



Loads: BLC 12, Ex

Lionakis		SK-17
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d



Loads: BLC 13, Ey

Lionakis		SK-18
KLS		Dec 12, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d

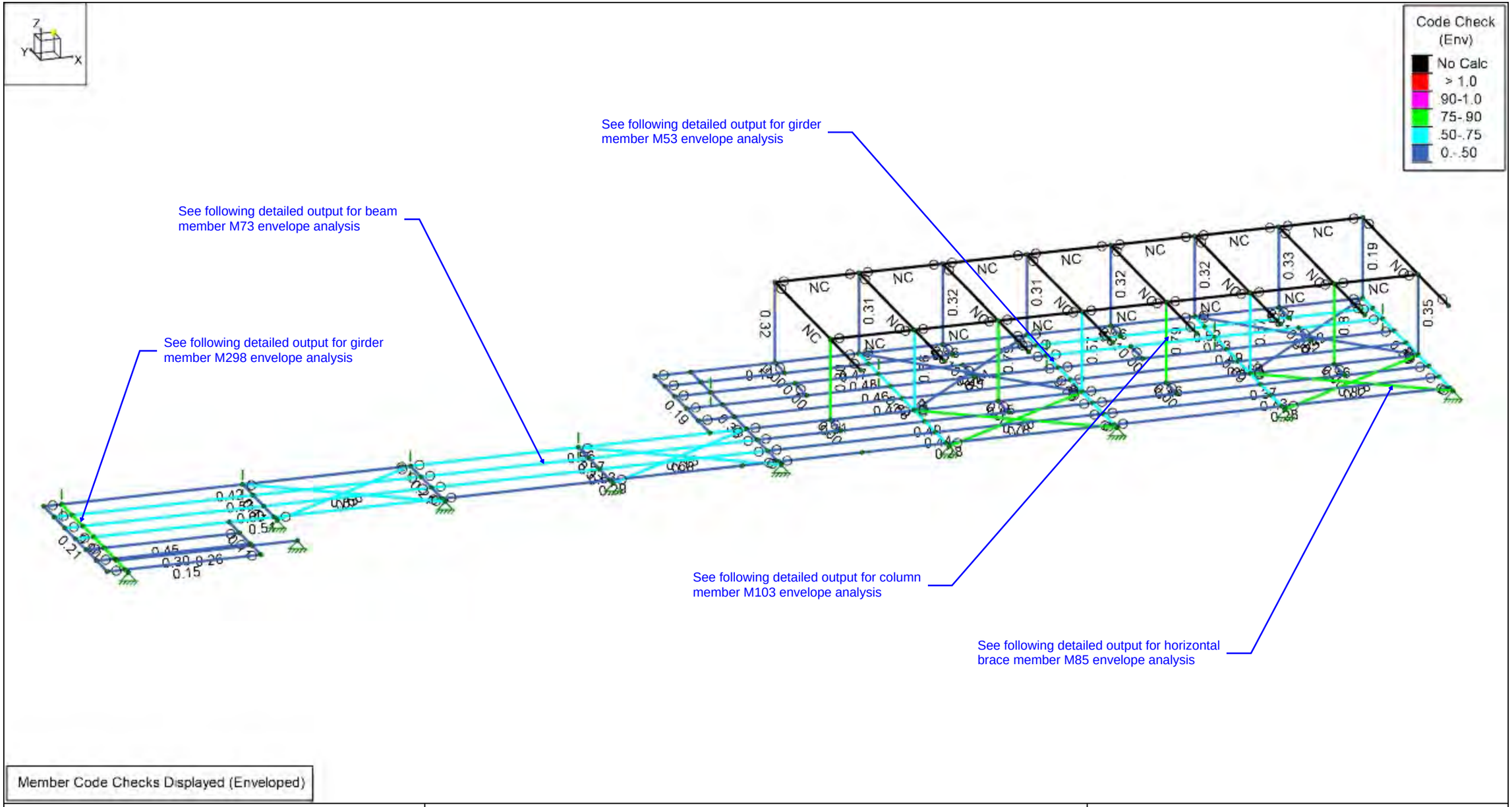
Basic Load Cases

	BLC Description	Category	Z Gravity	Nodal	Distributed	Area(Member)
1	D	DL	-1	16		3
2	Lr(1)	RLL		8		
3	Lr(2)	RLL		8		
4	LL(1)	LL				1
5	LL(2)	LL				3
6	Wy+ (MWFRS)	None		8	7	
7	Wy- (MWFRS)	None		8	7	
8	Wx+ (MWFRS)	None		8	3	
9	Wx- (MWFRS)	None		8	3	
10	W_uplift	None		16		4
11	W_downward	None		16		4
12	Ex	ELX		8		3
13	Ey	ELY		8		3
14	D (self)	None	-1			
15	BLC 1 Transient Area Loads	None			265	
16	BLC 4 Transient Area Loads	None			90	
17	BLC 5 Transient Area Loads	None			261	
18	BLC 10 Transient Area Loads	None			271	
19	BLC 11 Transient Area Loads	None			271	
20	BLC 12 Transient Area Loads	None			296	
21	BLC 13 Transient Area Loads	None			296	

Load Combinations

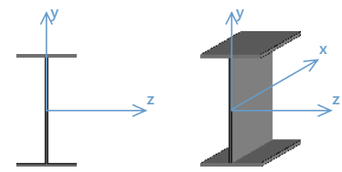
	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	D	Yes	Y	DL	1								
2	LL(1)	Yes	Y	4	1								
3	LL(2)	Yes	Y	5	1								
4	LL	Yes	Y	LL	1								
5	Lr(1)	Yes	Y	2	1								
6	Lr(2)	Yes	Y	3	1								
7	Lr	Yes	Y	RLL	1								
8	D+LL(1)	Yes	Y	DL	1	4	1						
9	D+LL(2)	Yes	Y	DL	1	5	1						
10	D+LL	Yes	Y	DL	1	LL	1						
11	D+Lr(2)	Yes	Y	DL	1	2	1						
12	D+Lr(2)	Yes	Y	DL	1	3	1						
13	D+Lr	Yes	Y	DL	1	RLL	1						
14	D+0.75LL(2)+0.75Lr	Yes	Y	DL	1	5	0.75	RLL	0.75				
15	D+0.75LL+0.75Lr	Yes	Y	DL	1	LL	0.75	RLL	0.75				
16	D+0.6(Wy+)(MWFRS)+0.6W_downward	Yes	Y	DL	1	6	0.6	11	0.6				
17	D+0.6(Wy-)(MWFRS)+0.6W_downward	Yes	Y	DL	1	7	0.6	11	0.6				
18	D+0.6(Wx+)(MWFRS)+0.6W_downward	Yes	Y	DL	1	8	0.6	11	0.6				
19	D+0.6(Wx-)(MWFRS)+0.6W_downward	Yes	Y	DL	1	9	0.6	11	0.6				
20	0.6D+0.6(Wy+)(MWFRS)+0.6W_uplift	Yes	Y	DL	0.6	6	0.6	10	0.6				
21	0.6D+0.6(Wy-)(MWFRS)+0.6W_uplift	Yes	Y	DL	0.6	7	0.6	10	0.6				
22	0.6D+0.6(Wx+)(MWFRS)+0.6W_uplift	Yes	Y	DL	0.6	8	0.6	10	0.6				
23	0.6D+0.6(Wx-)(MWFRS)+0.6W_uplift	Yes	Y	DL	0.6	9	0.6	10	0.6				
24	(1+0.14Sds)D+0.7Ex	Yes	Y	DL	1.1	12	0.7						
25	(1+0.14Sds)D-0.7Ex	Yes	Y	DL	1.1	12	-0.7						
26	(1+0.14Sds)D+0.7Ey	Yes	Y	DL	1.1	13	0.7						
27	(1+0.14Sds)D-0.7Ey	Yes	Y	DL	1.1	13	-0.7						
28	(0.6-0.14Sds)D+0.7Ex	Yes	Y	DL	0.53	12	0.7						
29	(0.6-0.14Sds)D-0.7Ex	Yes	Y	DL	0.53	12	-0.7						
30	(0.6-0.14Sds)D+0.7Ey	Yes	Y	DL	0.53	13	0.7						
31	(0.6-0.14Sds)D-0.7Ey	Yes	Y	DL	0.53	13	-0.7						
32	ASCE Strength 1		Y	DL	1.4								
33	ASCE Strength 2 (a)		Y	DL	1.2	5	1.6			3	0.5		
34	ASCE Strength 4 (a) (a)		Y	DL	1.2	6	1	11	1	5	1	3	0.5
35	ASCE Strength 4 (a) (b)		Y	DL	1.2	7	1	11	1	5	1	3	0.5
36	ASCE Strength 4 (a) (c)		Y	DL	1.2	8	1	11	1	5	1	3	0.5
37	ASCE Strength 4 (a) (d)		Y	DL	1.2	9	1	11	1	5	1	3	0.5
38	ASCE Strength 5 (a)		Y	DL	0.9	6	1	10	1				
39	ASCE Strength 5 (b)		Y	DL	0.9	7	1	10	1				
40	ASCE Strength 5 (c)		Y	DL	0.9	8	1	10	1				
41	ASCE Strength 5 (d)		Y	DL	0.9	9	1	10	1				
42	ASCE Strength 6 (a)		Y	DL	1.303			12	1	LL	0.5		
43	ASCE Strength 6 (b)		Y	DL	1.303			12	-1	LL	0.5		
44	ASCE Strength 6 (c)		Y	DL	1.303			13	1	LL	0.5		
45	ASCE Strength 6 (d)		Y	DL	1.303			13	-1	LL	0.5		
46	ASCE Strength 7 (a)		Y	DL	0.797			12	1				
47	ASCE Strength 7 (b)		Y	DL	0.797			12	-1				
48	ASCE Strength 7 (c)		Y	DL	0.797			13	1				
49	ASCE Strength 7 (d)		Y	DL	0.797			13	-1				

Strength load combinations used to find the reactions for anchorage to concrete. A separate RISA run was conducted to find these reactions, see following calc pages



Lionakis		SK-1
KLS		Dec 13, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d

Detail Report: M73 **Unity Check:** 0.574 (LC 9) **Load Combination:** Envelope



Input Data:

Shape:	W12X26	I Node:	N79
Member Type:	Beam	J Node:	N83
Length (ft):	37.16	I Release:	BenPIN
Material Type:	Hot Rolled Steel	J Release:	BenPIN
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

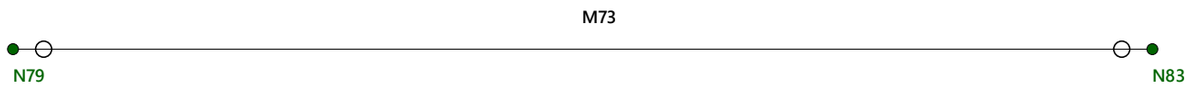
Material:	A992	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	R_y:	1.1
E (ksi):	29000	Density (k/ft^3):	0.49	F_u (ksi):	65
G (ksi):	11154	F_y (ksi):	50	R_t:	1.1
Nu:	0.3				

Shape Properties:

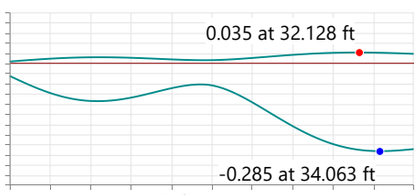
d (in):	12.2	Area (in^2):	7.65	S_w (in^4):	11.8
b_f (in):	6.49	Z_{yy} (in^3):	8.17	r_T (in):	1.72
t_f (in):	0.38	Z_{zz} (in^3):	37.2	J (in^4):	0.3
t_w (in):	0.23	C_w (in^6):	607	k_{det} (in):	1.062
I_{yy} (in^4):	17.3	W_{no} (in^2):	19.2	k_{des} (in):	0.68
I_{zz} (in^4):	204				

Design Properties:

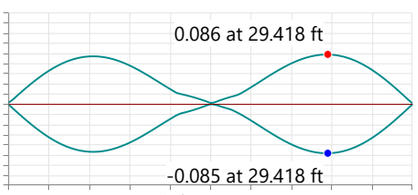
$L_{b\ y-y}$ (ft):	1	K_{y-y}:	1	Max Defl Ratio:	L/5053
$L_{b\ z-z}$ (ft):	20	K_{z-z}:	1	Max Defl Location:	18.58
$L_{comp\ top}$ (ft):	1	y sway:	No	Span:	1
$L_{comp\ bot}$ (ft):	20	z sway:	No		
L_{torque} (ft):	N/A	Function:	Lateral		
		Seismic DR:	None		



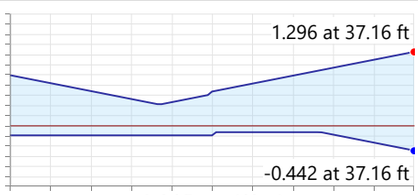
Diagrams:



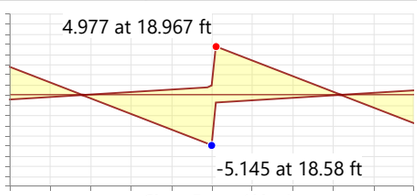
y Deflection (in)



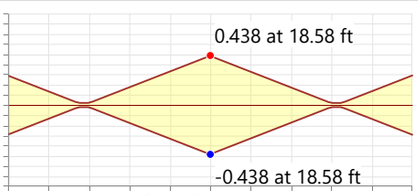
z Deflection (in)



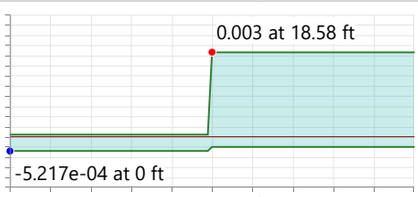
Axial Force (kips)



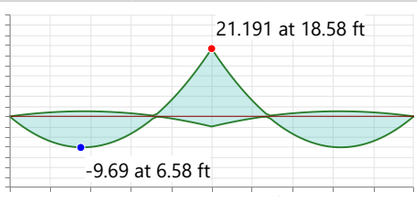
y Shear Force (kips)



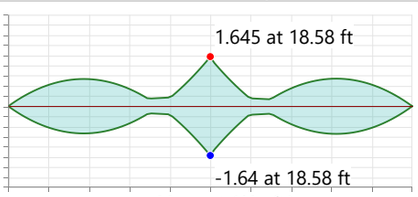
z Shear Force (kips)



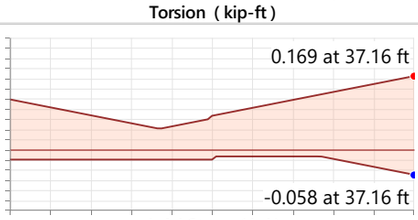
Torsion (kip-ft)



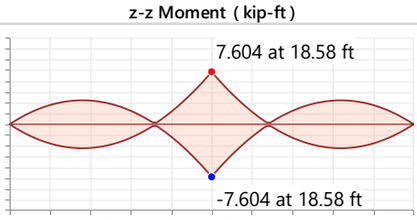
z-z Moment (kip-ft)



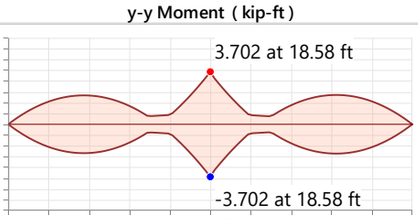
y-y Moment (kip-ft)



Axial Stress (ksi)



Bending Strong Stress (ksi)



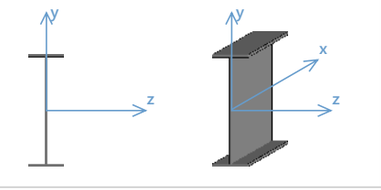
Bending Weak Stress (ksi)

AISC 15th (360-16): ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	9	-	-	-	-
Applied Loading - Shear + Torsion	9	-	-	-	-

Axial Tension Analysis	9	0.001 k	229.042 k	-	-
Axial Compression Analysis	9	0.000 k	76.607 k	-	-
Flexural Analysis (Strong Axis)	9	21.191 k-ft	36.934 k-ft	-	-
Flexural Analysis (Weak Axis)	9	0.001 k-ft	20.384 k-ft	-	-
Shear Analysis (Major Axis y)	9	5.276 k	56.12 k	0.094	Pass
Shear Analysis (Minor Axis z)	9	0.231 k	88.606 k	0.003	Pass
Bending & Axial Interaction Check (UC Bending Max)	9	-	-	0.574	Pass

Detail Report: M298 **Unity Check:** 0.899 (LC 9) **Load Combination:** Envelope



Input Data:

Shape:	W21X50	I Node:	N145
Member Type:	Beam	J Node:	N2
Length (ft):	22.5	I Release:	Fixed
Material Type:	Hot Rolled Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

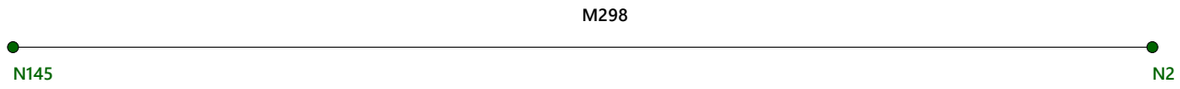
Material:	A992	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	R_y:	1.1
E (ksi):	29000	Density (k/ft^3):	0.49	F_u (ksi):	65
G (ksi):	11154	F_y (ksi):	50	R_t:	1.1
Nu:	0.3				

Shape Properties:

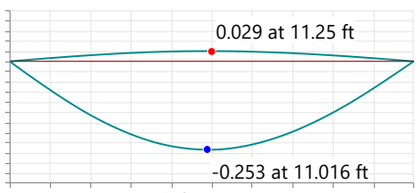
d (in):	20.8	Area (in^2):	14.7	S_w (in^4):	28.9
b_f (in):	6.53	Z_{yy} (in^3):	12.2	r_T (in):	1.6
t_f (in):	0.535	Z_{zz} (in^3):	110	J (in^4):	1.14
t_w (in):	0.38	C_w (in^6):	2570	k_{det} (in):	1.25
I_{yy} (in^4):	24.9	W_{no} (in^2):	33.1	k_{des} (in):	1.04
I_{zz} (in^4):	984				

Design Properties:

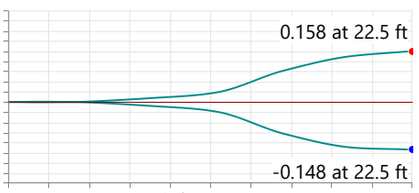
$L_{b\ y\text{-}y}$ (ft):	N/A	$K_{y\text{-}y}$:	1	Max Defl Ratio:	L/5221
$L_{b\ z\text{-}z}$ (ft):	N/A	$K_{z\text{-}z}$:	1	Max Defl Location:	0.938
$L_{comp\ top}$ (ft):	Lbyy	y sway:	No	Span:	1
$L_{comp\ bot}$ (ft):	N/A	z sway:	No		
L_{torque} (ft):	N/A	Function:	Lateral		
		Seismic DR:	None		



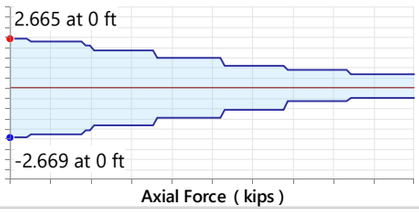
Diagrams:



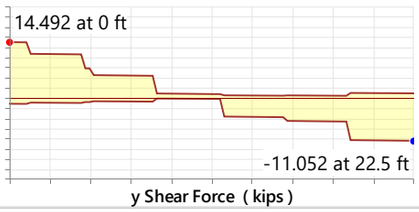
y Deflection (in)



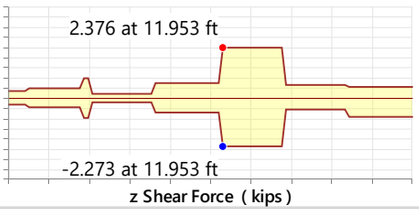
z Deflection (in)



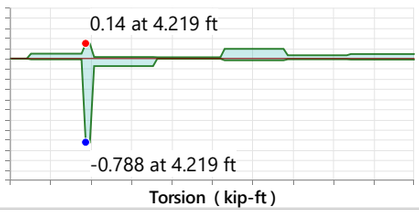
Axial Force (kips)



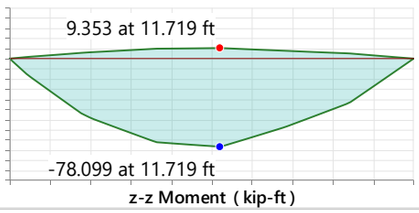
y Shear Force (kips)



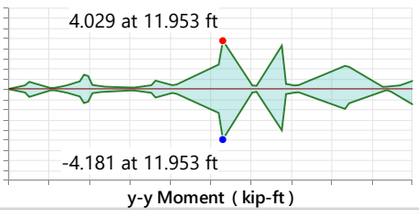
z Shear Force (kips)



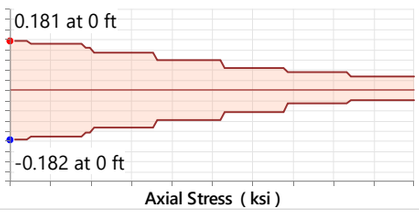
Torsion (kip-ft)



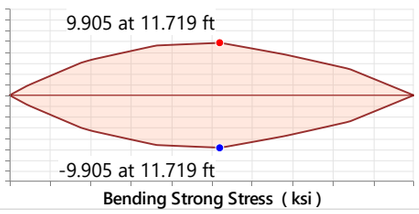
z-z Moment (kip-ft)



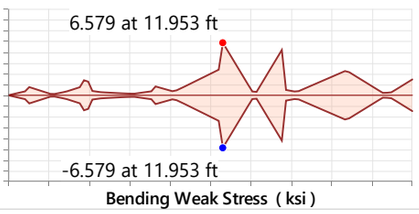
y-y Moment (kip-ft)



Axial Stress (ksi)



Bending Strong Stress (ksi)



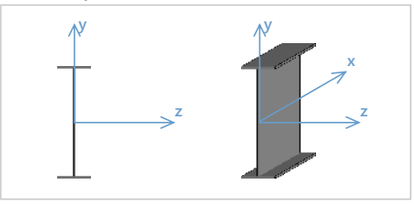
Bending Weak Stress (ksi)

AISC 15th (360-16): ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	9	-	-	-	-
Applied Loading - Shear + Torsion	9	-	-	-	-

Axial Tension Analysis	9	0.001 k	440.12 k	-	-
Axial Compression Analysis	9	0.000 k	51.34 k	-	-
Flexural Analysis (Strong Axis)	9	78.099 k-ft	86.843 k-ft	-	-
Flexural Analysis (Weak Axis)	9	0.003 k-ft	30.439 k-ft	-	-
Shear Analysis (Major Axis y)	9	23.798 k	158.08 k	0.151	Pass
Shear Analysis (Minor Axis z)	9	14.985 k	125.517 k	0.119	Pass
Bending & Axial Interaction Check (UC Bending Max)	9	-	-	0.899	Pass

Detail Report: M53 **Unity Check:** 0.684 (LC 25) **Load Combination:** Envelope



Input Data:

Shape:	W24X55	I Node:	N141
Member Type:	Beam	J Node:	N17
Length (ft):	30.5	I Release:	Fixed
Material Type:	Hot Rolled Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

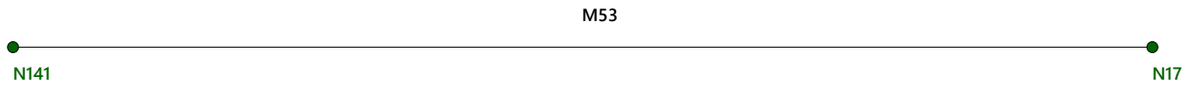
Material:	A992	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	R_y:	1.1
E (ksi):	29000	Density (k/ft^3):	0.49	F_u (ksi):	65
G (ksi):	11154	F_y (ksi):	50	R_t:	1.1
Nu:	0.3				

Shape Properties:

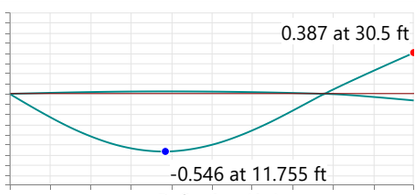
d (in):	23.6	Area (in^2):	16.2	S_w (in^4):	35.8
b_f (in):	7.01	Z_{yy} (in^3):	13.3	r_T (in):	1.68
t_f (in):	0.505	Z_{zz} (in^3):	134	J (in^4):	1.18
t_w (in):	0.395	C_w (in^6):	3870	k_{det} (in):	1.438
I_{yy} (in^4):	29.1	W_{no} (in^2):	40.5	k_{des} (in):	1.01
I_{zz} (in^4):	1350				

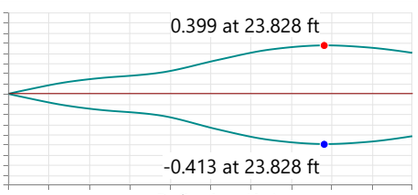
Design Properties:

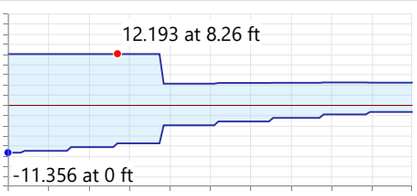
$L_{b\ y\text{-}y}$ (ft):	N/A	$K_{y\text{-}y}$:	1	Max Defl Ratio:	L/2190
$L_{b\ z\text{-}z}$ (ft):	N/A	$K_{z\text{-}z}$:	1	Max Defl Location:	13.661
$L_{comp\ top}$ (ft):	4	y sway:	No	Span:	5
$L_{comp\ bot}$ (ft):	15	z sway:	No		
L_{torque} (ft):	N/A	Function:	Lateral		
		Seismic DR:	None		

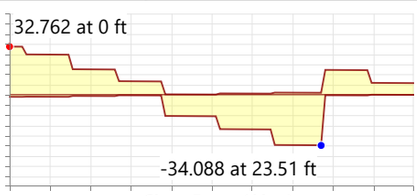


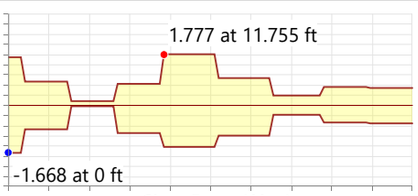
Diagrams:

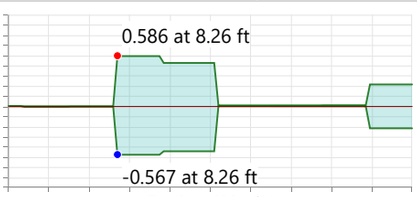


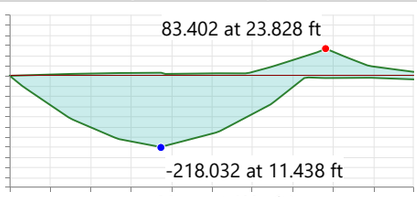


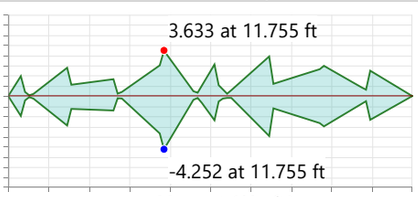


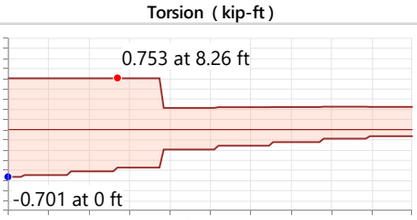


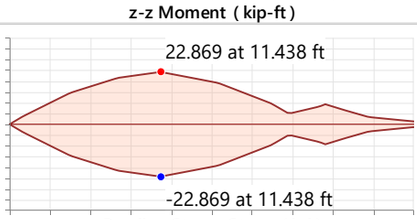


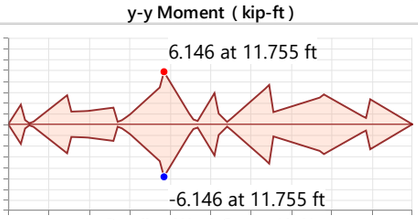










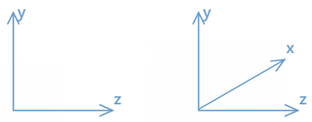


AISC 15th (360-16): ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	25	-	-	-	-
Applied Loading - Shear + Torsion	10	-	-	-	-

Axial Tension Analysis	25	0.000 k	485.03 k	-	-
Axial Compression Analysis	25	12.193 k	32.652 k	-	-
Flexural Analysis (Strong Axis)	25	80.074 k-ft	334.331 k-ft	-	-
Flexural Analysis (Weak Axis)	25	3.629 k-ft	33.143 k-ft	-	-
Shear Analysis (Major Axis y)	10	34.197 k	167.461 k	0.204	Pass
Shear Analysis (Minor Axis z)	10	0.086 k	127.187 k	0.001	Pass
Bending & Axial Interaction Check (UC Bending Max)	25	-	-	0.684	Pass

Detail Report: M103 **Unity Check:** 0.788 (LC 25) **Load Combination:** Envelope



Input Data:

Shape:	HSS6X6X6	I Node:	N280
Member Type:	Column	J Node:	N266
Length (ft):	9	I Release:	Fixed
Material Type:	Hot Rolled Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

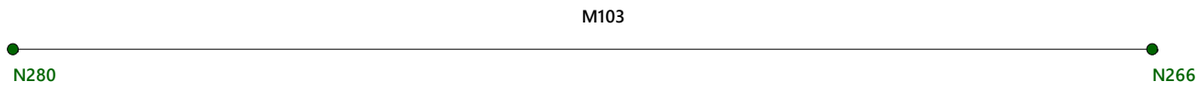
Material:	A500 Gr.C Rect	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	R_y:	1.4
E (ksi):	29000	Density (k/ft^3):	0.527	F_u (ksi):	62
G (ksi):	11154	F_y (ksi):	50	R_t:	1.3
Nu:	0.3				

Shape Properties:

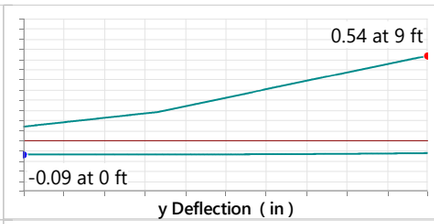
d (in):	6	I_{yy} (in^4):	39.5	Area (in^2):	7.58
b_f (in):	6	I_{zz} (in^4):	39.5	J (in^4):	64.6
t (in):	0.349				

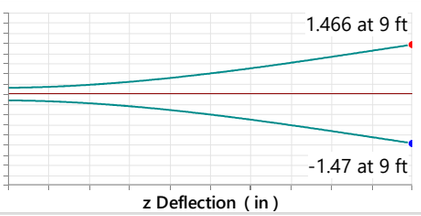
Design Properties:

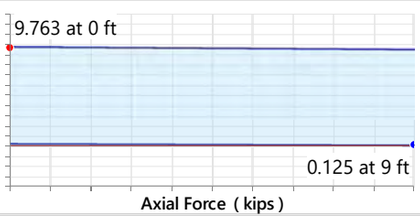
$L_{b\ y\text{-}y}$ (ft):	N/A	$K_{y\text{-}y}$:	2.1	Max Defl Ratio:	L/84
$L_{b\ z\text{-}z}$ (ft):	N/A	$K_{z\text{-}z}$:	2.1	Max Defl Location:	0
$L_{comp\ top}$ (ft):	Lbyy	y sway:	No	Span:	N/A
$L_{comp\ bot}$ (ft):	N/A	z sway:	No		
L_{torque} (ft):	N/A	Function:	Lateral		
		Seismic DR:	None		

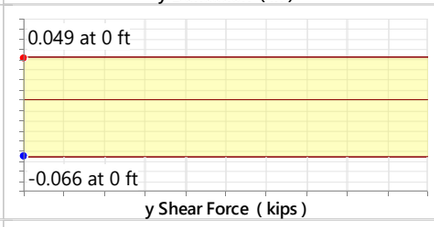


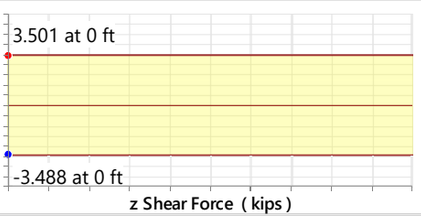
Diagrams:

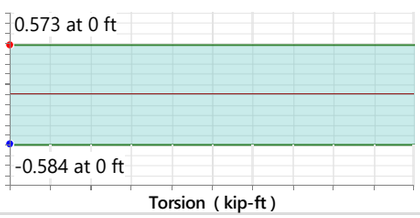


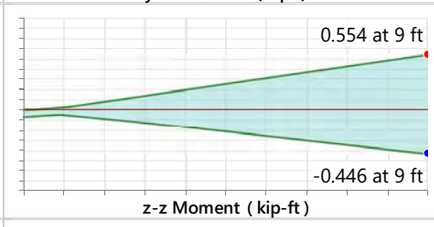


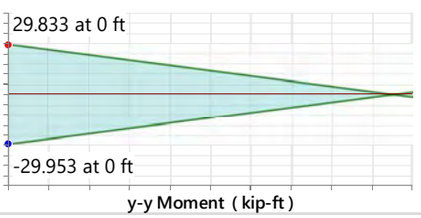


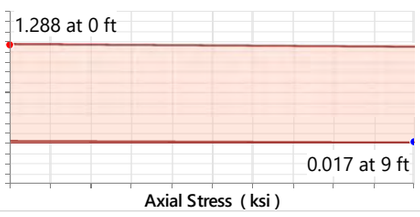










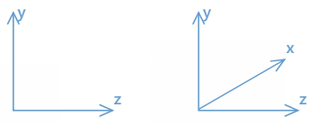


AISC 15th (360-16): ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	25	-	-	-	-
Applied Loading - Shear + Torsion	24	-	-	-	-
Axial Tension Analysis	25	0.000 k	226.946 k	-	-
Axial Compression Analysis	25	5.974 k	110.275 k	-	-

Flexural Analysis (Strong Axis)	25	0.025 k-ft	39.421 k-ft	-	-
Flexural Analysis (Weak Axis)		29.953 k-ft	39.421 k-ft	-	-
Shear Analysis (Major Axis y)	24	1.1 k	62.105 k	0.018	Pass
Shear Analysis (Minor Axis z)	24	4.575 k	62.105 k	0.074	Pass
Bending & Axial Interaction Check (UC Bending Max)	25	-	-	0.788	Pass
Torsional Analysis	25	0.573 k-ft	33.122 k-ft	0.017	Pass

Detail Report: M85 **Unity Check:** 0.778 (LC 29) **Load Combination:** Envelope



Input Data:

Shape:	1"DIA	I Node:	N19
Member Type:	VBrace	J Node:	N142
Length (ft):	21.984	I Release:	BenPIN
Material Type:	Hot Rolled Steel	J Release:	BenPIN
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

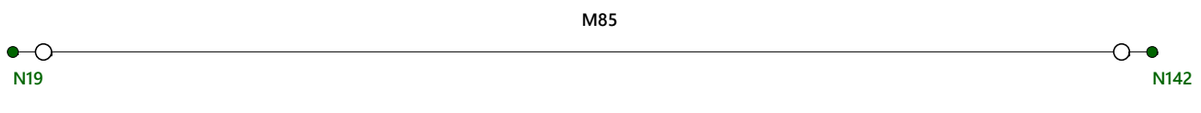
Material:	A36 Gr.36 (Rod)	Therm. Coeff. ($1e^{5}°F^{-1}$):	0.65	R_y:	1.5
E (ksi):	29000	Density (k/ft^3):	0	F_u (ksi):	58
G (ksi):	11154	F_y (ksi):	36	R_t:	1.2
Nu:	0.3				

Shape Properties:

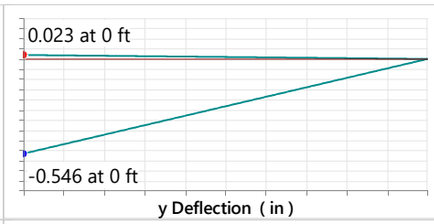
d (in):	1	Area (in^2):	0.785	I_{yy} (in^4):	0.049
Z (in^3):	0.167	J (in^4):	0.098	I_{zz} (in^4):	0.049

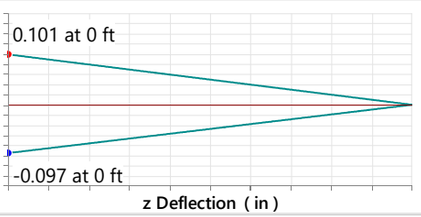
Design Properties:

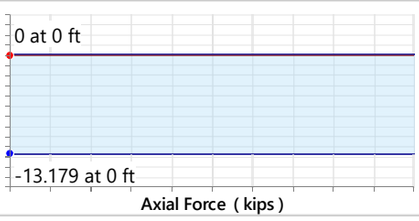
$L_{b\ y\text{-}y}$ (ft):	N/A	$K_{y\text{-}y}$:	1	Max Defl Ratio:	L/10000
$L_{b\ z\text{-}z}$ (ft):	N/A	$K_{z\text{-}z}$:	1	Max Defl Location:	0
$L_{comp\ top}$ (ft):	Lbyy	y sway:	No	Span:	N/A
$L_{comp\ bot}$ (ft):	N/A	z sway:	No		
L_{torque} (ft):	N/A	Function:	Lateral		
		Seismic DR:	None		

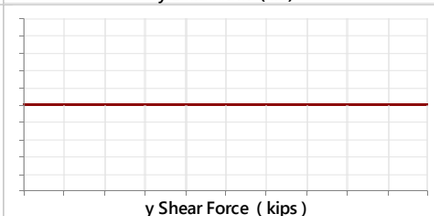


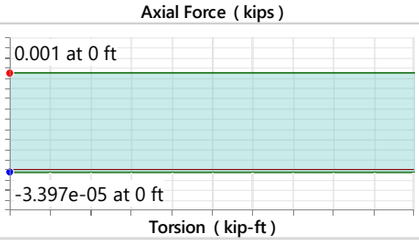
Diagrams:

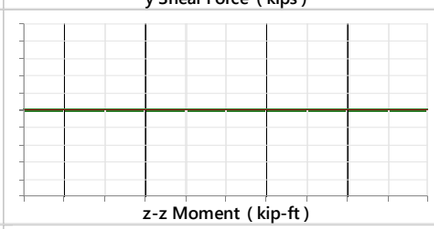


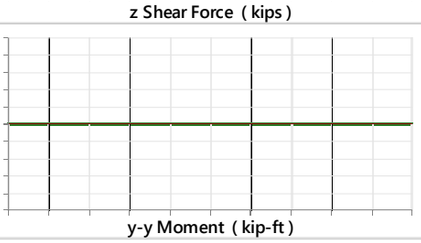


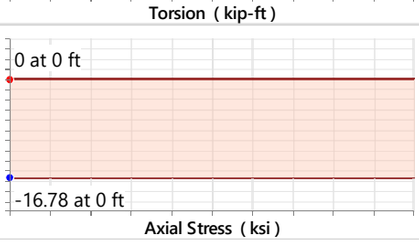


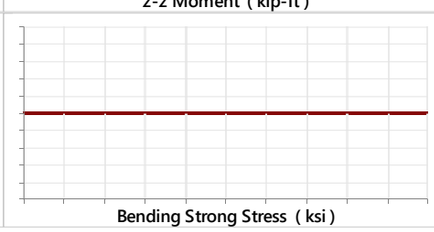


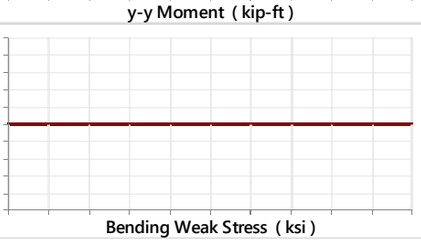












AISC 15th (360-16): ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	29	-	-	-	-
Applied Loading - Shear + Torsion	9	-	-	-	-
Axial Tension Analysis	29	13.179 k	16.931 k	-	-
Axial Compression Analysis	29	0.000 k	0.106 k	-	-
Flexural Analysis	29	0.000 k-ft	0.282 k-ft	-	-

Shear Analysis	9	0.069 k	10.158 k	0.007	Pass
Bending & Axial Interaction Check (UC Bending Max)	29	-	-	0.778	Pass

Collector Connections

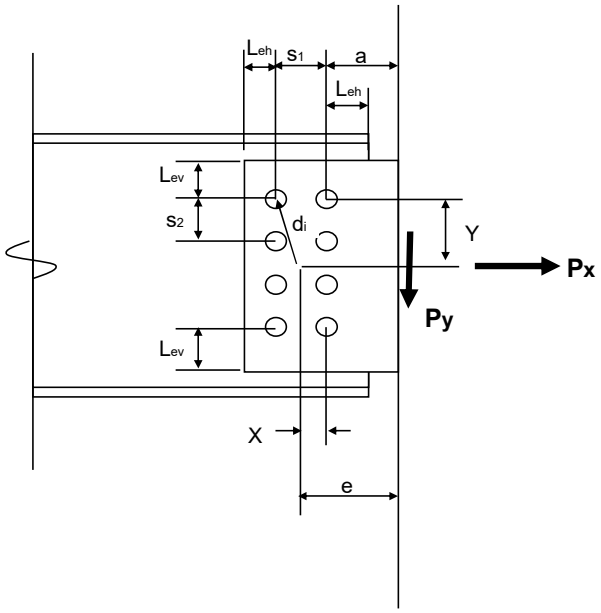
User Input				*Connection Properties*					*DCR Checks*				
Conn. Loc.	**Beam Size**	**Loads (kips) P_y**	**P_x**	**# Rows (Vert)**	**t_{web} (in)**	**d_{bolt} (in)**	**s_{weld} (in)**	**t_{tab} (in)**	**Bolt Shr Check**	**Bolt Brg Check**	**Weld Check**	**Blk Shr Check**	**Connection Check**
Intermediate Col Support Bm	W12X40	8.0	16.0	1	0.30	7/8	1/4	3/8	0.40	0.56	0.13	0.24	OK
Primary Girders (Enveloped Demands)	W24X55	51.4	19.0	1	0.40	7/8	1/4	1/2	0.72	0.75	0.30	0.32	OK
Short Girders1	W18X35	23.6	6.3	1	0.30	7/8	1/4	3/8	0.66	0.92	0.23	0.33	OK
Short Girders2	W18X35	11.4	7.7	1	0.30	7/8	1/4	3/8	0.37	0.52	0.11	0.19	OK

Sample Bolted Connection Calculation

User Input				*Connection Properties*					*DCR Checks*			
Conn. Loc.	**Beam Size**	**Loads (kips) P_y (k)**	**P_x (k)**	**# Rows (Vert)**	**t_{web} (in)**	**d_{bolt} (in)**	**s_{weld} (in)**	**t_{tab} (in)**	**Bolt Shr Check**	**Bolt Brg Check**	**Weld Check**	**Block Shr Check**
14 (S)	W16x26	10.0	70.0	2	0.25	7/8	1/4	3/8	0.44	0.72	0.35	0.88

Bolt Shear Check (AISC 360-16 J3.6)

N = # Vertical Bolt Rows =	2	
n = # Bolts Per Row =	4	
s_1 =	3	in
s_2 =	3	in
a =	3	in
$e = K+s_1(N-1)/2$ =	4.5	in
$P_x = \lvert \Omega_o E \rvert$ =	70	kips
$P_y = V$ =	10	kips
$M = P_y e$ =	45	kip-in
$X_{max} = s_1(N-1)/2$ =	1.5	in
$Y_{max} = s_2(n-1)/2$ =	4.5	in
Σd_i^2 =	108	
$R_x = (P_x)/(n*N) + (MY_{max})/(\Sigma d_i^2)$ =	10.6	kips
$R_y = (P_y)/(n*N) + (MX_{max})/(\Sigma d_i^2)$ =	1.9	kips
$R_u = (R_x^2+R_y^2)^{1/2}$ =	10.8	kips
$R_{nv} = F_{nv}A_{bolt}$ =	32.5	kips
$\phi R_{nv} = 0.75R_{nv}$ =	24.4	kips
DCR = $R_u/\phi R_{nv}$ =	**0.44**	



Bolt Brg Check (AISC 360-16 J3.10 / AISC 341-16 D2.2(a))

R_u =	10.8	kips
$t_{web}F_u$ =	16.3	k/in
$t_{tab}F_{ut}$ =	18.8	k/in
Beam Web Controls		
tF_u =	16.3	k/in
L_{eh} =	1.5	in
L_{ev} =	1.5	in
$L_c = Min\{L_{eh},L_{ev}\} - (d_{bolt} + 1/16")/2$ =	1.0	in
$R_n = 1.2L_ctF_u \le 2.4d_{bolt}tF_u$ =	20.1	kips
$\phi R_n = 0.75R_n$ =	15.1	kips
DCR = $R_u/\phi R_n$ =	**0.72**	

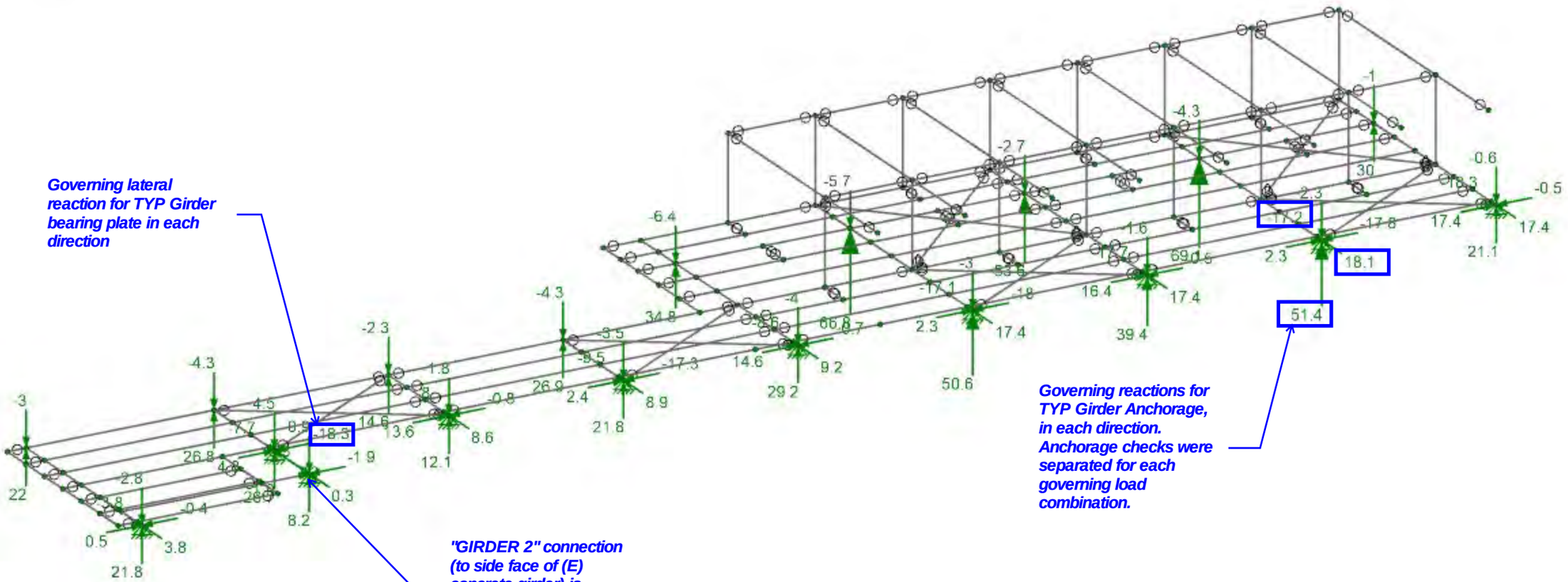
Weld Check (AISC 360-16 J2.4)

$R_u = (P_x^2+P_y^2)^{1/2}$ =	70.7	kips
$\theta_{weld} = \tan^{-1}(P_x/P_y)$ =	81.9	degrees
$L_{weld} = s_2(n-1)+2(L_{ev})$ =	12.0	in
$R_n = [0.6F_{EXX}(1.0+0.5\sin^{1.5}\theta)](2$ sides(0.	265.9	kips
$\phi R_n = 0.75R_n$ =	199.4	kips
DCR = $R_u/\phi R_n$ =	**0.35**	

Block Shear Check (AISC 360-16 J4)

From Bolt Brg Check:	Beam Web Controls	
F_y =	50	ksi
F_u =	65	ksi
t =	0.25	in
$d_{hole} = d_{bolt}$ + 1/8" =	1.00	in
U_{bs} =	0.5	
Block Tearout		
$A_{gv} = [L_{eh}+s_1(N-1)]2t$	2.25	in^2
$A_{nv} = [L_{eh}-d_{hole}/2+(s_1 - d_{hole})(N-1)]2t$	1.50	in^2
$A_{nt} = [(s_2 - d_{hole})(n-1)]t$	1.50	in^2
$R_{n1} = 0.6F_uA_{nv}+U_{bs}F_uA_{nt}$ =	107.3	kips <--USE
$R_{n2} = 0.6F_yA_{gv}+U_{bs}F_uA_{nt}$ =	116.3	kips
Tab Tension Failure (U = 1.0)		
$A_g = [2(L_{ev})+s_2(n-1)]t_{tab}$	4.50	in^2
$A_e = U[2(L_{ev})+(s_2 -d_{hole})(n-1)]t_{tab}$	3.38	in^2
$R_{n1} = F_{yt}A_g$ =	225.0	kips
$R_{n2} = F_{ut}A_e$ =	168.8	k <--USE
$\phi R_{n\text{-}min} = 0.75R_{n\text{-}min}$ =	80.4	kips
DCR = $(P_x^2+P_y^2)^{1/2}/\phi R_{n\text{-}min}$ =	**0.88**	

ENVELOPED REACTIONS FROM STRENGTH LOAD COMBINATIONS (SEPARATE RISA RUN FROM ASD LOAD COMBINATIONS)



Reaction and Moment Units are kips and kip-ft (Enveloped)

Lionakis		SK-4
KLS		Dec 13, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	1/6
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Torque controlled expansion anchor
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 5.750
Effective Embedment depth, h_{ef} (inch): 5.000
Code report: ICC-ES ESR-3037
Anchor category: 1
Anchor ductility: Yes
h_{min} (inch): 8.75
c_{ac} (inch): 8.00
C_{min} (inch): 6.00
S_{min} (inch): 3.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 36.00
State: Cracked
Compressive strength, f'_c (psi): 4000
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 15.00 x 15.00 x 0.38

Recommended Anchor
Anchor Name: Strong-Bolt® 2 - 3/4"Ø CS Strong-Bolt 2, hnom:5.75" (146mm)
Code Report: ICC-ES ESR-3037

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

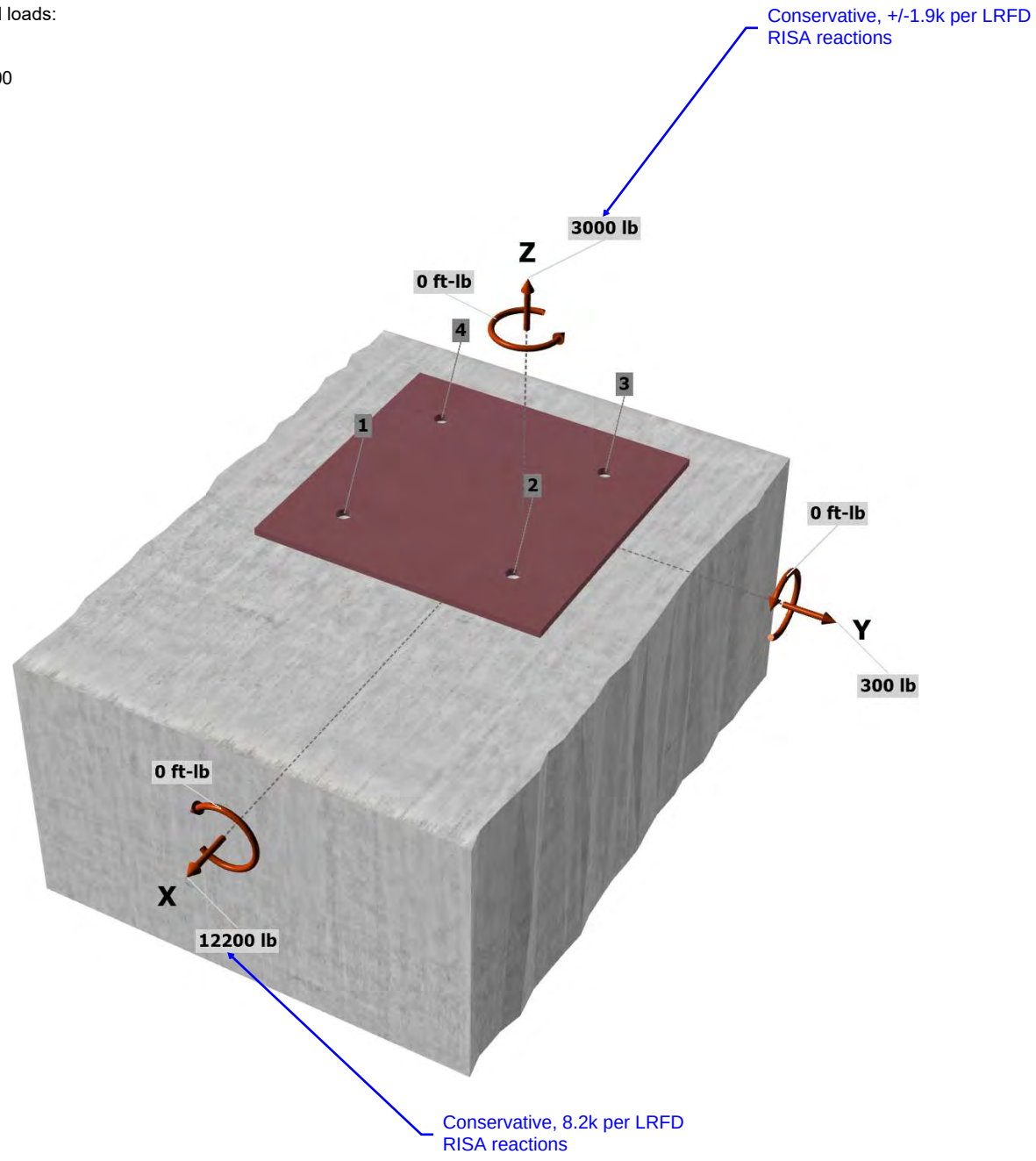
Company:		Date:	11/7/2023
Engineer:		Page:	2/6
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]: 3000
V_{uax} [lb]: 12200
V_{uay} [lb]: 300
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



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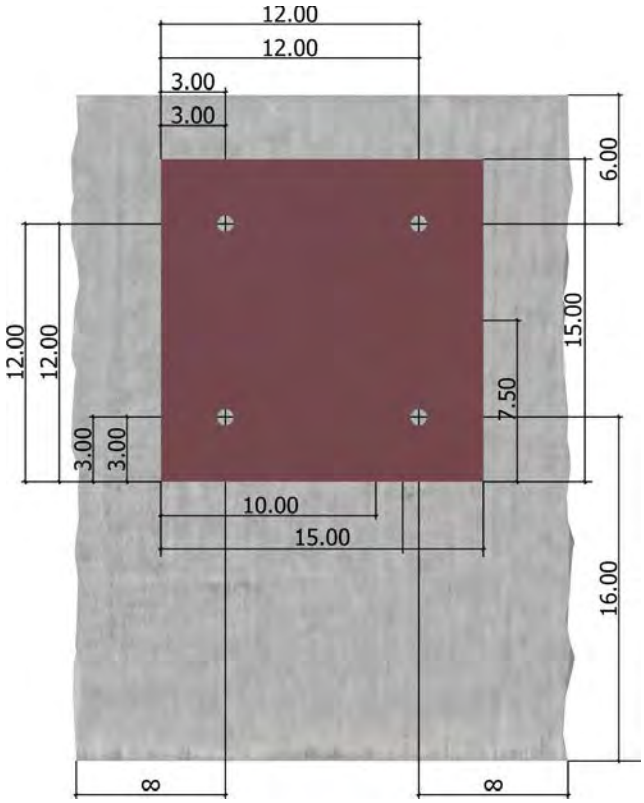
Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	3/6
Project:			
Address:			
Phone:			
E-mail:			

<Figure 2>



SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

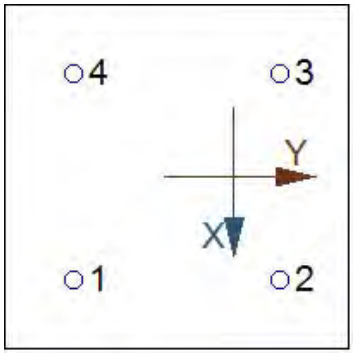
Company:		Date:	11/7/2023
Engineer:		Page:	4/6
Project:			
Address:			
Phone:			
E-mail:			

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	333.7	2202.8	-772.2	2334.2
2	1166.3	3897.2	-772.2	3973.0
3	1166.3	3897.2	922.2	4004.9
4	333.7	2202.8	922.2	2388.0
Sum	3000.0	12200.0	300.0	12700.1

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 3000
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 2.50
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.07
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
29700	0.75	22275

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.6.2.2.1)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	4000	5.000	12021

$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
540.00	225.00	6.00	0.750	0.940	1.00	1.000	12021	0.75	15258

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.5.1.2, Eq. 17.6.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	8500	4000	0.50	0.65	6989

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	5/6
Project:			
Address:			
Phone:			
E-mail:			

8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
14480	1.0	0.65	9412

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.7.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min\left|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}\right|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
5.00	0.750	1.00	4000	25.00	70041

$\phi V_{cbgx} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.5.1.2 & Eq. 17.7.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
3024.00	2812.50	0.968	1.000	1.000	1.021	70041	0.75	55786

Shear parallel to edge in x-direction:

$V_{by} = \min\left|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}\right|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
5.00	0.750	1.00	4000	6.00	8235

$\phi V_{cbgx} = \phi\ (2)(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. 17.5.1.2, 17.7.2.1(c) & Eq. 17.7.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
243.00	162.00	1.000	1.000	1.000	1.000	8235	0.75	18529

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cp} = \phi k_{cp} N_{cb} = \phi k_{cp}(A_{Nc} / A_{Nco})\,\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.5.1.2 & Eq. 17.7.3.1a)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cp} (lb)
2.0	126.00	225.00	0.940	1.000	1.000	12021	0.70	8859

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	1166	22275	0.05	Pass
Concrete breakout	**3000**	**15258**	**0.20**	**Pass (Governs)**
Pullout	1166	6989	0.17	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	4005	9412	0.43	Pass
T Concrete breakout x+	12200	55786	0.22	Pass
|| Concrete breakout x-	1844	18529	0.10	Pass
Pryout	**4005**	**8859**	**0.45**	**Pass (Governs)**

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.8.2	0.00	0.45	45.2%	1.0	Pass

3/4"Ø CS Strong-Bolt 2, hnom:5.75" (146mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

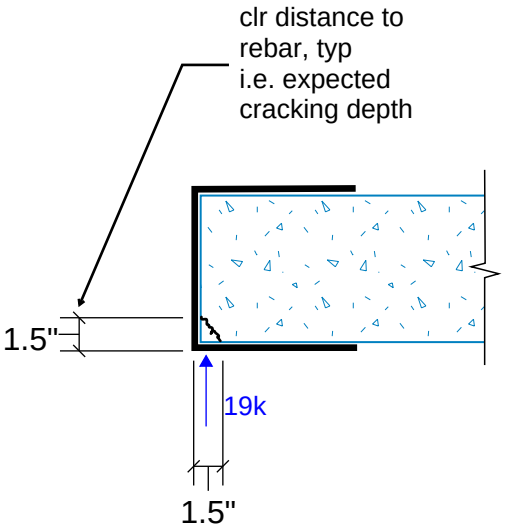
LIONAKIS

Project # 019124.02 Sheet # G8

Project Rio City Cafe Deck

Professional KLS Date 12/13/2023

GIRDER CONNECTION - STL CHECK:



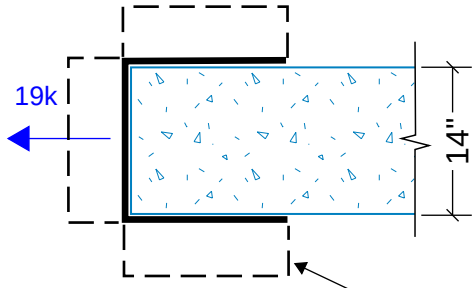
Check lateral bearing on end of concrete:
Assume all load bears along 1" wide section at end of 20" deep plate
Shear load is expected to be fully resisted by stl pl compression on one side of (E) beam.

Vu = 19k/(20") = 0.95k/in
PhiVn = 0.75(2*SQRT(4000psi)(1.5") = 0.143k/iin NG

Check steel for distribution of load past cracking location to bear on concrete (steel bending)

Mu = 19k(1.5") = 28.5k-in
PhiMn = 0.9(36ksi)bt^2/4
t_min = SQRT(28.5k-in(4)/(0.9*36ksi*20")) = 0.176" min

USE 3/8" thick PL min

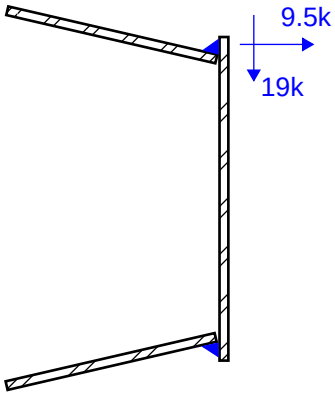


Check plate bending for axial loads:
Assume 24" deep PL
Pu = 19k
Mu = 19k(14")/4 = 66.5 k-in

PhiMn = 0.9(36ksi)(24")t^2/4
t_min = SQRT(66.5k-in(4)/(0.9*36ksi*24")) = 0.58" min
USE 5/8" thick PL min

OR
b_min = (66.5k-in)(4)/(0.9*36ksi*0.5"^2) = 33" deep

Note that steel plates will be welded horizontally to ea side and face of anchor plate for distribution of lateral loads to anchors, conservative



Check plate weld
Assume 24" long weld
Loads provided are enveloped, worst case
Include shear from gravity, Pu = 52k/2 = 26k

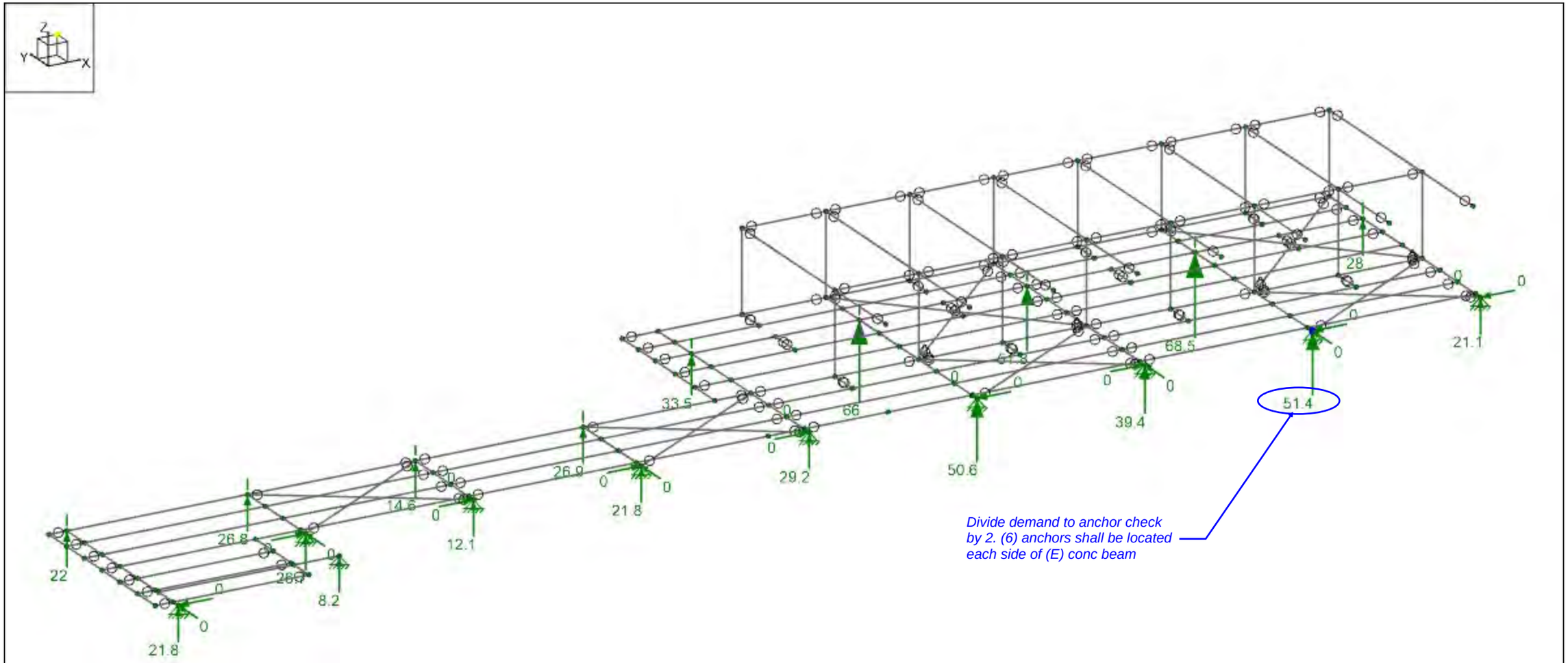
Vu = SQRT((9.5k^2) + (19k^2) + (26k^2)) = 33.57k
vu = 33.57k/24" = 1.4k/in

Fillet weld, phi*Rn = 0.75(0.6)(70ksi)(0.707)(t) = 22.3*t k/in^2

t_min = (1.4k/in)/(22.3k/in^2) = 0.07" min

Use 1/4" Fillet Weld, ea side

Post Installed Anchors
Use 3/4" dia SIMPSON Strong Bolt 2 w/ 5.75" embed
See attachd Post installed



1.2D+1.6L+0.5Lr

Results for LC 33, ASCE Strength 2 (a)
Reaction and Moment Units are kips and kip-ft

See attached SIMPSON Anchorage calc to check governing vertical reactions

Lionakis		SK-5
KLS		Dec 13, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

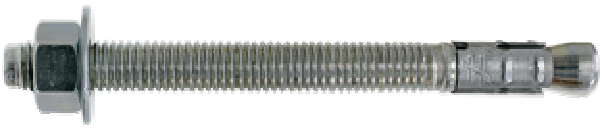
General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Torque controlled expansion anchor
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 5.750
Effective Embedment depth, h_{ef} (inch): 5.000
Code report: ICC-ES ESR-3037
Anchor category: 1
Anchor ductility: Yes
h_{min} (inch): 8.75
c_{ac} (inch): 8.00
C_{min} (inch): 6.00
S_{min} (inch): 3.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 23.00
State: Cracked
Compressive strength, f'_c (psi): 4000
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 29.00 x 22.00 x 0.38

Recommended Anchor
Anchor Name: Strong-Bolt® 2 - 3/4"Ø CS Strong-Bolt 2, hnom:5.75" (146mm)
Code Report: ICC-ES ESR-3037



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Anchor Designer™ Software
Version 3.1.2303.1

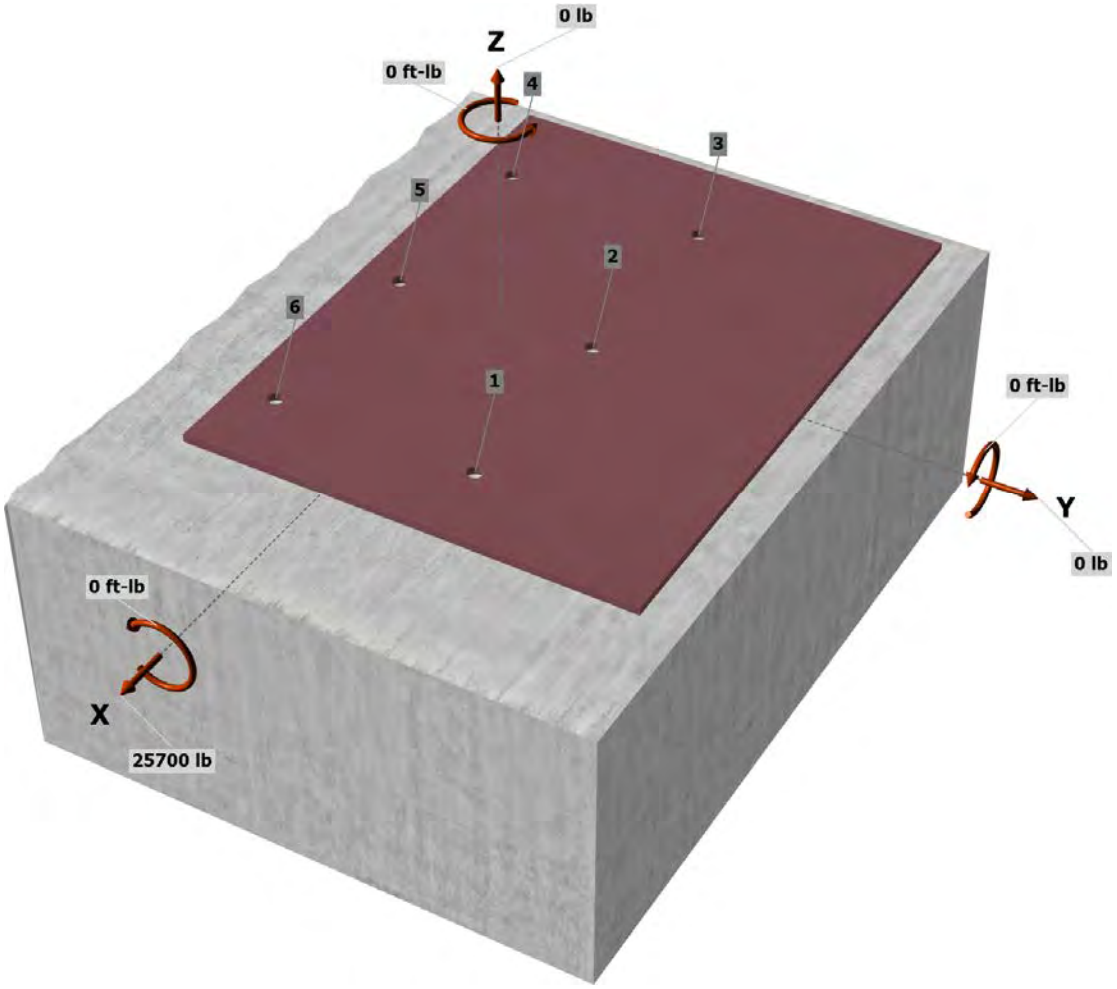
Company:		Date:	11/7/2023
Engineer:		Page:	2/5
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 25700
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



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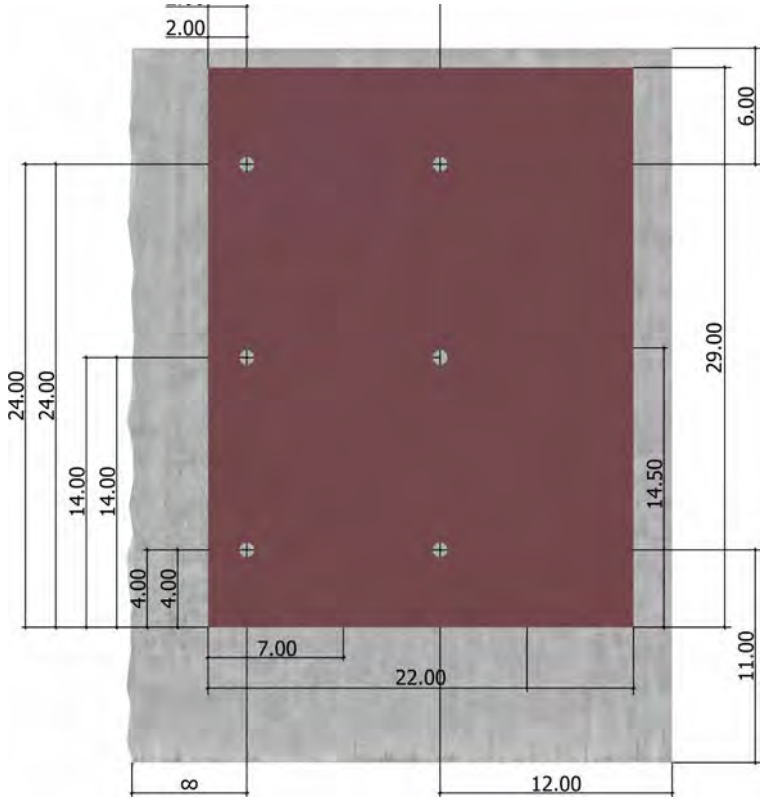
Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	3/5
Project:			
Address:			
Phone:			
E-mail:			

<Figure 2>



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Anchor Designer™ Software
Version 3.1.2303.1

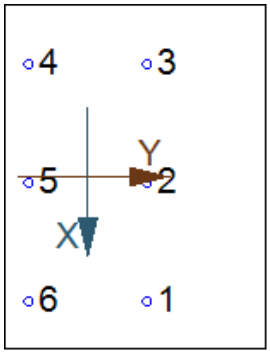
Company:		Date:	11/7/2023
Engineer:		Page:	4/5
Project:			
Address:			
Phone:			
E-mail:			

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	0.0	4283.3	0.0	4283.3
2	0.0	4283.3	0.0	4283.3
3	0.0	4283.3	0.0	4283.3
4	0.0	4283.3	0.0	4283.3
5	0.0	4283.3	0.0	4283.3
6	0.0	4283.3	0.0	4283.3
Sum	0.0	25700.0	0.0	25700.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 0
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
14480	1.0	0.65	9412

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.7.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
5.00	0.750	1.00	4000	31.00	96713

$\phi V_{cbgx} = \phi\,(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.5.1.2 & Eq. 17.7.2.1b)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
1575.50	4324.50	1.000	0.777	1.000	1.422	96713	0.75	29211

Shear parallel to edge in y-direction:

$V_{bx} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
5.00	0.750	1.00	4000	12.00	23292

$\phi V_{cbgy} = \phi\ (2)(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.5.1.2, 17.7.2.1(c) & Eq. 17.7.2.1b)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgy} (lb)
666.00	648.00	1.000	1.000	1.000	1.000	23292	0.75	35909

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	5/5
Project:			
Address:			
Phone:			
E-mail:			

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cpg} = \phi k_{cp} N_{cbg} = \phi k_{cp} (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.7.3.1b)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	837.50	225.00	1.000	0.940	1.000	1.000	12021	0.70	58883

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

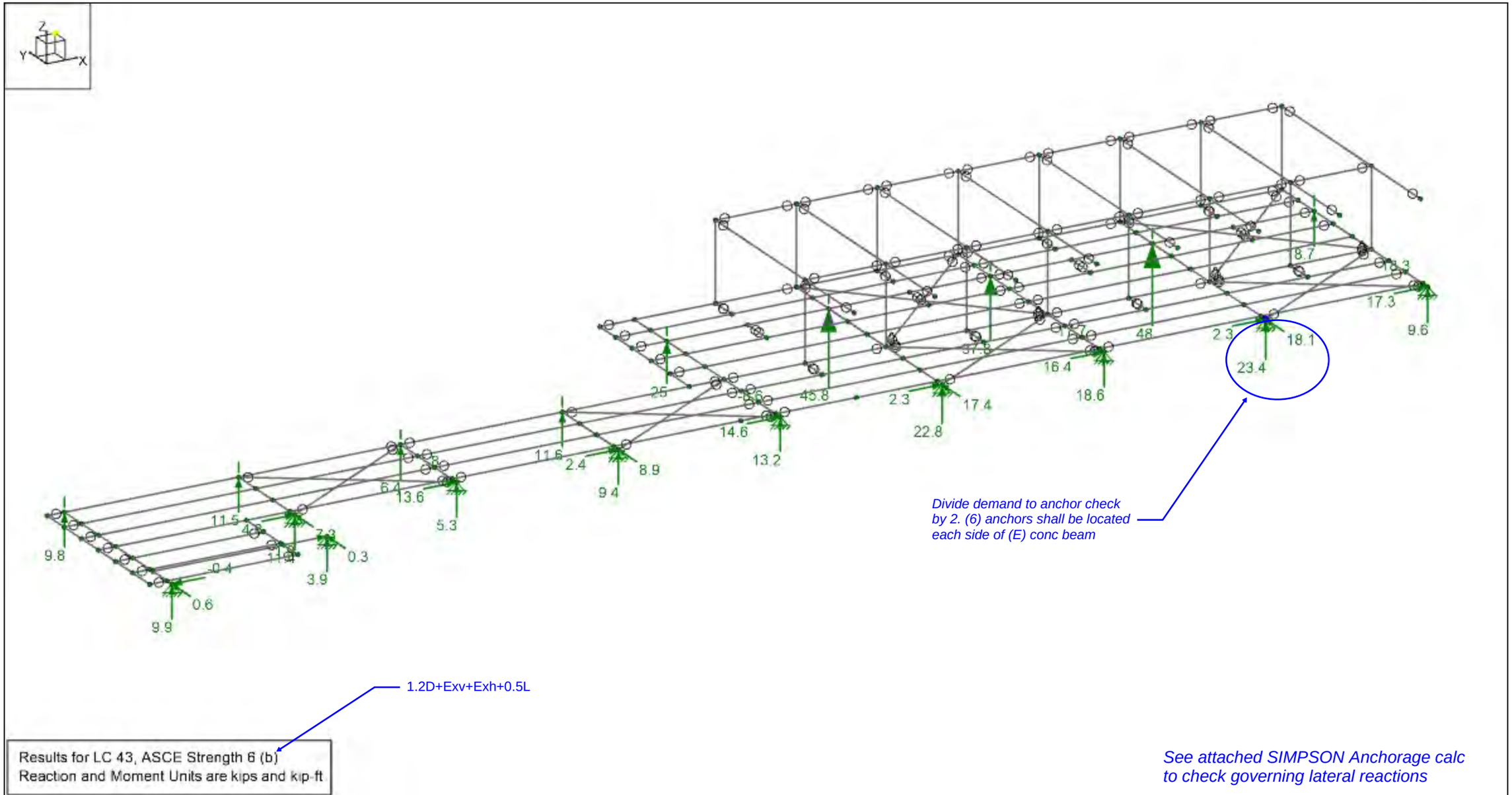
Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	4283	9412	0.46	Pass
T Concrete breakout x+	**25700**	**29211**	**0.88**	**Pass (Governs)**
|| Concrete breakout y+	**12850**	**35909**	**0.36**	**Pass (Governs)**
Pryout	25700	58883	0.44	Pass

3/4"Ø CS Strong-Bolt 2, hnom:5.75" (146mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.



Lionakis		SK-6
KLS		Dec 13, 2023
		RISA Model - Rio_City_Cafe_Deck.r3d

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Torque controlled expansion anchor
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 5.750
Effective Embedment depth, h_{ef} (inch): 5.000
Code report: ICC-ES ESR-3037
Anchor category: 1
Anchor ductility: Yes
h_{min} (inch): 8.75
c_{ac} (inch): 8.00
C_{min} (inch): 6.00
S_{min} (inch): 3.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 23.00
State: Cracked
Compressive strength, f'_c (psi): 4000
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 29.00 x 22.00 x 0.38

Recommended Anchor
Anchor Name: Strong-Bolt® 2 - 3/4"Ø CS Strong-Bolt 2, hnom:5.75" (146mm)
Code Report: ICC-ES ESR-3037

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

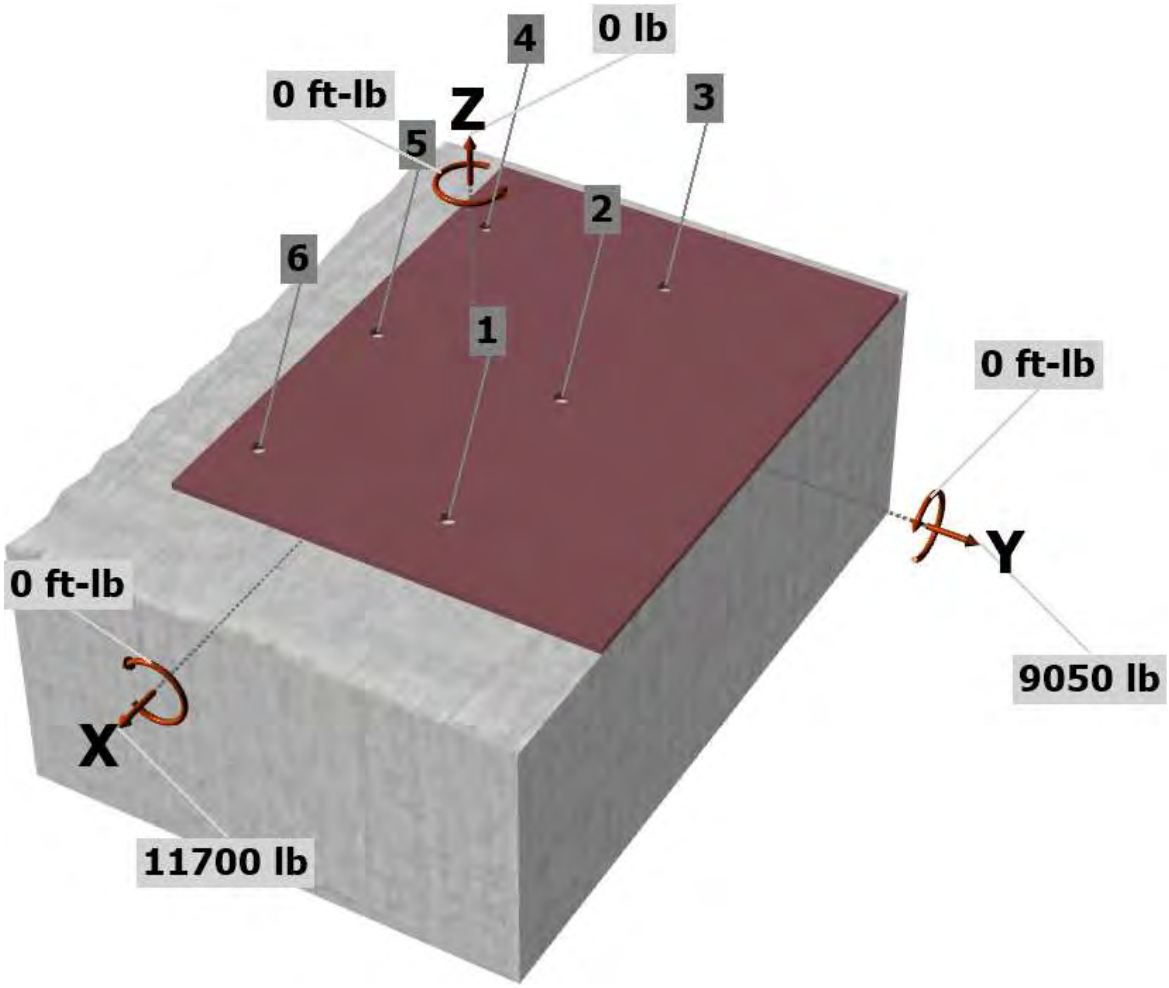
Company:		Date:	11/7/2023
Engineer:		Page:	2/5
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

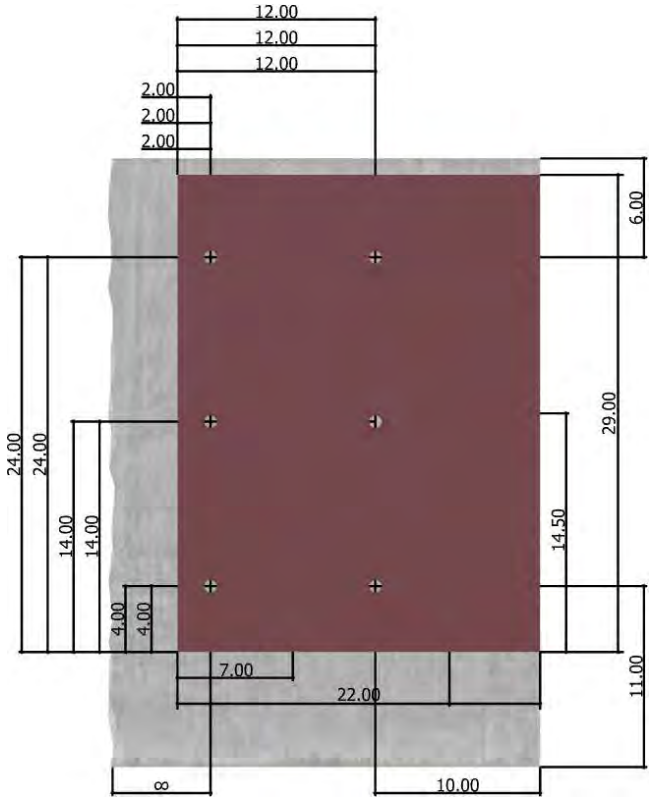
N_{ua} [lb]: 0
V_{uax} [lb]: 11700
V_{uay} [lb]: 9050
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



Company:		Date:	11/7/2023
Engineer:		Page:	3/5
Project:			
Address:			
Phone:			
E-mail:			

<Figure 2>



SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

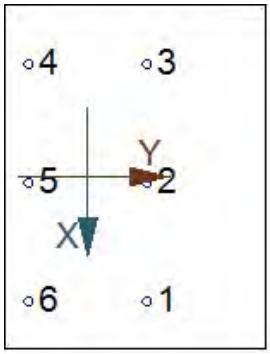
Company:		Date:	11/7/2023
Engineer:		Page:	4/5
Project:			
Address:			
Phone:			
E-mail:			

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	0.0	1991.1	1426.1	2449.1
2	0.0	1991.1	1508.3	2497.9
3	0.0	1991.1	1590.6	2548.5
4	0.0	1908.9	1590.6	2484.7
5	0.0	1908.9	1508.3	2432.9
6	0.0	1908.9	1426.1	2382.7
Sum	0.0	11700.0	9050.0	14795.8

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 0
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.24
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.19

<Figure 3>



8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
14480	1.0	0.65	9412

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.7.2)

Shear perpendicular to edge in y-direction:

$V_{by} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
5.00	0.750	1.00	4000	15.33	33643

$\phi V_{cbgy} = \phi\,(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. 17.5.1.2 & Eq. 17.7.2.1b)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgy} (lb)
851.00	1058.00	0.984	0.778	1.000	1.000	33643	0.75	15549

Shear perpendicular to edge in x-direction:

$V_{bx} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
5.00	0.750	1.00	4000	31.00	96713

$\phi V_{cbgx} = \phi\,(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.5.1.2 & Eq. 17.7.2.1b)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
1529.50	4324.50	0.998	0.765	1.000	1.422	96713	0.75	27824

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	11/7/2023
Engineer:		Page:	5/5
Project:			
Address:			
Phone:			
E-mail:			

Shear parallel to edge in x-direction:

V_{by} = min|7(l_e / d_a)$^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}$; 9$\lambda_a\sqrt{f'_c}c_{a1}^{1.5}$| (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
5.00	0.750	1.00	4000	6.00	8235

$\phi V_{cbgx} = \phi$ (2)(A_{Vc} / A_{Vco})$\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. 17.5.1.2, 17.7.2.1(c) & Eq. 17.7.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
252.00	162.00	1.000	1.000	1.000	1.000	8235	0.75	19215

Shear parallel to edge in y-direction:

V_{bx} = min|7(l_e / d_a)$^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}$; 9$\lambda_a\sqrt{f'_c}c_{a1}^{1.5}$| (Eq. 17.7.2.2.1a & Eq. 17.7.2.2.1b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
5.00	0.750	1.00	4000	10.00	17719

$\phi V_{cbgy} = \phi$ (2)(A_{Vc} / A_{Vco})$\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.5.1.2, 17.7.2.1(c) & Eq. 17.7.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgy} (lb)
555.00	450.00	1.000	1.000	1.000	1.000	17719	0.75	32780

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cpg} = \phi k_{cp} N_{cbg} = \phi k_{cp}$($A_{Nc}$ / A_{Nco})$\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.5.1.2 & Eq. 17.7.3.1b)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	837.50	225.00	0.945	0.940	1.000	1.000	12021	0.70	55654

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	2548	9412	0.27	Pass
T Concrete breakout y+	9050	15549	0.58	Pass
T Concrete breakout x+	11700	27824	0.42	Pass
|| Concrete breakout x-	3181	19215	0.17	Pass
|| Concrete breakout y+	5973	32780	0.18	Pass
Concrete breakout, combined	**-**	**-**	**0.72**	**Pass (Governs)**
Pryout	14792	55654	0.27	Pass

3/4"Ø CS Strong-Bolt 2, hnom:5.75" (146mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

SEISMIC JT.

$\Delta_{BLDG\ ALLOW} = .020 h_{sx}$ FOR RISK CAT III BLDG

h_{sx} = HT @ JOINT = TOP OF NEW TRUSS.
= 13'-2" = 158"

$\Delta_{BLDG\ ALLOW} = .020(158") = 3.16" = \delta_{M1}$

$\Delta_{CANOPY\ ALLOW} = .015 h_{sx}$ FOR RISK CAT III BLDG

h_{sx} = HT @ TOP CANOPY COL AS TRUSS IS RIGID & WILL LATERALLY DEFLECT SAME AS COL
= 9'-0" = 108"

$\Delta_{CANOPY\ ALLOW} = .015(108") = 1.62" = \delta_{M2}$

JOINT WIDTH PER ASCE 7 (12.12-2)

$$\delta_{MT} = \left[(\delta_{M1})^2 + (\delta_{M2})^2 \right]^{1/2}$$

$$= \left[(3.16)^2 + (1.62)^2 \right]^{1/2}$$

$$= 3.55" \text{ MIN.}$$

USE 4" SEISMIC JT

LIONÄKIS

Project # 019174.02 Sheet #

Project RIO CITY CAFE

Professional KDS Date 12/19/23

SHORING

- NORTH WALL LEDGER
  - LOADING : W_D = 300 PLF, W_L = 170 PLF
    - STUD SPACING = 24"
    - ⇒ P_D = 300(2') = 600 #
    - ⇒ P_L = 170#(2') = 240#
    - ⇒ $P_D + P_L$ = 840#
  - CHECK (5) 16D NAILS PER STUD
    - Z_a = 5(176#) = 880# (FROM SPREADSHEET, C_D = 1.25)
      - ⇒ Z_a = 880# > P = 840 # ⇒ OK ✓ DCR = 0.95
  - CHECK 2X12
    - SEE ENERCALC OUTPUT, DCR = 0.38 ✓
- SHORING BEAMS
  - 4X12 BEAMS SPACED 4'-0" O.C [DF-L, NO 1]
  - LOADING
    - P_D = 300 PLF (4') = 1200#
    - P_L = 170 PLF (4') = 680#
      - ⇒ $P_D + P_L$ = 1880 #
  - CHECK INVERTED HU412 HANGER AT CANTILEVER END
    - P_A = 3,970# [SIMPSON CATALOG FOR ROOF LOAD W/ MAX FASTENERS]
      - ⇒ P_A = 3970 # > 1880 # ⇒ OK ✓ DCR = 0.47
  - CHECK BEAM
    - SEE ENERCALC OUTPUT, DCR = 0.50 ✓
  - CHECK INVERTED HU412 HANGER AT BACKSPAN
    - P_D = 370 #, P_L = 150 # (FROM ENERCALC)
      - ⇒ P = 570# < 3970 # ⇒ OK ✓ DCR = 0.13
- WEST WALL LEDGER
  - WALL LOADING : W_D = 760 PLF, W_L = 100 PLF
  - NORTH LEDGER LOADING: 2' OF NORTH WALL TRIB ⇒ P_D = 600 #, P_L = 240 #
  - CHECK 2X12 DF-L NO.1 LEDGER
    - SEE ENERCALC OUTPUT, DCR = 0.93 ✓
  - CHECK (5) 16D NAILS PER STUD
    - LOADS ARE LOWER THAN EAST WALL ⇒ OK BY INSPECTION
  - CHECK EAST & NORTH LEDGER CONNECTION USING (2) A35
    - P_a = 2(590) = 1180# (SIMPSON CATALOG) > $P_D + P_L$ = 600 # + 240# = 840 # ⇒ OK ✓ DCR = 0.71

Nail Lateral Design Values

Location:

2016 CBC Chapter 23, 2015 NDS Chapter 11 and12

Nail Properties

Nail Type = Common
F_{yb} = 90000 psi
Nail Size = 16d
D = 0.162 in
L = 3.5 in

Section Properties

Side Member

Member thickness, t_s = 1.5 in
Species = DF-L
Dowel Bearing Strength, F_{es} = 4650 psi

Main Member

Member Thickness, t_m = 4 in
Species = DF-L
Dowel Bearing Strength, F_{em} = 4650 psi

Yield Mode Equations

$$R_t = l_m / l_s = (L - t_s - D) / t_s = 1.00$$

$$k_1 = [(R_e + 2 R_e^2 (1 + R_t + R_t^2) + R_t^2 R_e^3)^{1/2} - R_e (1 + R_t)] / (1 + R_e) = 0.46$$

$$k_2 = -1 + [2 (1 + R_e) + (2 F_{yb} (1+ 2 R_e) D^2 / (3 F_{em} l_m^2))]^{1/2} = 1.06$$

$$k_3 = -1 + [(2 (1 + R_e) / R_e) + ((2 F_{yb} (2 + R_e) D^2) / (3 F_{em} l_s^2))]^{1/2} = 1.11$$

$$R_d = 2.2$$

Mode I_m	$Z = (D l_m F_{em}) / R_d$ =	685	lbs	Eqn. 12.3-1
Mode I_s	$Z = (D l_s F_{es}) / R_d$ =	514	lbs	Eqn. 12.3-2
Mode II	$Z = (k_1 D l_s F_{es}) / R_d$ =	239	lbs	Eqn. 12.3-3
Mode III_m	$Z = (k_2 D l_m F_{em}) / (R_d (1 + 2 R_e))$ =	243	lbs	Eqn. 12.3-4
Mode III_s	$Z = (k_3 D l_s F_{em}) / (R_d (2 + R_e))$ =	190	lbs	Eqn. 12.3-5
Mode IV	$Z = (D^2 / R_d) [(2 F_{em} F_{yb}) / (3 (1 + R_e))]^{1/2}$ =	141	lbs	Eqn. 12.3-6
	Failure Mode =	Mode IV		
	Z_{min} =	**141**	**lbs**	

Applicable Adjustment Factors

(NDS Tbl 11.3.1): C_D C_M C_t C_g C_Δ C_{eg} C_{di} C_{tn}

Load Duration, C_D = see below
Wet Service, C_M = 1.00
Temperature, C_t = 1.00
Group Action Factor, C_g = 1.00
Geometry Factor, C_Δ = 1.00
End Grain, C_{eg} = 1.00
Diaphragm, C_{di} = 1.00
Toe Nail, C_{tn} = 1.00

Lateral Design Values

$Z'_{allow} = Z_{min}$ C_D C_M C_t C_g C_Δ C_{eg} C_{di} C_{tn}

Load Duration C_D (2015 NDS Tbl 2.3.2)		Z_{allow}, lbs
Dead Load	0.90	127
Floor, Occupancy Live Load	1.00	141
Snow Load	1.15	162
Roof Live Load	1.25	176
Earthquake / Wind Load	1.60	225

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Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: North Wall Ledger

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	900 psi	*E : Modulus of Elasticity*	
Load Combination :	IBC 2021	Fb -	900 psi	Ebend- xx	1600 ksi
		Fc - Prll	1350 psi	Eminbend - xx	580 ksi
Wood Species :	Douglas Fir-Larch	Fc - Perp	625 psi		
Wood Grade :	No.2	Fv	180 psi		
		Ft	575 psi	Density	31.21 pcf
Beam Bracing :	Completely Unbraced				

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.30, L = 0.120 , Tributary Width = 1.0 ft, (Wall Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.380 : 1	Maximum Shear Stress Ratio	=	0.221 : 1
Section used for this span		2x12	Section used for this span		2x12
fb: Actual	=	318.58 psi	fv: Actual	=	39.79 psi
F'b	=	838.30 psi	F'v	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.000 ft	Location of maximum on span	=	3.066 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.002 in	Ratio =	19660 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.009 in	Ratio =	5617 >=180	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 4.0 ft	1	0.298	0.175	0.90	1.00	1.00	0.94	1.000	1.00	1.00	1.00	0.60	227.6	764.6	0.32	28.4	162.0
+D+L					1.00	1.00	0.94	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.0 ft	1	0.380	0.221	1.00	1.00	1.00	0.93	1.000	1.00	1.00	1.00	0.84	318.6	838.3	0.45	39.8	180.0
+D+0.750L					1.00	1.00	0.93	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.0 ft	1	0.295	0.164	1.25	1.00	1.00	0.89	1.000	1.00	1.00	1.00	0.78	295.8	1,001.5	0.42	36.9	225.0
+0.60D					1.00	1.00	0.89	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 4.0 ft	1	0.117	0.059	1.60	1.00	1.00	0.81	1.000	1.00	1.00	1.00	0.36	136.5	1,163.3	0.19	17.1	288.0

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Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: North Wall Ledger

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0085	2.015		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.840	0.840
Max Upward from Load Combinations	0.840	0.840
Max Upward from Load Cases	0.600	0.600
D Only	0.600	0.600
+D+L	0.840	0.840
+D+0.750L	0.780	0.780
+0.60D	0.360	0.360
L Only	0.240	0.240

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Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: Shoring Beam

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

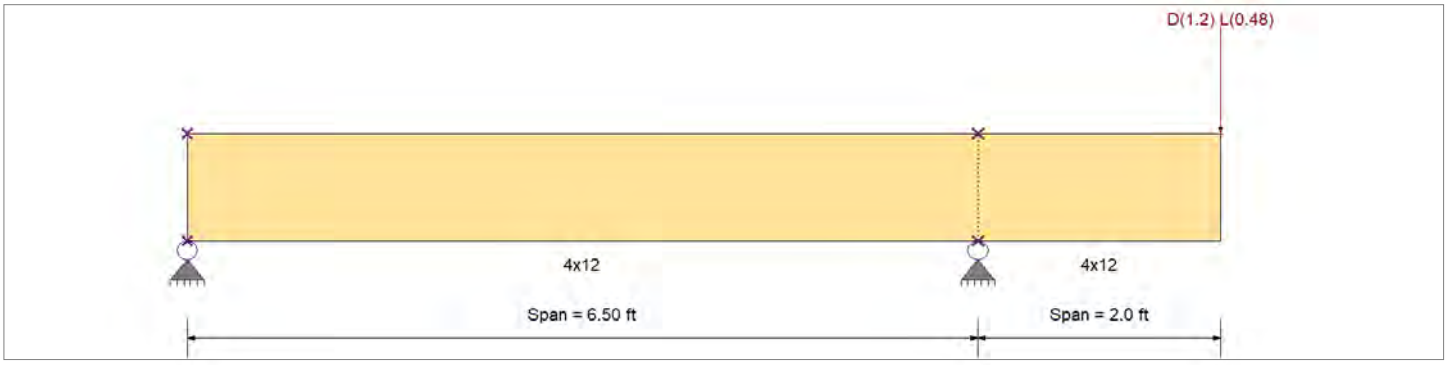
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination :	IBC 2021
Wood Species :	Douglas Fir-Larch
Wood Grade :	No.1
Beam Bracing :	Completely Unbraced

Fb +	1,000.0 psi
Fb -	1,000.0 psi
Fc - Prll	1,500.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	675.0 psi

E : Modulus of Elasticity

Ebend- xx	1,700.0 ksi
Eminbend - xx	620.0 ksi
Density	31.210 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Load for Span Number 2
Point Load : D = 1.20, L = 0.480 k @ 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.503 : 1	Maximum Shear Stress Ratio	=	0.356 : 1
Section used for this span		4x12	Section used for this span		4x12
fb: Actual	=	546.13 psi	fv: Actual	=	64.00 psi
F'b	=	1,085.12 psi	F'v	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	6.500 ft	Location of maximum on span	=	6.500 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.013 in	Ratio =	3608 >=360	Span: 2 : L Only
Max Upward Transient Deflection	-0.006 in	Ratio =	12159 >=360	Span: 1 : L Only
Max Downward Total Deflection	0.047 in	Ratio =	1030 >=180	Span: 2 : +D+L
Max Upward Total Deflection	-0.022 in	Ratio =	3474 >=180	Span: 1 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 6.50 ft	1	0.399	0.282	0.90	1.00	1.00	0.99	1.100	1.00	1.00	1.00	2.40	390.1	978.2	1.20	45.7	162.0
Length = 2.0 ft	2	0.395	0.282	0.90	1.00	1.00	1.00	1.100	1.00	1.00	1.00	2.40	390.1	986.8	1.20	45.7	162.0
+D+L					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.50 ft	1	0.503	0.356	1.00	1.00	1.00	0.99	1.100	1.00	1.00	1.00	3.36	546.1	1,085.1	1.68	64.0	180.0
Length = 2.0 ft	2	0.498	0.356	1.00	1.00	1.00	1.00	1.100	1.00	1.00	1.00	3.36	546.1	1,096.1	1.68	64.0	180.0
+D+0.750L					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.50 ft	1	0.376	0.264	1.25	1.00	1.00	0.98	1.100	1.00	1.00	1.00	3.12	507.1	1,350.3	1.56	59.4	225.0
Length = 2.0 ft	2	0.370	0.264	1.25	1.00	1.00	1.00	1.100	1.00	1.00	1.00	3.12	507.1	1,368.8	1.56	59.4	225.0

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Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: Shoring Beam

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+0.60D					1.00	1.00	1.00	1.100	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.50 ft	1	0.136	0.095	1.60	1.00	1.00	0.97	1.100	1.00	1.00	1.00	1.44	234.1	1,715.7	0.72	27.4	288.0
Length = 2.0 ft	2	0.134	0.095	1.60	1.00	1.00	0.99	1.100	1.00	1.00	1.00	1.44	234.1	1,749.5	0.72	27.4	288.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+L	-0.0225	3.777
+D+L	2	0.0466	2.000		0.0000	3.777

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		2.197	
Max Upward from Load Combinations		2.197	
Max Upward from Load Cases		1.569	
Max Downward from all Load Conditio	-0.517		
Max Downward from Load Combinations	-0.517		
Max Downward from Load Cases (Resis	-0.369		
D Only	-0.369	1.569	
+D+L	-0.517	2.197	
+D+0.750L	-0.480	2.040	
+0.60D	-0.222	0.942	
L Only	-0.148	0.628	

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Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: West Wall Ledger

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

Wood Species : Douglas Fir-Larch
Wood Grade : No.1

Beam Bracing : Beam bracing is defined as a set spacing over all spans

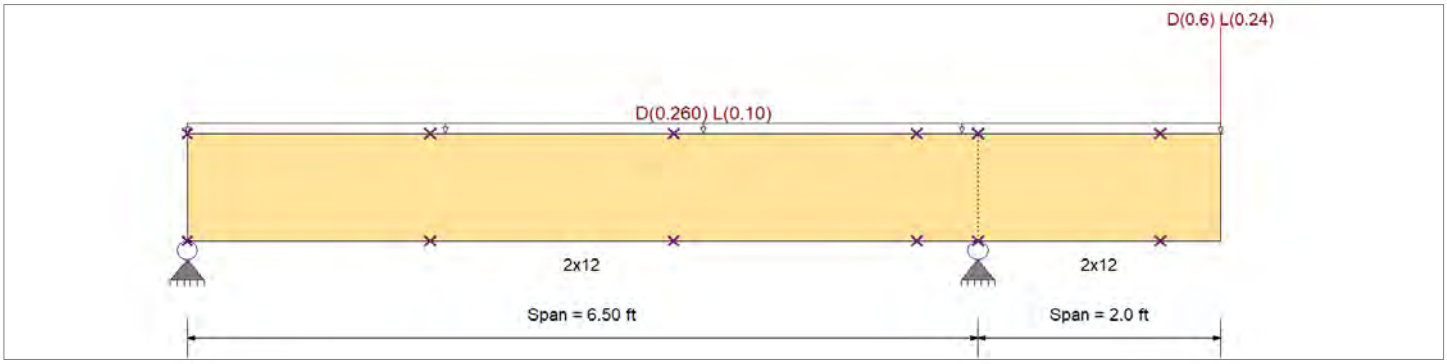
Fb +	1,000.0 psi
Fb -	1,000.0 psi
Fc - Prll	1,500.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	675.0 psi

E : Modulus of Elasticity

Ebend- xx	1,700.0 ksi
Eminbend - xx	620.0 ksi
Density	31.210 pcf

Unbraced Lengths

First Brace starts at ft from Left-Most support
Regular spacing of lateral supports on length of beam = 2.0 ft



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added
Loads on all spans...
Uniform Load on ALL spans : D = 0.260, L = 0.10 k/ft
Load for Span Number 2
Point Load : D = 0.60, L = 0.240 k @ 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.925 : 1	Maximum Shear Stress Ratio	=	0.770 : 1
Section used for this span		2x12	Section used for this span		2x12
fb: Actual	=	910.22 psi	fv: Actual	=	138.67 psi
F'b	=	984.05 psi	F'v	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	0.000 ft	Location of maximum on span	=	6.500 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.009 in	Ratio =	5622 >=360	Span: 2 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.029 in	Ratio =	1644 >=180	Span: 2 : +D+L
Max Upward Total Deflection	-0.001 in	Ratio =	55882 >=180	Span: 1 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 1.997 ft	1	0.276	0.318	0.90	1.00	1.00	0.98	1.000	1.00	1.00	1.00	0.64	243.0	881.8	0.58	51.6	162.0
Length = 1.997 ft	1	0.279	0.318	0.90	1.00	1.00	0.98	1.000	1.00	1.00	1.00	0.65	245.7	881.8	0.46	51.6	162.0
Length = 1.997 ft	1	0.512	0.536	0.90	1.00	1.00	0.98	1.000	1.00	1.00	1.00	1.19	451.1	881.8	0.98	86.9	162.0
Length = 0.5084 ft	1	0.728	0.615	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.72	652.3	896.3	1.12	99.6	162.0

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Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: West Wall Ledger

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 1.497 ft	2	0.735	0.615	0.90	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.72	652.3	887.4	1.12	99.6	162.0
Length = 0.5028 ft	2	0.142	0.615	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.33	126.9	896.4	0.73	99.6	162.0
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.997 ft	1	0.342	0.395	1.00	1.00	1.00	0.98	1.000	1.00	1.00	1.00	0.88	334.2	976.6	0.80	71.2	180.0
Length = 1.997 ft	1	0.346	0.395	1.00	1.00	1.00	0.98	1.000	1.00	1.00	1.00	0.89	337.8	976.6	0.64	71.2	180.0
Length = 1.997 ft	1	0.646	0.670	1.00	1.00	1.00	0.98	1.000	1.00	1.00	1.00	1.66	631.1	976.6	1.36	120.6	180.0
Length = 0.5084 ft	1	0.914	0.770	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.40	910.2	995.4	1.56	138.7	180.0
Length = 1.497 ft	2	0.925	0.770	1.00	1.00	1.00	0.98	1.000	1.00	1.00	1.00	2.40	910.2	984.1	1.56	138.7	180.0
Length = 0.5028 ft	2	0.178	0.770	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.47	177.4	995.5	1.02	138.7	180.0
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.997 ft	1	0.257	0.295	1.25	1.00	1.00	0.97	1.000	1.00	1.00	1.00	0.82	311.4	1,209.5	0.75	66.3	225.0
Length = 1.997 ft	1	0.260	0.295	1.25	1.00	1.00	0.97	1.000	1.00	1.00	1.00	0.83	314.7	1,209.5	0.59	66.3	225.0
Length = 1.997 ft	1	0.485	0.498	1.25	1.00	1.00	0.97	1.000	1.00	1.00	1.00	1.55	586.1	1,209.5	1.26	112.1	225.0
Length = 0.5084 ft	1	0.681	0.573	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	2.23	845.7	1,242.7	1.45	128.9	225.0
Length = 1.497 ft	2	0.691	0.573	1.25	1.00	1.00	0.98	1.000	1.00	1.00	1.00	2.23	845.7	1,223.3	1.45	128.9	225.0
Length = 0.5028 ft	2	0.133	0.573	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	0.43	164.8	1,242.8	0.95	128.9	225.0
+0.60D					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.997 ft	1	0.096	0.107	1.60	1.00	1.00	0.95	1.000	1.00	1.00	1.00	0.38	145.8	1,522.3	0.35	31.0	288.0
Length = 1.997 ft	1	0.097	0.107	1.60	1.00	1.00	0.95	1.000	1.00	1.00	1.00	0.39	147.4	1,522.3	0.27	31.0	288.0
Length = 1.997 ft	1	0.178	0.181	1.60	1.00	1.00	0.95	1.000	1.00	1.00	1.00	0.71	270.7	1,522.3	0.59	52.1	288.0
Length = 0.5084 ft	1	0.247	0.207	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.03	391.4	1,587.7	0.67	59.7	288.0
Length = 1.497 ft	2	0.252	0.207	1.60	1.00	1.00	0.97	1.000	1.00	1.00	1.00	1.03	391.4	1,551.3	0.67	59.7	288.0
Length = 0.5028 ft	2	0.048	0.207	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	0.20	76.1	1,587.9	0.44	59.7	288.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0133	2.469	+D+L	-0.0014	5.992
+D+L	2	0.0292	2.000		0.0000	5.992

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	0.801	3.099	
Max Upward from Load Combinations	0.801	3.099	
Max Upward from Load Cases	0.580	2.230	
D Only	0.580	2.230	
+D+L	0.801	3.099	
+D+0.750L	0.746	2.882	
+0.60D	0.348	1.338	
L Only	0.220	0.870	

LIONÄKIS

Project # 019124.02 Sheet #

Project RIO CITY CAFE

Professional KPJ Date 12/19/23

SHORING (cont)

- SOUTH WALL LEDGER
  - CHECK LEDGER TO RESIST BEAM BACK SPAN
  - LOADING
    - FROM BEAM CHECK / ENERCALC P = 570 #
  - => LEDGER: 6 (5) NAILS PER SGD BY INSPECTION
- SHORING GIRDER (PROPPED)
  - CHECK 6x12 DF-L SELECT STRUCTURAL BEAM
  - LOADING
    - FROM WEST LEDGER ENERCALC: P_D = 2,230 #, P_L = 870 #
    - FROM BEAM ENERCALC: P_D = 1,570 #, P_L = 630 #
  - CHECK BEAM
    - SEE ENERCALC OUTPUT, DCR = 0.62 ✓
- 6x6 VERTICAL POST
  - LOADING FROM GIRDER
    - COMPRESSION: P_D = 2.39 K, P_L = 0.94 K (FROM GIRDER ENERCALC)
  - CHECK POST FOR COMPRESSION
    - SEE ENERCALC OUTPUT, DCR = 0.11 ✓
- 6x6 DIAGONAL PROP
  - LOADING FROM GIRDER
    - VERTICAL = P_D = 6.10k, P_L = 2.53k (FROM GIRDER ENERCALC)
      - => AXIAL: P_D = 6.1k/(0.71) = 8.6k, P_L = 3.56k
      - => HORIZONTAL: P_D = 6.1k, P_L = 2.53k
  - CHECK POST FOR COMPRESSION
    - SEE ENERCALC OUTPUT, DCR = 0.39 ✓

- Check Simpson LTP4 in combination with SDCP 0.315 X 9 1/2" screws to resist horizontal load
  - Pa = 450# per SDCP (per spreadsheet)
  - Pa = 580# per LTP4 (per Simpson catlog)
  - => For (6) LTP4 each side, and 6 SDCP, Pa = (12X580)+(6x450) = 9,660#
  - => Pa = 9,660# > 6.15+2.53k = 8.63k => OK, DCR = 0.89

- Check Transfer of forces to the ground
  - Check A35 transfer from base 6X12 to flat 6X12
    - Pa = 555# per A35 (per Simpson Catalog)
    - Determine required number of A35 ea side of base 6x12
      - n = 8630#/(555# x 2 Sides) = 7.77 => 8 min ea side
  - Check Expansion Anchor transfer into slab
    - Pa = 1450# per anchor (per Profis output)
      - 3/8" DIA anchor w/ 6" min edge distance in 4" 3ksi slab
    - Determine required number of anchor pairs at flat 6x12
      - n = 8630#/(1450# x 2 Sides) = 2.97 => 3 min ea side
  - More than 8 A35s are provided and more than 3 pairs of expansion anchors are provided => OK

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Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 25 JAN 2024, 6:47PM

Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: Propped Shoring Girder

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2021

Wood Species : Douglas Fir-Larch
Wood Grade : Select Structural

Beam Bracing : Beam bracing is defined as a set spacing over all spans

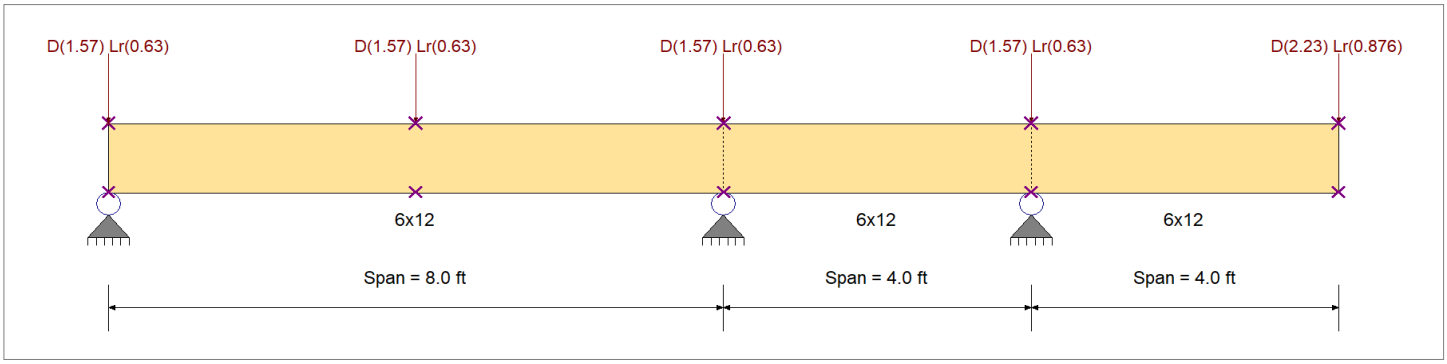
Fb +	1,600.0 psi
Fb -	1,600.0 psi
Fc - Prll	1,100.0 psi
Fc - Perp	625.0 psi
Fv	170.0 psi
Ft	950.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	31.210 pcf

Unbraced Lengths

First Brace starts at ft from Left-Most support
Regular spacing of lateral supports on length of beam = 4.0 ft



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load for Span Number 1
Point Load : D = 1.570, Lr = 0.630 k @ 0.0 ft, (4X8 Beam)
Point Load : D = 1.570, Lr = 0.630 k @ 4.0 ft, (4X8 Beam)
Point Load : D = 1.570, Lr = 0.630 k @ 8.0 ft, (4X8 Beam)
Load for Span Number 2
Point Load : D = 1.570, Lr = 0.630 k @ 4.0 ft, (4X8 Beam)
Load for Span Number 3
Point Load : D = 2.230, Lr = 0.8760 k @ 4.0 ft, (4X8 Beam)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.624 : 1	Maximum Shear Stress Ratio	=	0.363 : 1
Section used for this span		6x12	Section used for this span		6x12
fb: Actual	=	1,240.66 psi	fv: Actual	=	77.24 psi
F'b	=	1,988.04 psi	F'v	=	212.50 psi
Load Combination		+D+Lr+H, LL Comb Run (**L)	Load Combination		+D+Lr+H, LL Comb Run (**L)
Location of maximum on span	=	4.000 ft	Location of maximum on span	=	3.059 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.058 in	Ratio =	1656 >=360	Span: 3 : Lr Only, LL Comb Run (LLL)
Max Upward Transient Deflection	-0.006 in	Ratio =	8419 >=360	Span: 2 : Lr Only, LL Comb Run (L*L)
Max Downward Total Deflection	0.207 in	Ratio =	464 >=180	Span: 3 : +D+Lr+H, LL Comb Run (LLL)
Max Upward Total Deflection	-0.020 in	Ratio =	2357 >=180	Span: 2 : +D+Lr+H, LL Comb Run (L*L)

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H														0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.217	0.125	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,434.0	0.81	19.2	153.0

Wood Beam

DESCRIPTION: Propped Shoring Girder

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 4.034 ft	1	0.217	0.340	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,433.9	2.19	52.0	153.0
Length = 4.0 ft	2	0.623	0.352	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,434.0	2.27	53.9	153.0
Length = 4.0 ft	3	0.623	0.352	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,434.0	2.27	53.9	153.0
+D+L+H, LL Comb Run (**L)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.196	0.113	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.6	0.81	19.2	170.0
Length = 4.034 ft	1	0.196	0.306	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.4	2.19	52.0	170.0
Length = 4.0 ft	2	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
Length = 4.0 ft	3	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
+D+L+H, LL Comb Run (*L*)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.196	0.113	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.6	0.81	19.2	170.0
Length = 4.034 ft	1	0.196	0.306	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.4	2.19	52.0	170.0
Length = 4.0 ft	2	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
Length = 4.0 ft	3	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
+D+L+H, LL Comb Run (*LL)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.196	0.113	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.6	0.81	19.2	170.0
Length = 4.034 ft	1	0.196	0.306	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.4	2.19	52.0	170.0
Length = 4.0 ft	2	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
Length = 4.0 ft	3	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
+D+L+H, LL Comb Run (L**)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.196	0.113	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.6	0.81	19.2	170.0
Length = 4.034 ft	1	0.196	0.306	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.4	2.19	52.0	170.0
Length = 4.0 ft	2	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
Length = 4.0 ft	3	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
+D+L+H, LL Comb Run (L*L)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.196	0.113	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.6	0.81	19.2	170.0
Length = 4.034 ft	1	0.196	0.306	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.4	2.19	52.0	170.0
Length = 4.0 ft	2	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
Length = 4.0 ft	3	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
+D+L+H, LL Comb Run (LL*)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.196	0.113	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.6	0.81	19.2	170.0
Length = 4.034 ft	1	0.196	0.306	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.4	2.19	52.0	170.0
Length = 4.0 ft	2	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
Length = 4.0 ft	3	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
+D+L+H, LL Comb Run (LLL)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.196	0.113	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.6	0.81	19.2	170.0
Length = 4.034 ft	1	0.196	0.306	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.15	311.8	1,592.4	2.19	52.0	170.0
Length = 4.0 ft	2	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
Length = 4.0 ft	3	0.561	0.317	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.03	893.8	1,592.5	2.27	53.9	170.0
+D+Lr+H, LL Comb Run (**L)					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.171	0.098	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.44	340.5	1,988.2	0.88	20.9	212.5
Length = 4.034 ft	1	0.171	0.359	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.44	340.9	1,987.9	3.22	76.2	212.5
Length = 4.0 ft	2	0.624	0.363	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.26	77.2	212.5
Length = 4.0 ft	3	0.624	0.363	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.15	77.2	212.5
+D+Lr+H, LL Comb Run (*L*)					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.157	0.090	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,988.2	0.81	19.2	212.5
Length = 4.034 ft	1	0.157	0.245	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,987.9	2.19	52.0	212.5
Length = 4.0 ft	2	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5

Wood Beam

DESCRIPTION: Propped Shoring Girder

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 4.0 ft	3	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
+D+Lr+H, LL Comb Run (*LL)					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.171	0.098	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.44	340.5	1,988.2	0.88	20.9	212.5
Length = 4.034 ft	1	0.171	0.359	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.44	340.9	1,987.9	3.22	76.2	212.5
Length = 4.0 ft	2	0.624	0.363	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.26	77.2	212.5
Length = 4.0 ft	3	0.624	0.363	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.15	77.2	212.5
+D+Lr+H, LL Comb Run (L**)					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.203	0.117	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.09	404.6	1,988.2	1.04	24.8	212.5
Length = 4.034 ft	1	0.204	0.227	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.09	404.6	1,987.9	2.04	48.3	212.5
Length = 4.0 ft	2	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
Length = 4.0 ft	3	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
+D+Lr+H, LL Comb Run (L*L)					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.218	0.125	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.38	433.2	1,988.2	1.12	26.5	212.5
Length = 4.034 ft	1	0.218	0.341	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.38	433.2	1,987.9	3.06	72.5	212.5
Length = 4.0 ft	2	0.624	0.351	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.15	74.7	212.5
Length = 4.0 ft	3	0.624	0.351	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.15	74.7	212.5
+D+Lr+H, LL Comb Run (LL*)					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.203	0.117	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.09	404.6	1,988.2	1.04	24.8	212.5
Length = 4.034 ft	1	0.204	0.227	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.09	404.6	1,987.9	2.04	48.3	212.5
Length = 4.0 ft	2	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
Length = 4.0 ft	3	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
+D+Lr+H, LL Comb Run (LLL					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.218	0.125	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.38	433.2	1,988.2	1.12	26.5	212.5
Length = 4.034 ft	1	0.218	0.341	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.38	433.2	1,987.9	3.06	72.5	212.5
Length = 4.0 ft	2	0.624	0.351	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.15	74.7	212.5
Length = 4.0 ft	3	0.624	0.351	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	12.53	1,240.7	1,988.0	3.15	74.7	212.5
+D+S+H					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.170	0.098	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,830.1	0.81	19.2	195.5
Length = 4.034 ft	1	0.170	0.266	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,829.9	2.19	52.0	195.5
Length = 4.0 ft	2	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
Length = 4.0 ft	3	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
+D+0.750Lr+0.750L+H, LL Cc					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.168	0.096	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.3	1,988.2	0.86	20.5	212.5
Length = 4.034 ft	1	0.168	0.330	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.6	1,987.9	2.96	70.2	212.5
Length = 4.0 ft	2	0.580	0.335	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	3.00	71.2	212.5
Length = 4.0 ft	3	0.580	0.335	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	2.93	71.2	212.5
+D+0.750Lr+0.750L+H, LL Cc					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.157	0.090	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,988.2	0.81	19.2	212.5
Length = 4.034 ft	1	0.157	0.245	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,987.9	2.19	52.0	212.5
Length = 4.0 ft	2	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
Length = 4.0 ft	3	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
+D+0.750Lr+0.750L+H, LL Cc					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.168	0.096	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.3	1,988.2	0.86	20.5	212.5
Length = 4.034 ft	1	0.168	0.330	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.6	1,987.9	2.96	70.2	212.5
Length = 4.0 ft	2	0.580	0.335	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	3.00	71.2	212.5
Length = 4.0 ft	3	0.580	0.335	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	2.93	71.2	212.5
+D+0.750Lr+0.750L+H, LL Cc					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Wood Beam

DESCRIPTION: Propped Shoring Girder

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
Length = 3.966 ft	1	0.192	0.110	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	1,988.2	0.99	23.4	212.5
Length = 4.034 ft	1	0.192	0.232	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	1,987.9	2.08	49.2	212.5
Length = 4.0 ft	2	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
Length = 4.0 ft	3	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
+D+0.750Lr+0.750L+H, LL Cc					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.203	0.116	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	1,988.2	1.04	24.7	212.5
Length = 4.034 ft	1	0.203	0.317	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	1,987.9	2.84	67.4	212.5
Length = 4.0 ft	2	0.580	0.327	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	2.93	69.5	212.5
Length = 4.0 ft	3	0.580	0.327	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	2.93	69.5	212.5
+D+0.750Lr+0.750L+H, LL Cc					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.192	0.110	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	1,988.2	0.99	23.4	212.5
Length = 4.034 ft	1	0.192	0.232	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	1,987.9	2.08	49.2	212.5
Length = 4.0 ft	2	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
Length = 4.0 ft	3	0.450	0.254	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,988.0	2.27	53.9	212.5
+D+0.750Lr+0.750L+H, LL Cc					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.203	0.116	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	1,988.2	1.04	24.7	212.5
Length = 4.034 ft	1	0.203	0.317	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	1,987.9	2.84	67.4	212.5
Length = 4.0 ft	2	0.580	0.327	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	2.93	69.5	212.5
Length = 4.0 ft	3	0.580	0.327	1.25	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	1,988.0	2.93	69.5	212.5
+D+0.750L+0.750S+H, LL Co					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.170	0.098	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,830.1	0.81	19.2	195.5
Length = 4.034 ft	1	0.170	0.266	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,829.9	2.19	52.0	195.5
Length = 4.0 ft	2	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
Length = 4.0 ft	3	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
+D+0.750L+0.750S+H, LL Co					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.170	0.098	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,830.1	0.81	19.2	195.5
Length = 4.034 ft	1	0.170	0.266	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,829.9	2.19	52.0	195.5
Length = 4.0 ft	2	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
Length = 4.0 ft	3	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
+D+0.750L+0.750S+H, LL Co					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.170	0.098	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,830.1	0.81	19.2	195.5
Length = 4.034 ft	1	0.170	0.266	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,829.9	2.19	52.0	195.5
Length = 4.0 ft	2	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
Length = 4.0 ft	3	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
+D+0.750L+0.750S+H, LL Co					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.170	0.098	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,830.1	0.81	19.2	195.5
Length = 4.034 ft	1	0.170	0.266	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,829.9	2.19	52.0	195.5
Length = 4.0 ft	2	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
Length = 4.0 ft	3	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
+D+0.750L+0.750S+H, LL Co					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.170	0.098	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,830.1	0.81	19.2	195.5
Length = 4.034 ft	1	0.170	0.266	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,829.9	2.19	52.0	195.5

Wood Beam

DESCRIPTION: Propped Shoring Girder

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 4.0 ft	2	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
Length = 4.0 ft	3	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
+D+0.750L+0.750S+H, LL Co					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.170	0.098	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,830.1	0.81	19.2	195.5
Length = 4.034 ft	1	0.170	0.266	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	1,829.9	2.19	52.0	195.5
Length = 4.0 ft	2	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
Length = 4.0 ft	3	0.488	0.276	1.15	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	1,830.0	2.27	53.9	195.5
+D+0.60W+H					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.70E+H					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750Lr+0.750L+0.450W-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.131	0.075	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.3	2,540.0	0.86	20.5	272.0
Length = 4.034 ft	1	0.131	0.258	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.6	2,539.6	2.96	70.2	272.0
Length = 4.0 ft	2	0.454	0.262	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	3.00	71.2	272.0
Length = 4.0 ft	3	0.454	0.262	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	2.93	71.2	272.0
+D+0.750Lr+0.750L+0.450W-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750Lr+0.750L+0.450W-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.131	0.075	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.3	2,540.0	0.86	20.5	272.0
Length = 4.034 ft	1	0.131	0.258	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.37	333.6	2,539.6	2.96	70.2	272.0
Length = 4.0 ft	2	0.454	0.262	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	3.00	71.2	272.0
Length = 4.0 ft	3	0.454	0.262	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	2.93	71.2	272.0
+D+0.750Lr+0.750L+0.450W-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.150	0.086	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	2,540.0	0.99	23.4	272.0
Length = 4.034 ft	1	0.150	0.181	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	2,539.6	2.08	49.2	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750Lr+0.750L+0.450W-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.159	0.091	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	2,540.0	1.04	24.7	272.0
Length = 4.034 ft	1	0.159	0.248	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	2,539.6	2.84	67.4	272.0
Length = 4.0 ft	2	0.454	0.255	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	2.93	69.5	272.0
Length = 4.0 ft	3	0.454	0.255	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	2.93	69.5	272.0
+D+0.750Lr+0.750L+0.450W-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.150	0.086	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	2,540.0	0.99	23.4	272.0
Length = 4.034 ft	1	0.150	0.181	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.85	381.4	2,539.6	2.08	49.2	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0

Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: Propped Shoring Girder

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
+D+0.750Lr+0.750L+0.450W-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.159	0.091	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	2,540.0	1.04	24.7	272.0
Length = 4.034 ft	1	0.159	0.248	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	4.07	402.9	2,539.6	2.84	67.4	272.0
Length = 4.0 ft	2	0.454	0.255	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	2.93	69.5	272.0
Length = 4.0 ft	3	0.454	0.255	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	11.66	1,153.9	2,539.8	2.93	69.5	272.0
+D+0.750L+0.750S+0.450W+					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.450W+					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.450W+					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.450W+					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.450W+					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.450W+					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.450W+					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.5250E-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.5250E-					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0

Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: Propped Shoring Girder

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.5250E·					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.5250E·					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.5250E·					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.5250E·					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+D+0.750L+0.750S+0.5250E·					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.123	0.070	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,540.0	0.81	19.2	272.0
Length = 4.034 ft	1	0.123	0.191	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	3.15	311.8	2,539.6	2.19	52.0	272.0
Length = 4.0 ft	2	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
Length = 4.0 ft	3	0.352	0.198	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	9.03	893.8	2,539.8	2.27	53.9	272.0
+0.60D+0.60W+0.60H					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.074	0.042	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.89	187.1	2,540.0	0.49	11.5	272.0
Length = 4.034 ft	1	0.074	0.115	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.89	187.1	2,539.6	1.32	31.2	272.0
Length = 4.0 ft	2	0.211	0.119	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	5.42	536.3	2,539.8	1.36	32.3	272.0
Length = 4.0 ft	3	0.211	0.119	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	5.42	536.3	2,539.8	1.36	32.3	272.0
+0.60D+0.70E+0.60H					1.00	1.00	0.99	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.966 ft	1	0.074	0.042	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.89	187.1	2,540.0	0.49	11.5	272.0
Length = 4.034 ft	1	0.074	0.115	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	1.89	187.1	2,539.6	1.32	31.2	272.0
Length = 4.0 ft	2	0.211	0.119	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	5.42	536.3	2,539.8	1.36	32.3	272.0
Length = 4.0 ft	3	0.211	0.119	1.60	1.00	1.00	0.99	1.000	1.00	1.00	1.00	5.42	536.3	2,539.8	1.36	32.3	272.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+Lr+H, LL Comb Run (L*L)	1	0.0368	4.034		0.0000	0.000
	2	0.0000	4.034	+D+Lr+H, LL Comb Run (L*L)	-0.0204	2.319
+D+Lr+H, LL Comb Run (LLL)	3	0.2068	4.000		0.0000	2.319

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Max Upward from all Load Conditions	3.331	1.416	8.631	
Max Upward from Load Combinations	3.331	1.416	8.631	
Max Upward from Load Cases	2.391	1.181	6.103	

Wood Beam

DESCRIPTION: Propped Shoring Girder

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Max Downward from all Load Conditio	-0.000	-1.095	-0.157	
Max Downward from Load Combinations		-0.860		
Max Downward from Load Cases (Resis	-0.000	-1.095	-0.157	
+D+H	2.391	0.235	6.103	
+D+L+H, LL Comb Run (**L)	2.391	0.235	6.103	
+D+L+H, LL Comb Run (*L*)	2.391	0.235	6.103	
+D+L+H, LL Comb Run (*LL)	2.391	0.235	6.103	
+D+L+H, LL Comb Run (L**)	2.391	0.235	6.103	
+D+L+H, LL Comb Run (L*L)	2.391	0.235	6.103	
+D+L+H, LL Comb Run (LL*)	2.391	0.235	6.103	
+D+L+H, LL Comb Run (LLL)	2.391	0.235	6.103	
+D+Lr+H, LL Comb Run (**L)	2.464	-0.860	8.001	
+D+Lr+H, LL Comb Run (*L*)	2.391	0.235	6.733	
+D+Lr+H, LL Comb Run (*LL)	2.464	-0.860	8.631	
+D+Lr+H, LL Comb Run (L**)	3.258	1.416	5.945	
+D+Lr+H, LL Comb Run (L*L)	3.331	0.321	7.843	
+D+Lr+H, LL Comb Run (LL*)	3.258	1.416	6.575	
+D+Lr+H, LL Comb Run (LLL)	3.331	0.321	8.473	
+D+S+H	2.391	0.235	6.103	
+D+0.750Lr+0.750L+H, LL Comb Run (*	2.446	-0.586	7.526	
+D+0.750Lr+0.750L+H, LL Comb Run (*	2.391	0.235	6.575	
+D+0.750Lr+0.750L+H, LL Comb Run (*	2.446	-0.586	7.999	
+D+0.750Lr+0.750L+H, LL Comb Run (L	3.041	1.121	5.985	
+D+0.750Lr+0.750L+H, LL Comb Run (L	3.096	0.300	7.408	
+D+0.750Lr+0.750L+H, LL Comb Run (L	3.041	1.121	6.457	
+D+0.750Lr+0.750L+H, LL Comb Run (L	3.096	0.300	7.881	
+D+0.750L+0.750S+H, LL Comb Run (**	2.391	0.235	6.103	
+D+0.750L+0.750S+H, LL Comb Run (*L	2.391	0.235	6.103	
+D+0.750L+0.750S+H, LL Comb Run (*L	2.391	0.235	6.103	
+D+0.750L+0.750S+H, LL Comb Run (L*	2.391	0.235	6.103	
+D+0.750L+0.750S+H, LL Comb Run (L*	2.391	0.235	6.103	
+D+0.750L+0.750S+H, LL Comb Run (LL	2.391	0.235	6.103	
+D+0.750L+0.750S+H, LL Comb Run (LL	2.391	0.235	6.103	
+D+0.60W+H	2.391	0.235	6.103	
+D+0.70E+H	2.391	0.235	6.103	
+D+0.750Lr+0.750L+0.450W+H, LL Comb	2.446	-0.586	7.526	
+D+0.750Lr+0.750L+0.450W+H, LL Comb	2.391	0.235	6.575	
+D+0.750Lr+0.750L+0.450W+H, LL Comb	2.446	-0.586	7.999	
+D+0.750Lr+0.750L+0.450W+H, LL Comb	3.041	1.121	5.985	
+D+0.750Lr+0.750L+0.450W+H, LL Comb	3.096	0.300	7.408	
+D+0.750Lr+0.750L+0.450W+H, LL Comb	3.041	1.121	6.457	
+D+0.750Lr+0.750L+0.450W+H, LL Comb	3.096	0.300	7.881	
+D+0.750L+0.750S+0.450W+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.450W+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.450W+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.450W+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.450W+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.450W+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.450W+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.5250E+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.5250E+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.5250E+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.5250E+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.5250E+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.5250E+H, LL Comb	2.391	0.235	6.103	
+D+0.750L+0.750S+0.5250E+H, LL Comb	2.391	0.235	6.103	
+0.60D+0.60W+0.60H	1.435	0.141	3.662	
+0.60D+0.70E+0.60H	1.435	0.141	3.662	
D Only	2.391	0.235	6.103	
Lr Only, LL Comb Run (**L)	0.073	-1.095	1.898	

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Project Title:
Engineer:
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Wood Beam

Project File: Shoring Calcs.ec6

DESCRIPTION: Propped Shoring Girder

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Lr Only, LL Comb Run (*L*)	-0.000	0.000	0.630	
Lr Only, LL Comb Run (*LL)	0.073	-1.095	2.528	
Lr Only, LL Comb Run (L**)	0.866	1.181	-0.157	
Lr Only, LL Comb Run (L*L)	0.939	0.086	1.740	
Lr Only, LL Comb Run (LL*)	0.866	1.181	0.473	
Lr Only, LL Comb Run (LLL)	0.939	0.086	2.370	
H Only				

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Wood Column

Project File: Shoring Calcs.ec6

DESCRIPTION: Vertical Support Post

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Analysis Method	Allowable Stress Design	Wood Section Name	**6x6**
End Fixities	Top & Bottom Pinned	Wood Grading/Manuf.	Graded Lumber
Overall Column Height	6 ft	Wood Member Type	Sawn
(Used for non-slender calculations)			
Wood Species	Douglas Fir-Larch	Exact Width	**5.50** in
Wood Grade	Select Structural	Exact Depth	**5.50** in
Fb +	1500 psi	Fv	170 psi
Fb -	1500 psi	Ft	1000 psi
Fc - Prll	1150 psi	Density	31.21 pcf
Fc - Perp	625 psi		

Area	30.250 in^2
Ix	76.255 in^4
Iy	76.255 in^4

Allow Stress Modification Factors

Cf or Cv for Bending	1.0
Cf or Cv for Compressio	1.0
Cf or Cv for Tension	1.0
Cm : Wet Use Factor	1.0
Ct : Temperature Fact	1.0
Cfu : Flat Use Factor	1.0
Kf : Built-up columns	1.0
Use Cr : Repetitive ?	No

E : Modulus of Elasticity . . .

	x-x Bending	y-y Bending	Axial
Basic	1600	1600	1600 ksi
Minimum	580	580	

Column Buckling Condition:
ABOUT X-X Axis: Lux = 6 ft, Kx = 1.0
ABOUT Y-Y Axis: Luy = 6 ft, Ky = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 39.338 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 6.0 ft, D = 2.390, L = 0.940 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.1082 : 1**

Load Combination	+D+L
Governing NDS Forumla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	3.369 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	1,029.15 psi

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.60D
Location of max.above base	6.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	272.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : n/a

Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.900	0.907	0.08550	PASS	0.0 ft	0.0	PASS	6.0 ft
+D+L	1.000	0.895	0.1082	PASS	0.0 ft	0.0	PASS	6.0 ft
+D+0.750L	1.250	0.862	0.08365	PASS	0.0 ft	0.0	PASS	6.0 ft
+0.60D	1.600	0.812	0.03226	PASS	0.0 ft	0.0	PASS	6.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments k-ft @ Base	@ Top	Mx - End Moments @ Base	@ Top
D Only					2.429				
+D+L					3.369				
+D+0.750L					3.134				

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Wood Column

Project File: Shoring Calcs.ec6

DESCRIPTION: Vertical Support Post

Maximum Reactions

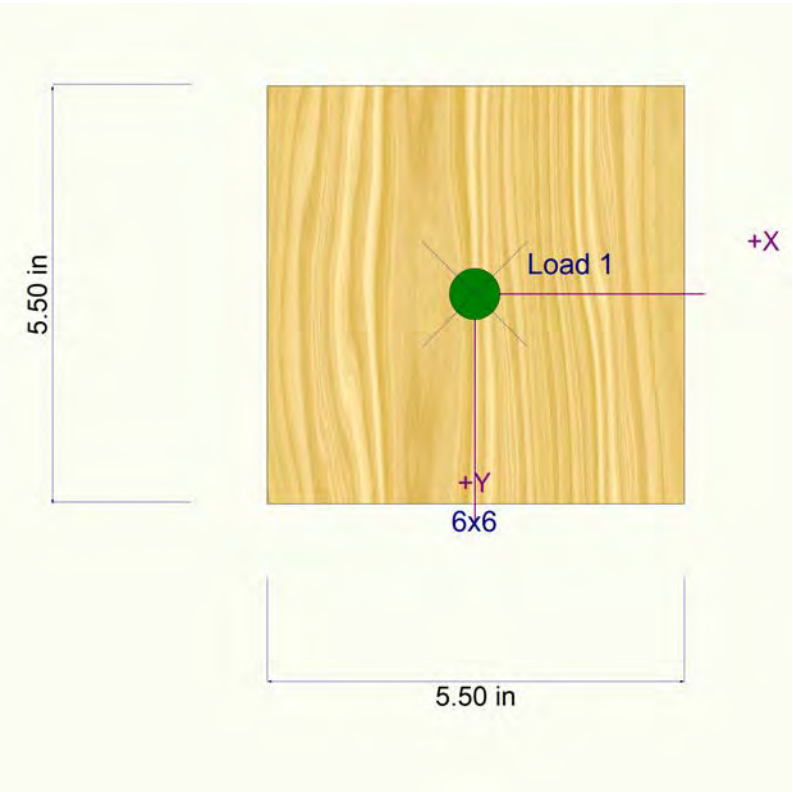
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments @ Base	@ Top	k-ft	Mx - End Moments @ Base	@ Top
+0.60D						1.458					
L Only						0.940					

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000ft	0.000 in	0.000 ft

Sketches



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Project Title:
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Wood Column

Project File: Shoring Calcs.ec6

DESCRIPTION: Diagonal Prop Post

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Analysis Method	Allowable Stress Design	Wood Section Name	**6x6**
End Fixities	Top & Bottom Pinned	Wood Grading/Manuf.	Graded Lumber
Overall Column Height	6 ft	Wood Member Type	Sawn
(Used for non-slender calculations)			
Wood Species	Douglas Fir-Larch	Exact Width	**5.50** in
Wood Grade	Select Structural	Exact Depth	**5.50** in
Fb +	1,500.0 psi	Fv	170.0 psi
Fb -	1,500.0 psi	Ft	1,000.0 psi
Fc - Prll	1,150.0 psi	Density	31.210 pcf
Fc - Perp	625.0 psi		

Area	30.250 in^2
Ix	76.255 in^4
Iy	76.255 in^4

Allow Stress Modification Factors

Cf or Cv for Bending	1.0
Cf or Cv for Compressio	1.0
Cf or Cv for Tension	1.0
Cm : Wet Use Factor	1.0
Ct : Temperature Fact	1.0
Cfu : Flat Use Factor	1.0
Kf : Built-up columns	1.0
Use Cr : Repetitive ?	No

E : Modulus of Elasticity . . .

	x-x Bending	y-y Bending	Axial
Basic	1,600.0	1,600.0	1,600.0 ksi
Minimum	580.0	580.0	

Column Buckling Condition:
ABOUT X-X Axis: Lux = 6 ft, Kx = 1.0
ABOUT Y-Y Axis: Luy = 6 ft, Ky = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 39.338 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 6.0 ft, D = 8.60, L = 3.560 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.3919 : 1**

Load Combination	+D+L
Governing NDS Forumla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	12.199 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	1,029.15 psi

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.60D
Location of max.above base	6.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	272.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : n/a

Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

	Bending	Compression	Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.900	0.907	0.3041	PASS	0.0 ft	0.0	PASS	6.0 ft
+D+L	1.000	0.895	0.3919	PASS	0.0 ft	0.0	PASS	6.0 ft
+D+0.750L	1.250	0.862	0.3018	PASS	0.0 ft	0.0	PASS	6.0 ft
+0.60D	1.600	0.812	0.1147	PASS	0.0 ft	0.0	PASS	6.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments k-ft @ Base	@ Top	Mx - End Moments @ Base	@ Top
D Only					8.639				
+D+L					12.199				
+D+0.750L					11.309				

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Wood Column

Project File: Shoring Calcs.ec6

DESCRIPTION: Diagonal Prop Post

Maximum Reactions

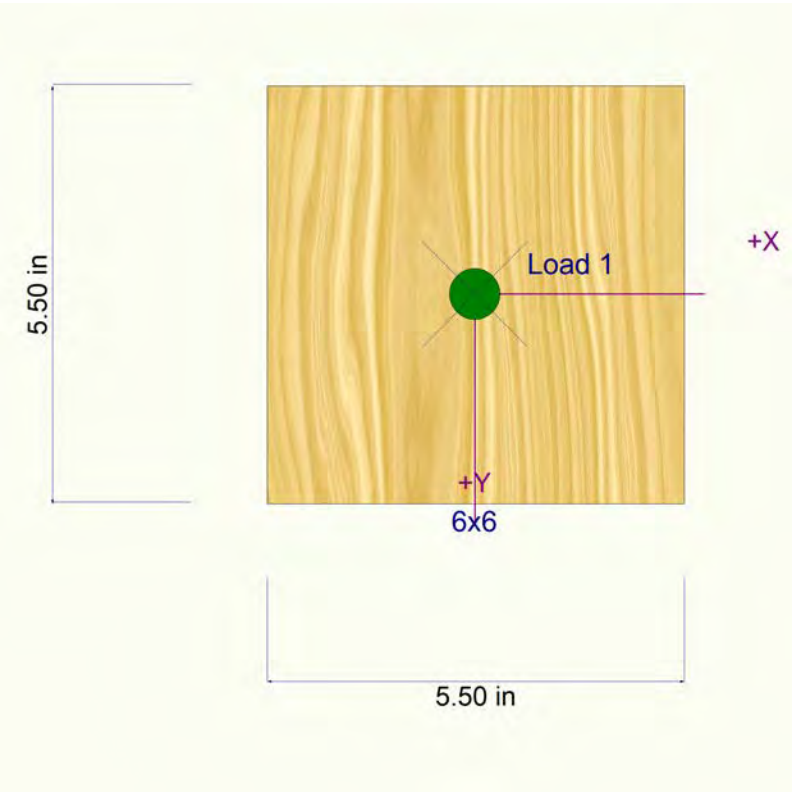
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments @ Base	@ Top	k-ft	Mx - End Moments @ Base	@ Top
+0.60D						5.184					
L Only						3.560					

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000ft	0.000 in	0.000 ft

Sketches



Wood Screw Design Values

Location:

2016 CBC Chapter 23, 2015 NDS Chapter 11 and 12

Section Properties

Main Member

member thickness, t_m =	11.3 in
Species =	DF-L
Dowel Bearing Strength, F_{em} =	4650 psi
G =	0.5

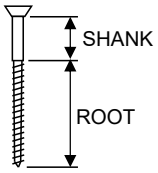
Side Member

member thickness, t_s =	5.50 in
Species =	DF-L
Dowel Bearing Strength, F_{es} =	4650 psi

Screw Properties

Simpson SDCP SCREW

Screw Length, L =	9.5 in
Screw Yield Stress, F_{yb} =	185000 psi
Shank Diameter, D =	0.278 in
Root Diameter, D =	0.208 in



Lateral Yield Mode Equations

	Shank	Root		
$R_e = F_{em} / F_{es}$ =	1.00	1.00		
$R_t = l_m / l_s = (L - t_s - D)/t_s$ =	0.67	0.67		
$k_1 = [(R_e + 2R_e^2 (1 + R_t + R_t^2) + R_t^2 R_e^3)^{1/2} - R_e (1 + R_t)] / (1 + R_e)$ =	0.36	0.36		
$k_2 = -1 + [2 (1 + R_e) + (2 F_{yb} (1+ 2 R_e) D^2 / (3 F_{em} l_m^2))]^{1/2}$ =	1.11	1.06		
$k_3 = -1 + [(2 (1 + R_e) / R_e) + (2 F_{yb} (2 + R_e) D^2) / (3 F_{em} l_s^2))]^{1/2}$ =	1.05	1.03		
R_d (for I_m, I_s) =	4.00	2.58		
R_d (for II) =	3.60	2.58		
R_d (for III_m, III_s, IV) =	3.20	2.58		
Mode I_m $Z = D l_m F_{em} / R_d$ =	1187	888	lbs	Eqn. 12.3-1
Mode I_s $Z = D l_s F_{es} / R_d$ =	1777	2062	lbs	Eqn. 12.3-2
Mode II $Z = = (k_1 D l_s F_{es}) / R_d$ =	705	736	lbs	Eqn. 12.3-3
Mode III_m $Z = (k_2 D l_m F_{em}) / (R_d (1 + 2 R_e))$ =	549	488	lbs	Eqn. 12.3-4
Mode III_s $Z = (k_3 D l_s F_{em}) / (R_d (2 + R_e))$ =	778	707	lbs	Eqn. 12.3-5
Mode IV $Z = (D^2 / R_d) [(2 F_{em} F_{yb}) / (3 (1 + R_e))]^{1/2}$ =	409	284	lbs	Eqn. 12.3-6
Failure Mode =	Mode IV			
Z_{min} =	**409**	**284**	**lbs**	

Applicable Adjustment Factors

(NDS Tbl 11.3.1): C_D C_M C_t C_g C_Δ C_{eg} C_{di} C_{tn}

Load Duration, C_D =	see below	Geometry, C_Δ =	1.00
Wet Service, C_M =	1.00	End Grain, C_{eg} =	1.00
Temperature, C_t =	1.00	Diaphragm, C_{di} =	1.10
Group Action, C_g =	1.00	Toe Nail, C_{tn} =	1.00

Lateral Design Values

$Z'_{allow} = C_D C_M C_t C_g C_\Delta C_{eg} C_{tn} C_{di} Z_{min}$

	Load Duration C_D (2015 NDS Tbl 2.3.2)	Z_{allow}, lbs Shank	Root
Dead Load	0.90	405	281
Floor, Occupancy Live Load	1.00	450	312
Snow Load	1.15	517	359
Roof Live Load	1.25	562	390
Earthquake / Wind Load	1.60	720	500

*Use Shank Allowable Load Only When Shank is in Shear Plane

Hilti PROFIS Engineering 3.0.90

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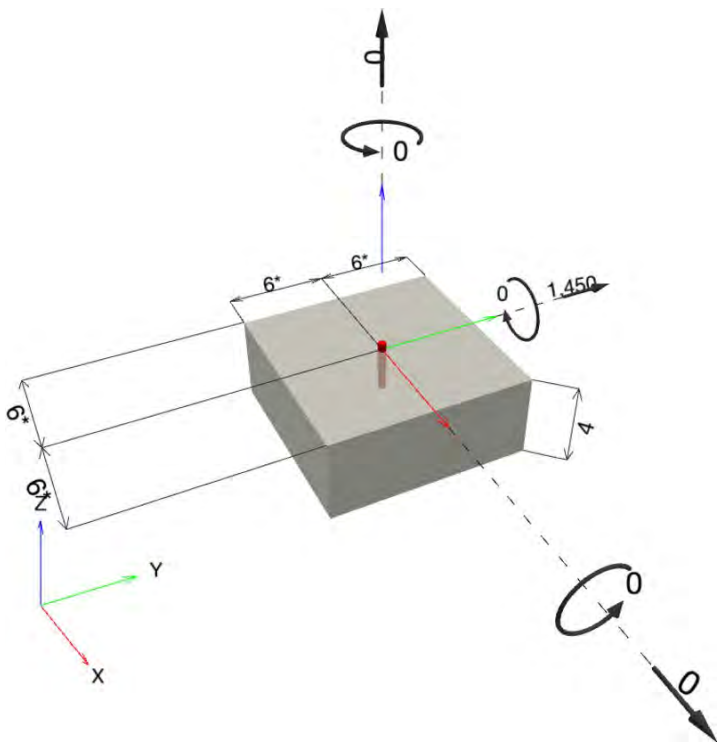
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 26, 2024	Date:	1/26/2024
Fastening point:			

Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - CS 3/8 (2) hnom2**
Item number:	2210236 KB-TZ2 3/8x3
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-4266
Issued I Valid:	12/17/2021 | 12/1/2023
Proof:	Design Method ACI 318-19 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 4.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

Geometry [in.] & Loading [lb, in.lb]



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Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 26, 2024	Date:	1/26/2024
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 0; V_x = 0; V_y = 1,450; M_x = 0; M_y = 0; M_z = 0;	no	97

Hilti PROFIS Engineering 3.0.90

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Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 26, 2024	Date:	1/26/2024
Fastening point:			

2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	-	-	-	- / -	N/A
Shear	Concrete edge failure in direction y+	1,450	1,500	- / 97	OK

Loading	**β_N**	**β_V**	**ζ**	**Utilization $\beta_{N,V}$ [%]**	**Status**
Combined tension and shear loads	-	-	-	-	N/A

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 26, 2024	Date:	1/26/2024
Fastening point:			

4 Remarks; Your Cooperation Duties

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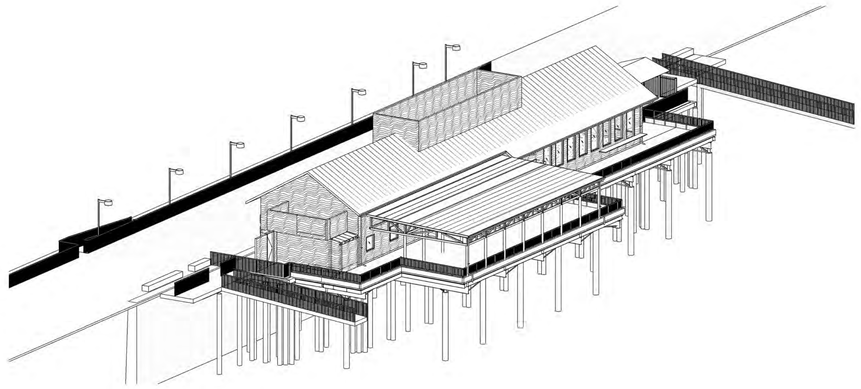

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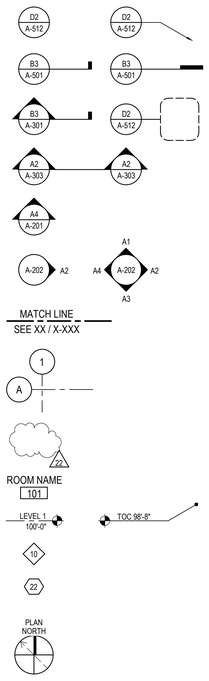
1110 FRONT ST,
SACRAMENTO, CA 95814

RIO CITY CAFE DECK REPAIR

100% CONSTRUCTION DOCUMENTS FEBRUARY 7, 2025

ARCHITECTURAL SYMBOLS LEGEND



DETAIL INDICATOR - REFERENCE & DETAIL INDICATOR - ITEM

DETAIL INDICATOR - SECTION & DETAIL INDICATOR - SECTION ITEM

SECTION INDICATOR - PARTIAL BUILDING/WALL & DETAIL INDICATOR - AREA

SECTION INDICATOR - BUILDING

ELEVATION INDICATOR - EXTERIOR

ELEVATION INDICATOR - INTERIOR, SINGLE & MULTIPLE VIEW

MATCH LINE INDICATOR

REFERENCE GRID WITH REFERENCE GRID LINES

REVISION INDICATOR & REVISION CLOUD

ROOM IDENTIFIER WITH ROOM NAME & NUMBER

ELEVATION INDICATOR - LEVEL & SPOT

WINDOW OR LOUVER IDENTIFIER

KEYNOTE INDICATOR

PLAN NORTH & TRUE NORTH INDICATOR

LIST OF ARCHITECTURAL ABBREVIATIONS

	SEE UNITED STATES NATIONAL CAD STANDARD FOR ANY ABBREVIATIONS NOT LISTED BELOW.
&	AND
@	AT
(E)	EXISTING
'	FOOT, FEET
"	INCH(ES)
#	NUMBER
ALUM	ALUMINUM
ARCH	ARCHITECTURAL
A/C UNIT	AIR CONDITIONING UNIT
A/E	ARCHITECT / ENGINEER
AB	ANCHOR BOLT
AC	ASPHALTIC CONCRETE
ACC	ACCESSIBLE
ACS DR	ACCESS DOOR
ACS PNL	ACCESS PANEL
ACST	ACOUSTIC
AD	AREA DRAIN
ADC	AUTOMATIC DOOR CLOSER
ADO	AUTOMATIC DOOR OPERATOR
ADDL	ADDITIONAL
ADJ SHV	ADJUSTABLE SHELVING
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AGGR	AGGREGATE
AHU	AIR HANDLING UNIT
ASSY	ASSEMBLY
BD	BOARD
BKG	BACKING
BLDG	BUILDING
BM	BEAM
BM	BENCHMARK
BOT	BOTTOM
BTWN	BETWEEN
BUR	BUILT-UP ROOFING
BW	BOTH WAYS
C	CHANNEL
CAB	CABINET
CB	CATCH BASIN
CBC	CALIFORNIA BUILDING CODE
CEM	CEMENT
CEM PLAS	CEM PLASTER
CFLG	COUNTERFLASHING
CFMF	COLD-FORMED METAL FRAMING
CG	CORNER GUARD
CI	CAST IRON
CJ	CONSTRUCTION JOINT / CONTROL JOINT
CL	CENTER LINE
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CNTR	COUNTER
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONSTR	CONSTRUCTION
CONT	CONTINUE / CONTINUOUS
COTG	CLEANOUT TO GRADE
CP	CONTROL PANEL
CPT	CARPET
CRS	COLD ROLLED STEEL
CSK	COUNTER SUNK
CSWK	CASEWORK
CT	CERAMIC TILE
CTR	CENTER
DBL	DOUBLE
DEPT	DEPARTMENT
DET	DETAIL
DF	DRINKING FOUNTAIN
DHM	DETENTION HOLLOW METAL
DIA	DIAMETER
DIM	DIMENSION
DS	DOWNSPOUT
DSP	DRY STANDPIPE
DWG	DRAWING
DWR	DRAWER
EA	EACH
EGSB	EXTERIOR GYPSUM SHEATHING BOARD
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC / ELECTRICAL
ELEV	ELEVATOR
EMER	EMERGENCY
ENCL	ENCLOSURE
EPB	ELECTRICAL PANEL BOARD
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EXH	EXHAUST
EXST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FA	FIRE ALARM
FB	FLAT BAR
FD	FLOOR DRAIN
FDTN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FIN	FINISH
FLG	FLOORING
FLL	FLOW LINE
FLR	FLOOR
FOC	FACE OF CONCRETE/CURB
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUD
FOW	FACE OF WALL
FP	FIREPROOF
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET / FOOT
FTG	FOOTING
FURG	FURRING
FUT	FUTURE
G	GROUND; NATURAL GAS
GA	GAGE
GALV	GALVANIZED
GB	GRAB BAR
GI	GALVANIZED IRON
GLU LAM	GLUED LAMINATED WOOD
GYP	GYPSUM
HB	HOSE BIB
HC	HOLLOW CORE
HDBD	HARDBOARD
HDW	HARDWARE
HDWD	HARDWOOD
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HR	HOUR
HT	HEIGHT
ID	INSIDE DIAMETER
INSUL	INSULATION
INT	INTERIOR
JAN	JANITOR
KIT	KITCHEN
L	ANGLE
LAB	LABORATORY
LAV	LAVATORY
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEMB	MEMBRANE
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MR	MOISTURE RESISTANT
MTD	MOUNTED
MTL	METAL
MULL	MULLION
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
O/	OVER
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF/CI	OWNER FURNISHED / CONTRACTOR INSTALLED
OFF	OFFICE
OGL	OBSCURE GLASS
OPH	OPPOSITE HAND
OPNG	OPENING
OPP	OPPOSITE
PAF	POWER ACTUATED FASTENER
PL	PROPERTY LINE; PLATE
PLAM	PLASTIC LAMINATE
PLB	PLUMB
PLBG	PLUMBING
PLYWD	PLYWOOD
PNL	PANEL
PROP	PROPERTY
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	PAINT; PAINT
PTN	PARTITION
PV	PHOTOVOLTAIC
QT	QUARRY TILE
R	RADIUS; RISER
RD	ROOF DRAIN
REBAR	REINFORCING STEEL BAR
REF	REFERENCE
REF	REFRIGERATOR
REINF	REINFORCE / REINFORCING
REQD	REQUIRED
RESIL	RESILIENT
RM	ROOM
RO	ROUGH OPENING
RWD	REDWOOD
RWL	RAIN WATER LEADER
SAD	SEE ARCHITECTURAL DRAWINGS
SATC	SUSPENDED ACOUSTICAL TILE CEILING
SB	SPLASH BLOCK
SC	SOLID CORE
SCHED	SCHEDULE
SD	STORM DRAIN
SDST	SELF DRIVING, SELF TAPPING
SHT	SHEET
SHTHG	SHEATHING
SHV	SHELVING
SIM	SIMILAR
SLNT	SEALANT
SM	SHEET METAL
SPEC	SPECIFICATION
SQ	SQUARE
SS	SANITARY SEWER; SERVICE SINK
SST	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SUSP CLG	SUSPENDED CEILING
SV	SHEET VINYL
SYMM	SYMMETRICAL
SYS	SYSTEM
T	TREAD
T&G	TONGUE & GROOVE
TEL	TELEPHONE
THK	THICKNESS
TMH	TOP OF MANHOLE
TMPD	TEMPERED
TO	TOP OF
TOC	TOP OF CURB
TOF	TOP OF FRAME
TOJ	TOP OF JOIST
TOM	TOP OF MASONRY
TOP	TOP OF PARAPET
TOPO	TOPOGRAPHY
TOS	TOP OF STEEL
TOW	TOP OF WALL
TV	TELEVISION
TYP	TYPICAL
UC	UNDER COUNTER/CABINET
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
UR	URINAL
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VWC	VINYL WALL COVERING
VWF	VINYL WALL FABRIC
W/	WITH
W/O	WITHOUT
WC	WATER CLOSET
WD	WOOD
WH	WATER HEATER
WO	WHERE OCCURS
WP	WORKING POINT
WPM	WATERPROOF MEMBRANE
WSCT	WAINSCOT
WT	WEIGHT
WTR	WATER
WWR	WELDED WIRE REINFORCEMENT

SHEET INDEX

GENERAL
G-001 COVER SHEET

STRUCTURAL
S-001 GENERAL NOTES
S-002 GENERAL NOTES
S-003 TESTING & INSPECTION, STATEMENT OF SPECIAL INSPECTIONS, & STRUCTURAL OBSERVATION
S-011 TYPICAL NOTES
S-012 TYPICAL NOTES
S-013 TYPICAL NOTES
SD111 DEMO PLAN - FLOOR FRAMING
SD132 DEMO PLAN - ROOF FRAMING
SD311 DEMO SECTIONS - BUILDING
S-111 PLAN - DECK REPLACEMENT FLOOR FRAMING
S-132 PLAN - CANOPY REPLACEMENT ROOF FRAMING
S-261 ELEVATIONS - WOOD FRAMING
S-311 SECTIONS - BUILDING
S-312 SECTIONS - BUILDING
S-551 DETAILS - TYPICAL STRUCTURAL STEEL BEAMS
S-552 DETAILS - STRUCTURAL STEEL
S-553 DETAILS - STRUCTURAL STEEL
S-561 DETAILS - TYPICAL WOOD FRAMING
S-562 DETAILS - TYPICAL WOOD FRAMING
S-563 DETAILS - TYPICAL WOOD SHEAR WALL FRAMING
S-564 DETAILS - TYPICAL WOOD FRAMING

ARCHITECTURAL
AS101 SITE PLAN - OVERALL
AD111 DEMOLITION FLOOR PLAN - LEVEL 1
AD121 DEMOLITION CEILING PLAN - LEVEL 1
AD132 DEMOLITION ROOF PLAN - LEVEL 2
AD551 DETAILS - ARCHITECTURAL - DEMO
A-111 FLOOR PLAN - LEVEL 1
A-122 REFLECTED CEILING PLAN - LEVEL 1
A-132 ROOF PLAN - LEVEL 2
A-211 ELEVATIONS - EXTERIOR
A-311 SECTIONS - BUILDING
A-551 DETAILS - ARCHITECTURAL
A-552 DETAILS - ARCHITECTURAL

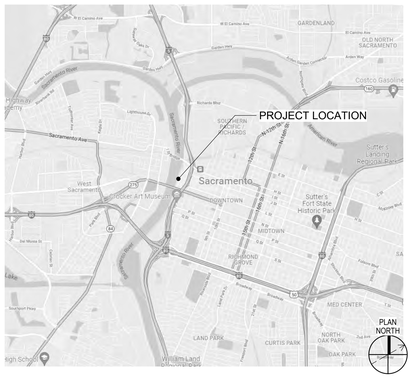
PLUMBING
P-001 PLUMBING NOTES, LEGEND AND SCHEDULES
PD111 PLUMBING DEMOLITION FLOOR PLAN
P-111 PLUMBING FLOOR PLAN
P-132 PLUMBING ROOF PLAN

ELECTRICAL
E-001 ELECTRICAL SHEET INDEX, ABBREVIATIONS AND NOTES
E-002 ELECTRICAL SYMBOL LEGEND
ED111 ELECTRICAL DEMOLITION FLOOR PLAN
EL111 LIGHTING FLOOR PLAN
EP111 POWER FLOOR PLAN

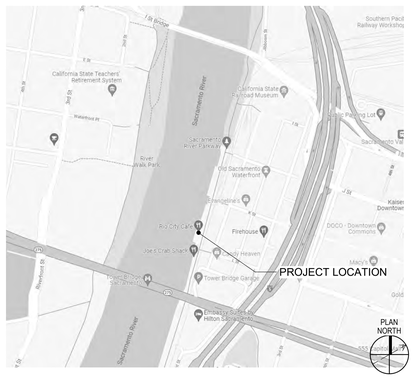
MECHANICAL
M-001 MECHANICAL NOTES, LEGEND AND SCHEDULES
MD111 MECHANICAL DEMOLITION FLOOR PLAN
M-111 MECHANICAL FLOOR PLAN

FIRE PROTECTION
FP001 FIRE SPRINKLER SYMBOLS AND ABBREVIATIONS SHEET
FD111 FIRE SPRINKLER DEMO FLOOR PLAN
FP111 FIRE SPRINKLER FLOOR PLAN

LOCATION MAP



VICINITY MAP



SCOPE OF PROJECT

THE PROJECT CONSISTS OF THE DEMOLITION, REPAIR AND/OR REPLACEMENT OF THE DRY-ROT DAMAGED DECK, BEAMS, GLBs AS WELL AS THE CANOPIES ABOVE THAT ARE SUPPORTED BY THE SAME DECK STRUCTURE.

A SMALL PORTION OF THE BUILDING AT THE NORTH END THAT WAS BUILT OVER THE DAMAGED DECK WILL ALSO BE DEMOLISHED AND REPLACED TO MATCH EXISTING CONDITIONS EXCEPT FOR FLOOR LEVEL WHICH WILL BE CONSTRUCTED TO MATCH ADJACENT FLOOR LEVEL.

PROJECT DATA

ADDRESS: 1110 FRONT STREET, SACRAMENTO, CA 95814

APN: 006-0075-003

CONSTRUCTION TYPE: BUILDING V-A SPRINKLERED, CANOPY V-B SPRINKLERED
OCCUPANCY TYPE: A-2
BUILDING HEIGHT: 1 STORY
BUILDING AREA: 5230 SQ.FT
CANOPY AREA: 2,168 SQ.FT
OPEN DECK AREA: 2569 SF
TOTAL AREA BUILDING + CANOPY: 7398 SF
TOTAL AREA: 9967 SF

ALLOWABLE AREA: 11,500 SQ.FT > 6,855 SQ.FT ~ BUILDING COMPLIES
OUTDOOR COVERED AREA IS OPEN THREE SIDES AND AT LEAST 50% OPEN

AREA OF WORK: 2,450 SQ.FT DECK AND 80 SQ.FT BUILDING, 2,350 SQ.FT. TOTAL

DEFERRED SUBMITTALS

WOOD TRUSSES - SEE STRUCTURAL
FIRE SPRINKLERS

PROJECT DIRECTORY

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PHONE: 916.558.1900
EMAIL: KERRY.VOLKER@LIONAKIS.COM

MECHANICAL, ELECTRICAL, PLUMBING AND FIRE SPRINKLER ENGINEER
LP CONSULTING ENGINEERS, INC
1209 PLEASANT GROVE BLVD
ROSEVILLE, CA 95678
CONTACT: TOM SCHLEPP
PHONE: 916-774-2910
EMAIL: TSCHLEPP@LPENGINEERS.COM

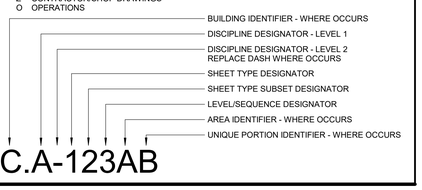
SHEET IDENTIFICATION LEGEND

DISCIPLINE DESIGNATORS - LEVEL 1

- G GENERAL
- H HAZARDOUS MATERIALS
- V SURVEY/MAPPING
- B GEOTECHNICAL
- C CIVIL
- L LANDSCAPE
- S STRUCTURAL
- A ARCHITECTURAL
- I INTERIORS
- Q EQUIPMENT
- F FIRE PROTECTION
- P PLUMBING
- D PROCESS
- M MECHANICAL
- E ELECTRICAL
- W DISTRIBUTED ENERGY
- T TELECOMMUNICATIONS
- R RESOURCE
- X OTHER DISCIPLINES
- Z CONTRACTOR/SHOP DRAWINGS
- O OPERATIONS

SHEET TYPE DESIGNATORS

- 0 - GENERAL
- 1 - PLANS
- 2 - ELEVATIONS
- 3 - SECTIONS
- 4 - LARGE SCALE VIEWS
- 5 - DETAILS
- 6 - SCHEDULES & DIAGRAMS
- 7 - USER DEFINED
- 8 - USER DEFINED
- 9 - 3D REPRESENTATIONS



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CONSULTANT

SEAL

PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST,
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
COVER SHEET

SHEET
G-001

STRUCTURAL ABBREVIATIONS LEGEND

S- 014213 N001A

SEE UNITED STATES NATIONAL CAD STANDARD FOR ANY ABBREVIATIONS NOT LISTED BELOW. SEE BUILDING CODE FOR REFERENCED DESIGN AND MATERIALS SYMBOLS, ACRONYMS & NOTATIONS.

A/E	ARCHITECT / ENGINEER	EMBED	EMBEDMENT	MAX	MAXIMUM	SP	STRUCTURAL PANEL
AB	ANCHOR BOLT	EN	EDGE NAIL	MB	MACHINE BOLT	SPEC	SPECIFICATION
ABV	ABOVE	EOS	EDGE OF SLAB	MC	MISCELLANEOUS CHANNEL	SQ	SQUARE
ADDL	ADDITIONAL	EQ	EQUAL, EQUALLY	MCJ	MASONRY CONTROL JOINT	SST	STAINLESS STEEL
AFF	ABOVE FINISHED FLOOR	ES	EACH SIDE	MDJ	MASONRY DOWEL JOINT	STAG	STAGGERED
AFG	ABOVE FINISHED GRADE	EW	EACH WAY	MECH	MECHANICAL	STD	STANDARD
AFS	ABOVE FINISHED SLAB	EXST	EXISTING	MEJ	MASONRY EXPANSION JOINT	STIF	STIFFENER
ALT	ALTERNATE	EXT	EXTERIOR	MFR	MANUFACTURER	STIR	STIRRUP
ALUM	ALUMINUM			MIN	MINIMUM	STL	STEEL
APPROX	APPROXIMATE	F/F	FACE TO FACE	MISC	MISCELLANEOUS	STRUCT	STRUCTURAL
ARCH	ARCHITECT	FA	FRAMING ANGLE	MKJ	MASONRY KEY JOINT	SUSP	SUSPEND, SUSPENDED
ATR	ALL THREAD ROD	FB	FLAT BAR	MRJ	MASONRY RAKE JOINT	SYMM	SYMMETRICAL
		FDTN	FOUNDATION				
BFF	BELOW FINISH FLOOR	FIN	FINISH			T	TREAD, THICKNESS
BFR	BEFORE	FLG	FLANGE	NA	NOT APPLICABLE	T&B	TOP & BOTTOM
BKG	BACKING	FLR	FLOOR	NF	NEAR FACE	T&G	TONGUE & GROOVE
BLDG	BUILDING	FMJH	FACE-MOUNT JOIST HANGER	NIC	NOT IN CONTRACT	TFJH	TOP-FLANGE JOIST HANGER
BLKG	BLOCKING	FN	FIELD NAIL	NS	NEAR SIDE	THK	THICKNESS
BLW	BELOW	FOC	FACE OF CONCRETE/CURB	NTS	NOT TO SCALE	THRU	THROUGH
BM	BEAM	FOF	FACE OF FINISH	NWC	NORMAL WEIGHT CONCRETE	TJ	TOOL JOINT
BMU	BRICK MASONRY UNIT	FOM	FACE OF MASONRY			TN	TOE NAIL
BN	BOUNDARY NAIL	FOS	FACE OF STUD	O/	OVER	TOB	TOP OF BEAM
BOS	BOTTOM OF STEEL	FOW	FACE OF WALL	OC	ON CENTER	TOC	TOP OF CURB/CONCRETE
BOT	BOTTOM	FRMG	FRAMING	OD	OUTSIDE DIAMETER	TOF	TOP OF FRAMING/FOOTING/FLOOR
BTWN	BETWEEN	FRTW	FIRE RETARDANT TREATED WOOD	OPH	OPPOSITE HAND	TOJ	TOP OF JOIST
BYND	BEYOND	FS	FAR SIDE	OPNG	OPENING	TOM	TOP OF MASONRY
		FT	FEET, FOOT	OPP	OPPOSITE	TOP	TOP OF PARAPET
C	CAMBER, CHANNEL	FTG	FOOTING	OR	OUTSIDE RADIUS	TOS	TOP OF STEEL
CB	CARRIAGE BOLT	FURG	FURRING	OWSJ	OPEN WEB STEEL JOIST	TOSP	TOP OF STRUCTURAL PANEL
CFSF	COLD-FORMED STEEL FRAMING					TOT	TOP OF TRUSS
CG	CENTER OF GRAVITY	GA	GAGE	PAF	POWER ACTUATED FASTENER	TOW	TOP OF WALL
CJ	CONSTRUCTION JOINT	GALV	GALVANIZED	PAR	PARALLEL	TS	TUBE STEEL
CJP	COMPLETE JOINT PENETRATION	GLB	GLUED LAMINATED BEAM	PCC	PRECAST CONCRETE	TYP	TYPICAL
CL	CENTER LINE	GR	GRADE	PCF	POUNDS PER CUBIC FOOT		
CLR	CLEAR			PERP	PERPENDICULAR	UC	UNDERCUT
CLSM	CONTROLLED LOW STRENGTH MATERIAL	H	HIGH, HEIGHT	PJP	PARTIAL JOINT PENETRATION	UNO	UNLESS NOTED OTHERWISE
CMU	CONCRETE MASONRY UNIT	HDG	HOT-DIPPED GALVANIZED	PL	PLATE, PROPERTY LINE	UON	UNLESS OTHERWISE NOTED
COL	COLUMN	HDR	HEADER	PLF	POUNDS PER LINEAR FOOT		
CONC	CONCRETE	HGR	HANGER	PREFAB	PREFABRICATE	VERT	VERTICAL
CONN	CONNECT, CONNECTION	HLDN	HOLD DOWN	PS	PRE-STRESSED	VIF	VERIFY IN FIELD
CONT	CONTINUE, CONTINUOUS	HORIZ	HORIZONTAL	PSF	POUNDS PER SQUARE FOOT	VR	VAPOR RETARDER
CRS	COLD ROLLED STEEL	HS	HIGH STRENGTH	PSI	POUNDS PER SQUARE INCH		
CSK	COUNTER SUNK	HSB	HIGH STRENGTH BOLT	PSL	PARALLEL STRAND LUMBER	W	WIDE, WIDTH, WELD, W-SHAPE
CTR	CENTER	HSS	HOLLOW STRUCTURAL SECTION	PT	POST-TENSIONED	W/	WITH
		HT	HEIGHT	PTW	PRESERVATIVE TREATED WOOD	W/O	WITHOUT
D	PENNY (NAIL), DEEP, DEPTH	ID	INSIDE DIAMETER	QTY	QUANTITY	WF	WIDE FLANGE
DBL	DOUBLE	IJ	ISOLATION JOINT			WHS	WELDED HEADED STUD
DCW	DEMAND CRITICAL WELD	IN	INCH, INCHES	R	RADIUS, RISER	WO	WHERE OCCURS
DEG	DEGREE	INFO	INFORMATION	REBAR	REINFORCING STEEL BAR	WP	WORKING POINT
DEMO	DEMOLITION	INT	INTERIOR	REINF	REINFORCE, REINFORCING	WPM	WATERPROOF MEMBRANE
DET	DETAIL	IR	INSIDE RADIUS	REQ	REQUIRE, REQUIRED	WRB	WATER-RESISTIVE BARRIER
DIA	DIAMETER			RND	ROUND	WT	WEIGHT, W TEE-SHAPE
DIAG	DIAGONAL	JH	JOIST HANGER	RO	ROUGH OPENING	WTS	WELDED THREADED STUD
DIM	DIMENSION	JT	JOINT	RS	ROUGH SAWN	WWR	WELDED WIRE REINFORCEMENT
DJ	DOWEL JOINT			RWD	REDWOOD		
DO	DITTO, DO OVER	L	ANGLE, LONG, LENGTH			XS	EXTRA STRONG
DOUG FIR	DOUGLAS FIR	LAT	LATERAL	S	SPACED, SPACING, SPLICE, STEP	XXS	DOUBLE EXTRA STRONG
DWG	DRAWING	LBS	POUNDS	SAD	SEE ARCHITECTURAL DRAWINGS		
DWL	DOWEL	LDGR	LEDGER	SCHED	SCHEDULE		
		LLBB	LONG LEG BACK TO BACK	SDST	SELF-DRILLING SELF-TAPPING		
EA	EACH	LLH	LONG LEG HORIZONTAL	SE	STRUCTURAL ENGINEER		
EE	EACH END	LLV	LONG LEG VERTICAL	SECT	SECTION		
EF	EACH FACE	LONG	LONGITUDINAL	SFRS	SEISMIC FORCE RESISTING SYSTEM		
EJ	EXPANSION JOINT	LS	LAG SCREW	SHTHG	SHEATHING		
EL	ELEVATION	LSL	LAMINATED STRAND LUMBER	SIM	SIMILAR		
ELEC	ELECTRIC, ELECTRICAL	LVL	LAMINATED VENEER LUMBER	SJ	SHRINKAGE JOINT		
ELEV	ELEVATOR	LWC	LIGHT WEIGHT CONCRETE	SLBB	SHORT LEG BACK TO BACK		

STRUCTURAL SYMBOLS LEGEND

SN011000-004

DETAIL INDICATOR - REFERENCE & DETAIL INDICATOR - ITEM

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SECTION INDICATOR - PARTIAL BUILDING/WALL DETAIL INDICATOR - AREA

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MATCH LINE INDICATOR

REFERENCE GRID WITH REFERENCE GRID LINES

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ELEVATION INDICATOR - LEVEL & SPOT

KEYNOTE INDICATOR

PLAN NORTH & TRUE NORTH INDICATOR

MATERIAL SYMBOL LEGEND

S- 011000 N006A
170125. Q2

EARTH

EARTH, COMPACT FILL

EARTH, ROCK

GRAVEL, ROCK FILL

SAND, MORTAR, GROUT

CONCRETE, CAST IN PLACE

CONCRETE, PRE-CAST OR TILT UP

MASONRY, CLAY BRICK

MASONRY, CONCRETE

STEEL

ALUMINUM

WOOD BLOCKING OR SHIM

WOOD FRAMING CONTINUOUS

WOOD

PROJECT DIRECTORY

S- 011000 N006A
170125. Q2

OWNER

CITY OF SACRAMENTO
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5730 24TH ST, BUILDING 4
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ARCHITECT

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2025 19TH STREET
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STRUCTURAL ENGINEER

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MECHANICAL, ELECTRICAL, PLUMBING AND FIRE SPRINKLER ENGINEER

LP CONSULTING ENGINEERS, INC
1209 PLEASANT GROVE BLVD
ROSEVILLE, CA 95678
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EMAIL: TSCHLEPP@LPENGINEERS.COM

STRUCTURAL SHEET INDEX

SN011000-001

SHEET NUMBER	SHEET NAME
S-001	GENERAL NOTES
S-002	GENERAL NOTES
S-003	TESTING & INSPECTION, STATEMENT OF SPECIAL INSPECTIONS, & STRUCTURAL OBSERVATION
S-011	TYPICAL NOTES
S-012	TYPICAL NOTES
S-013	TYPICAL NOTES
SD111	DEMO PLAN - FLOOR FRAMING
SD132	DEMO PLAN - ROOF FRAMING
SD311	DEMO SECTIONS - BUILDING
S-111	PLAN - DECK REPLACEMENT FLOOR FRAMING
S-132	PLAN - CANOPY REPLACEMENT ROOF FRAMING
S-261	ELEVATIONS - WOOD FRAMING
S-311	SECTIONS - BUILDING
S-312	SECTIONS - BUILDING
S-551	DETAILS - TYPICAL STRUCTURAL STEEL BEAMS
S-552	DETAILS - STRUCTURAL STEEL
S-553	DETAILS - STRUCTURAL STEEL
S-561	DETAILS - TYPICAL WOOD FRAMING
S-562	DETAILS - TYPICAL WOOD FRAMING
S-563	DETAILS - TYPICAL WOOD SHEAR WALL FRAMING
S-564	DETAILS - TYPICAL WOOD FRAMING

SHEET COUNT: 21

STRUCTURAL TEXT SYMBOLS LEGEND

S- 014100 N00xA
210927. Q2

TEXT SYMBOLS INDICATED IN THE CONSTRUCTION DOCUMENTS SHALL HAVE THE FOLLOWING MEANINGS, UNO. WHERE TEXT SYMBOLS ARE NOT DEFINED, THEY SHALL MEAN THE RECOGNIZED NAME AS INDICATED IN THE APPLICABLE BUILDING CODE AND REFERENCED STANDARDS OR AS DENOTED IN THE NATIONAL CAD STANDARDS.

ANNOTATION AND MATH SYMBOLS:

&	AND
@	AT
X°	DEGREES
/	DIVIDE BY, PER
$	DOLLAR (UNITED STATES)
=	EQUALS, EQUAL TO
(E)	EXISTING
X'	FOOT, FEET
>	GREATER THAN
≥	GREATER THAN OR EQUAL TO
X"	INCH, INCHES
<	LESS THAN
≤	LESS THAN OR EQUAL TO
-	MINUS
x	MULTIPLY BY, BY
#	NUMBER, POUND
II	PARALLEL
%	PERCENT
⊥	PERPENDICULAR
+	PLUS
+/-	PLUS OR MINUS

MATERIALS PROPERTIES AND LOAD SYMBOLS:

A	AREA
D	DEAD LOAD
E	MODULUS OF ELASTICITY, EARTHQUAKE LOAD
F	FLUID LOAD
F'c	CONCRETE COMPRESSIVE STRESS
F'm	MASONRY COMPRESSIVE STRESS
Fa	FLOOD LOAD
Fb	BENDING STRESS
Fc	COMPRESSIVE STRESS
Ft	TENSION STRESS
Fu	ULTIMATE TENSILE STRESS
Fv	SHEAR STRESS
Fy	YIELD STRESS
G	SPECIFIC GRAVITY
H	EARTH LOAD, BULK MATERIAL LOAD
I	MOMENT OF INERTIA
L	LIVE LOAD
Lr	ROOF LIVE LOAD
R	RAIN LOAD
S	SECTION MODULUS, SNOW LOAD
T	SELF-STRAINING LOAD
W	WIND LOAD
Wc	WIND LOAD COMPONENTS AND CLADDING
Wm	WIND LOAD MAIN WIND FORCE RESISTING SYSTEM
Z	PLASTIC SECTION MODULUS

STRUCTURAL INDUSTRY ACRONYMS LEGEND

S- 014100 N004A
210927. Q2

ACRONYMS INDICATED IN THE CONSTRUCTION DOCUMENTS SHALL HAVE THE FOLLOWING MEANINGS, UNO. WHERE ACRONYMS ARE NOT DEFINED, THEY SHALL MEAN THE RECOGNIZED NAME AS INDICATED IN THE APPLICABLE BUILDING CODE AND REFERENCED STANDARDS OR AS DENOTED IN THE NATIONAL CAD STANDARDS.

ACI	AMERICAN CONCRETE INSTITUTE
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AITC	AMERICAN INSTITUTE OF TIMBER CONSTRUCTION
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APA	APA-ENGINEERED WOOD ASSOCIATION
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS
AWC	AMERICAN WOOD COUNCIL
AWPA	AMERICAN WOOD PROTECTION ASSOCIATION
AWS	AMERICAN WELDING SOCIETY
CBC	CALIFORNIA BUILDING CODE
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
DOC	US DEPARTMENT OF COMMERCE
DSA	DIVISION OF THE STATE ARCHITECT
ER	EVALUATION REPORT
ESR	EVALUATION SERVICE REPORT
IAPMO	INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS
IBC	INTERNATIONAL BUILDING CODE
ICC	INTERNATIONAL CODE COUNCIL
NDS	NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OSHPD	OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
PCI	PRECAST/PRESTRESSED CONCRETE INSTITUTE
PTI	POST-TENSIONING INSTITUTE
SDI	STEEL DECK INSTITUTE
SJI	STEEL JOIST INSTITUTE
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
TMS	THE MASONRY SOCIETY
TPI	TRUSS PLATE INSTITUTE
UL	UNDERWRITERS' LABORATORIES

STRUCTURAL LINE SYMBOLS LEGEND

S- 014100 N00xA
210927. Q2

LINE SYMBOLS INDICATED IN THE CONSTRUCTION DOCUMENTS SHALL HAVE THE FOLLOWING MEANINGS, UNO. WHERE LINE SYMBOLS ARE NOT DEFINED, THEY SHALL MEAN THE RECOGNIZED NAME AS INDICATED IN THE APPLICABLE BUILDING CODE AND REFERENCED STANDARDS OR AS DENOTED IN THE NATIONAL CAD STANDARDS.

ANNOTATION OR SYMBOL LEADER

BREAK AT CIRCULAR OR ROUND ELEMENTS

BREAK AT LINEAR OR STRAIGHT ELEMENTS

CENTER LINE

CONTRACT LIMIT OR SCOPE OF WORK LINE

DIMENSION AND EXTENSION LINE

PROPERTY LINE

STRUCTURAL ELEMENT LINES INDICATE LINEAR OBJECTS OR OUTLINES AND EDGES OF OBJECTS:

ELEMENT CUT THROUGH OR VISIBLE FROM ABOVE OR BEFORE

ELEMENT HIDDEN ABOVE OR BEFORE

ELEMENT HIDDEN BELOW OR BEYOND

NON-BEARING ELEMENT HIDDEN BELOW

EXISTING ELEMENT CUT THROUGH OR VISIBLE FROM ABOVE OR BEFORE

EXISTING ELEMENT HIDDEN ABOVE OR BEFORE

EXISTING ELEMENT HIDDEN BELOW OR BEYOND

EXISTING NON-BEARING ELEMENT HIDDEN BELOW

DEMOLITION ELEMENT

NONSTRUCTURAL ELEMENT

EXISTING NONSTRUCTURAL ELEMENT

STRUCTURAL WALL SYMBOLS LEGEND

Q2

WALL SYMBOLS INDICATED IN THE CONSTRUCTION DOCUMENTS SHALL HAVE THE FOLLOWING MEANINGS, UNO. WHERE PATTERNS WITHIN WALL SYMBOLS ARE NOT DEFINED, THEY SHALL MEAN THE RECOGNIZED NAME AS DENOTED IN THE NATIONAL CAD STANDARDS. WALL SYMBOLS SHOWN ARE DIAGRAMMATIC AND GENERALLY USED FOR SMALL SCALE DRAWINGS, UNO. SEE PLANS, ELEVATIONS AND SECTIONS FOR WALL TYPES, MARKS, DIMENSIONS AND LOCATIONS.

CONCRETE WALL

INSULATED CONCRETE FORM WALL

PRECAST OR TILT-UP CONCRETE WALL

INSULATED PRECAST OR INSULATED TILT-UP CONCRETE WALL

CONCRETE MASONRY WALL

INSULATED CONCRETE MASONRY WALL

BRICK MASONRY WALL

INSULATED BRICK MASONRY WALL

COLD FORMED STEEL STUD WALL

INSULATED PREFABRICATED COLD FORMED STEEL STUD WALL

WOOD STUD WALL

INSULATED PREFABRICATED WOOD WALL (STRUCTURAL INSULATED PANEL)

STEEL DETENTION WALL

NON-STRUCTURAL WALL

WALL OUTLINES ARE SHOWN WITH LINE TYPE FOR ELEMENTS CUT THROUGH OR VISIBLE FROM ABOVE OR BEFORE. SEE STRUCTURAL LINE SYMBOLS LEGEND FOR LINE TYPES FOR OTHER WALL CONDITIONS AND LOCATIONS. WALL OUTLINES AND MATERIALS PATTERNS AT EXISTING CONSTRUCTION ARE SHOWN WITH HALF TONE LINE WORK.

STRUCTURAL DESIGN CRITERIA

S- 014100 N003A
170125. Q2

BUILDING CODE: 2022 CBC

ENFORCEMENT AGENCY: CITY OF SACRAMENTO BUILDING DEPARTMENT

A. VERTICAL DESIGN CRITERIA (UNLESS OTHERWISE SHOWN OR NOTED)

ROOF LIVE LOADS:
- TYP ROOF AREA — 20 PSF (REDUCIBLE)

FLOOR LIVE LOADS:
- FIRST FLOOR CORRIDORS — 100 PSF (REDUCIBLE)
- STAIRS & EXITS — 100 PSF (REDUCIBLE)
- ASSEMBLY AREAS — 100 PSF (NON-REDUCIBLE)

GROUND SNOW LOAD: 0 PSF
RAIN LOADS - INTENSITY = 1.5 INCHES PER HOUR (3" PER CITY OF SACRAMENTO)

B. LATERAL DESIGN CRITERIA

SEISMIC SITE CRITERIA: SS=0.58, S1 =0.26, SDS=0.51, SD1 =0.53, SITE CLASS: D

BUILDING CRITERIA:
SEISMIC:
- RISK CATEGORY= III
- IMPORTANCE FACTOR, I=1.25
- SEISMIC DESIGN CATEGORY = D
- SEISMIC FORCE RESISTING SYSTEM: STEEL ORDINARY CANTILEVER COLUMN
- RESPONSE MODIFICATION FACTOR, R = 1.25
- DESIGN BASE SHEAR: V = 0.51W
- SEISMIC RESPONSE COEFFICIENT, Cs=0.51
- ANALYSIS PROCEDURE: EQUIVALENT LATERAL FORCE
- HORIZONTAL IRREGULARITIES: NONE
- VERTICAL IRREGULARITIES: NONE

WIND:
ULTIMATE DESIGN WIND SPEED, V(ULT) = 105 MPH
NOMINAL DESIGN WIND SPEED, V(ASD) = 82 MPH
RISK CATEGORY = III
WIND EXPOSURE = C
GCPI = +/- 0.55
COMPONENTS AND CLADDING WIND PRESSURES TO BE DETERMINED PER ASCE 7-16

STRUCTURAL DEFERRED SUBMITTALS

S- 013300 N001A
171002. Q2

1. THE FOLLOWING ITEMS SHALL BE SUBMITTED FOR DEFERRED APPROVAL BY THE ENFORCEMENT AGENCY PRIOR TO FABRICATION OR INSTALLATION.
2. SEE THE SPECIFICATIONS AND STRUCTURAL DESIGN CRITERIA FOR REQUIRED PERFORMANCE AND LOADING CRITERIA.
3. DEFERRED SUBMITTALS ARE SUBJECT TO ALL THE REQUIREMENTS OF OTHER SUBMITTALS.
4. SUBMITTAL DOCUMENTS AND SUPPORTING DESIGN CALCULATIONS SHALL BE STAMPED AND SIGNED BY A CALIFORNIA REGISTERED PROFESSIONAL ENGINEER.
5. DOCUMENTS AND CALCULATIONS FOR DEFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW FOR GENERAL CONFORMANCE WITH THE DESIGN OF THE PROJECT PRIOR TO SUBMITTAL TO THE ENFORCEMENT AGENCY.
6. DEFERRED SUBMITTAL ITEMS SHALL NOT BE FABRICATED OR INSTALLED UNTIL THEIR DESIGN AND SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE ENFORCEMENT AGENCY.

LIST OF DEFERRED SUBMITTALS:
1. WOOD TRUSSES

LIONAKIS
2025 Nineteenth Street
Sacramento, CA 95818
P 916.558.1900
www.lionakis.com

CONSULTANT

SEAL

FOR REVIEW ONLY. NOT FOR CONSTRUCTION

PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST.
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
GENERAL NOTES

SHEET
S-001

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY

STRUCTURAL SUBMITTALS

S- 013300_N002A
170125. Q2

1. SUBMITTALS INCLUDE, BUT ARE NOT LIMITED TO, SHOP DRAWINGS, FABRICATION DRAWINGS, PLACEMENT DRAWINGS, CALCULATIONS, DESIGNS, TEST DATA, PRODUCT DATA, SAMPLES, CERTIFICATIONS AND REPORTS AS REQUIRED BY THE CONSTRUCTION DOCUMENTS.
2. SUBMITTALS, AS A MINIMUM, SHALL CONSIST OF TWO (2) COPIES OF EACH SHEET.
3. SUBMITTALS SHALL NOT CONTAIN NOR CONSIST OF REPRODUCTIONS OF THE CONSTRUCTION DOCUMENTS. SUBMITTALS CONTAINING REPRODUCTIONS OF ANY PORTION OF THE CONSTRUCTION DOCUMENTS ARE SUBJECT TO REJECTION.
4. EACH SUBMITTAL SHALL HAVE A COVER SHEET IDENTIFYING THE CONTENTS BY SPECIFICATION SECTION AND LISTING EACH ITEM AND SHEET NUMBER. EACH SUBMITTAL SHALL HAVE A UNIQUE IDENTIFICATION NUMBER.
5. PRIOR TO SUBMISSION TO THE STRUCTURAL ENGINEER, STAMP SUBMITTALS INDICATING THEY HAVE BEEN REVIEWED AND APPROVED FOR COMPLETENESS AND CONFORMANCE WITH THE INTENT OF THE CONSTRUCTION DOCUMENTS. SUBMITTALS THAT ARE DETERMINED TO BE INCOMPLETE, IN THE JUDGMENT OF THE STRUCTURAL ENGINEER, WILL BE RETURNED WITHOUT REVIEW SO THEY CAN BE COMPLETED. THE STRUCTURAL ENGINEER SHALL NOT BE REQUIRED TO REVIEW PARTIAL SUBMISSIONS OR THOSE FOR WHICH SUBMISSIONS OF CORRELATED ITEMS HAVE NOT BEEN RECEIVED.
6. PRIOR TO SUBMISSION TO THE STRUCTURAL ENGINEER, THE OWNER'S TESTING LABORATORY SHALL STAMP THE FOLLOWING MARKED SUBMITTALS INDICATING THEY HAVE BEEN REVIEWED AND APPROVED FOR COMPLETENESS AND CONFORMANCE WITH THE INTENT OF THE CONSTRUCTION DOCUMENTS:
   - ■ CONCRETE MIX DESIGNS AND SUBSTANTIATING TEST DATA
   - □ MASONRY GROUT MIX DESIGNS AND SUBSTANTIATING TEST DATA
   - ■ WELDING PROCEDURE SPECIFICATIONS
7. SUBMITTALS SHALL BE REVIEWED BY THE STRUCTURAL ENGINEER PRIOR TO UTILIZATION, INSTALLATION, FABRICATION OR CONSTRUCTION OF ITEMS CONTAINED WITHIN THE SUBMITTALS.
8. SUBMITTALS SHALL BE DELIVERED TO THE STRUCTURAL ENGINEER TO ALLOW SUFFICIENT TIME, IN THE STRUCTURAL ENGINEER'S JUDGMENT, FOR A REASONABLE PERIOD FOR ADEQUATE REVIEW, ENFORCEMENT AGENCY APPROVAL AS REQUIRED AND RESPONSE SO AS NOT TO AFFECT THE CONSTRUCTION SCHEDULE. ALLOW THE STRUCTURAL ENGINEER THE GREATER SUBMITTAL REVIEW PERIOD OF: TEN (10) WORK DAYS; OR FIVE (5) WORK DAYS FOR EACH 100 SHEETS, OR PORTION THEREOF, FOR EACH SUBMITTAL. SUBMITTAL REVIEW PERIOD COMMENCES THE NEXT WORK DAY AFTER SUBMITTAL RECEIPT BY THE STRUCTURAL ENGINEER. CONCURRENT SUBMITTALS OF MULTIPLE PORTIONS OF THE SAME SUBMITTAL ITEM WILL BE REVIEWED IN THEIR ENTIRETY AS ONE SUBMITTAL SUBJECT TO THE REVIEW PERIOD LIMITATION ABOVE. SCHEDULE SUBMITTAL REVIEWS AND CONSTRUCTION ACCORDINGLY.
9. REVIEW OF SUBMITTALS BY THE STRUCTURAL ENGINEER WILL INCLUDE CHECKING FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONSTRUCTION DOCUMENTS. IT WILL NOT INCLUDE REVIEW OF THE ACCURACY OR COMPLETENESS OF ITEMS SUCH AS QUANTITIES, DIMENSIONS, WEIGHTS OR GAUGES, FABRICATION PROCESSES, CONSTRUCTION MEANS OR METHODS, COORDINATION WITH THE WORK OF OTHER TRADES, OR CONSTRUCTION SAFETY PRECAUTIONS. REVIEW OF A SPECIFIC ITEM SHALL NOT INDICATE THAT THE STRUCTURAL ENGINEER HAS REVIEWED THE ENTIRE ASSEMBLY OF WHICH THE ITEM IS A COMPONENT. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY DEVIATIONS FROM THE CONSTRUCTION DOCUMENTS NOT BROUGHT TO THE STRUCTURAL ENGINEER'S ATTENTION IN WRITING.
10. SUBMITTALS PROCESSED BY THE STRUCTURAL ENGINEER ARE NOT CHANGE ORDERS.
11. SUBMITTALS THAT WILL REQUIRE ADDITIONAL REVIEW, IN THE STRUCTURAL ENGINEER'S JUDGMENT, WILL BE MARKED "RESUBMIT". THE SUBMITTAL SHALL BE REVISED AND RESUBMITTED FOR RE-REVIEW AND IS SUBJECT TO ALL THE REQUIREMENTS OF THE INITIAL SUBMITTAL. PROVIDE OWNER REIMBURSEMENT FOR STRUCTURAL ENGINEER COSTS INCURRED TO RE-REVIEW SUBMITTALS.
12. SUBMITTALS THAT HAVE BEEN REVIEWED AND RETURNED BY THE STRUCTURAL ENGINEER, REGARDLESS OF MARKINGS ON THE SUBMITTALS, SHALL NOT BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS.
13. THE MINIMUM REQUIRED STRUCTURAL SUBMITTALS INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING MARKED ITEMS:
   - ■ STEEL PILE LOAD TESTING RESULTS AND CAPACITIES
   - ■ CONCRETE MIX DESIGNS AND SUBSTANTIATING TEST DATA
   - ■ CONCRETE REINFORCING PLACEMENT DRAWINGS
   - ■ CONCRETE PRODUCT CERTIFICATION AND DATA SHEETS
   - □ CONCRETE SLAB JOINT LAYOUT
   - □ MASONRY REINFORCING PLACEMENT DRAWINGS
   - □ MASONRY GROUT MIX DESIGNS AND SUBSTANTIATING TEST DATA
   - □ MASONRY MORTAR MIX DESIGNS
   - □ MASONRY PRODUCT CERTIFICATION AND DATA SHEETS
   - ■ STRUCTURAL STEEL SHOP DRAWINGS
   - ■ STEEL DECK PLACEMENT DRAWINGS AND DATA SHEETS
   - ■ WELDING PROCEDURE SPECIFICATIONS
   - ■ METAL-PLATE-CONNECTED WOOD TRUSS PLACEMENT DRAWINGS AND CALCULATIONS
   - □ WOOD I-JOIST PLACEMENT DRAWINGS AND CALCULATIONS
   - □ METAL WEB WOOD JOIST PLACEMENT DRAWINGS AND CALCULATIONS
   - □ GLUED-LAMINATED TIMBER FABRICATION AND PLACEMENT DRAWINGS AND CERTIFICATIONS
   - □ PRE-ENGINEERED LUMBER CERTIFICATIONS AND DATASHEETS
   - □ OPEN WEB STEEL JOIST PLACEMENT DRAWINGS AND CALCULATIONS
   - □ PRE-ENGINEERED STEEL STAIR SHOP DRAWINGS AND CALCULATIONS
   - □ COLD-FORMED STEEL FRAMING PRODUCTS, ACCESSORIES, DATA SHEETS & CALCULATIONS

FIRE / SMOKE PROTECTION OF STRUCTURE

S- 078000_N001A
190605. Q2

1. THE FIRE RESISTANCE RATING OF STRUCTURAL MEMBERS AND ASSEMBLIES SHALL BE IN ACCORDANCE WITH THE BUILDING CODE AND THE REQUIREMENTS INDICATED IN THE CONSTRUCTION DOCUMENTS.
2. SEE THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS FOR THE BUILDING CONSTRUCTION TYPE AND THE FIRE AND SMOKE PROTECTION MATERIALS, SYSTEMS OR ASSEMBLIES REQUIRED TO PROVIDE THE NECESSARY FIRE RESISTANCE RATING FOR STRUCTURAL BUILDING ELEMENTS.
3. FIRE RESISTANCE RATINGS SHALL BE MAINTAINED FOR OPENINGS OR PENETRATIONS THROUGH STRUCTURAL BUILDING ELEMENTS THAT ARE PART OF THE FIRE AND SMOKE PROTECTION SYSTEMS OR ASSEMBLIES.
4. FIREBLOCKING AND DRAFTSTOPPING SHALL BE PROVIDED AT STRUCTURAL FRAMING IN COMBUSTIBLE CONCEALED LOCATIONS IN ACCORDANCE WITH THE BUILDING CODE.
5. WHEN FIRE PROTECTION IS REQUIRED, THE FIRE PROTECTED PRIMARY STRUCTURAL FRAME SHALL INCLUDE ALL OF THE FOLLOWING STRUCTURAL MEMBERS:
   - THE COLUMNS
   - STRUCTURAL MEMBERS HAVING DIRECT CONNECTIONS TO THE COLUMNS, INCLUDING GIRDERS, BEAMS, TRUSSES AND SPANDRELS
   - MEMBERS OF THE FLOOR CONSTRUCTION AND ROOF CONSTRUCTION HAVING DIRECT CONNECTIONS TO THE COLUMNS
   - BRACING MEMBERS THAT ARE ESSENTIAL TO THE VERTICAL STABILITY OF THE PRIMARY STRUCTURAL FRAME UNDER GRAVITY LOADING WHETHER OR NOT THE BRACING MEMBER CARRIES GRAVITY LOADS
6. WHEN FIRE PROTECTION IS REQUIRED, THE FOLLOWING STRUCTURAL MEMBERS SHALL BE CONSIDERED SECONDARY MEMBERS AND NOT PART OF THE FIRE PROTECTED PRIMARY STRUCTURAL FRAME:
   - STRUCTURAL MEMBERS NOT HAVING DIRECT CONNECTIONS TO THE COLUMNS
   - MEMBERS OF THE FLOOR CONSTRUCTION AND ROOF CONSTRUCTION NOT HAVING DIRECT CONNECTIONS TO THE COLUMNS
   - BRACING MEMBERS OTHER THAN THOSE THAT ARE PART OF THE PRIMARY STRUCTURAL FRAME
7. FIRE PROTECTION CONSTRUCTION CLASSIFICATIONS USED FOR DETERMINING CONDITIONS OF RESTRAINT FOR FLOOR AND ROOF STRUCTURAL ASSEMBLIES AND FOR INDIVIDUAL BEAMS SHALL CONFORM TO ASTM E119. USE THE FOLLOWING FIRE PROTECTION CONSTRUCTION CLASSIFICATIONS, UNO:
   - UNRESTRAINED
     - WOOD FRAMING
     - COLD FORMED STEEL FRAMING
     - STEEL FRAMING SUPPORTED BY BEARING WALLS
     - CONCRETE FRAMING SUPPORTED BY BEARING WALLS
   - RESTRAINED
     - STEEL FRAMING
     - CONCRETE FRAMING

FIRE SPRINKLER COORDINATION

S- 210000_N001A
180620. Q2

1. AUTOMATIC FIRE SPRINKLER SYSTEM (AFSS) DESIGN AND INSTALLATION SHALL COMPLY WITH THE REQUIREMENTS OF THE BUILDING CODE, ASCE 7, AND NFPA 13.
2. THE ABOVE GROUND PORTION OF THE AFSS SHALL BE DESIGNED BY A CALIFORNIA LICENSED MECHANICAL ENGINEER, FIRE PROTECTION ENGINEER, OR A DESIGN/BUILD C-16 FIRE PROTECTION CONTRACTOR.
3. INSTALLATION SHALL NOT BEGIN PRIOR TO OBTAINING APPROVAL FROM THE ENFORCEMENT AGENCY AND REVIEW BY ARCHITECT AND STRUCTURAL ENGINEER.
4. INSTALL AFSS PIPING WITH 2” MINIMUM CLEARANCE FROM STRUCTURAL MEMBERS NOT PENETRATED OR USED TO SUPPORT THE PIPING.
5. INSTALL APPROVED SEISMIC SEPARATION ASSEMBLIES WHERE AFSS PIPING, REGARDLESS OF SIZE, CROSSES BUILDING SEISMIC SEPARATION JOINTS AT GROUND LEVEL AND ABOVE. PROVIDE A FOUR-WAY BRACE TO PIPING AT EACH SIDE OF ASSEMBLIES. ATTACH BRACE TO PIPING, NOT THE ASSEMBLIES, WITHIN 6’ OF THE ASSEMBLIES.
6. AFSS PIPING SHALL PASS THROUGH HOLES/SLEEVES IN WALLS, FLOORS, ROOFS OR FOUNDATIONS. COMPLY WITH ALL STRUCTURAL DETAILS AND THE FOLLOWING: PROVIDE 2” NOMINAL CLEAR AT HOLES/SLEEVES FOR PIPES 3 1/2” AND SMALLER. PROVIDE 4” NOMINAL CLEAR AT HOLES/SLEEVES FOR PIPES 4” AND LARGER.
7. AFSS PIPING SHALL NOT PENETRATE OR INTERRUPT FRAMING MEMBERS INCLUDING BUT NOT LIMITED TO STUDS, POSTS, COLUMNS, JOISTS, RAFTERS, BEAMS AND GIRDERS. DO NOT CUT OR DRILL FRAMING MEMBERS UNLESS SPECIFICALLY NOTED.
8. AFSS PIPING HANGERS, COMPONENTS AND FASTENERS SHALL BE LISTED, FERROUS, AND DESIGNED TO SUPPORT FIVE TIMES THE TRIBUTARY WEIGHT OF WATER-FILLED PIPE PLUS 250 POUNDS.
9. PIPING HANGERS SHALL NOT BE SUBJECTED TO BENDING. INSTALL WITH SWIVELS, EYE NUTS, ARTICULATING ATTACHMENTS OR OTHER DEVICES TO PREVENT BENDING.
10. PIPING HANGERS SHALL BE SUBSTANTIALLY SUPPORTED FROM THE BUILDING STRUCTURE. C-TYPE CLAMPS USED TO ATTACH HANGERS TO THE BUILDING STRUCTURE SHALL BE EQUIPPED WITH A RESTRAINING STRAP. POWER ACTUATED FASTENERS SHALL NOT BE USED TO ATTACH HANGERS TO THE BUILDING STRUCTURE.
11. STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE TRIBUTARY WEIGHT OF WATER-FILLED PIPE PLUS 250 POUNDS AT EACH SPRINKLER SUPPORT POINT, WITHIN FRAMING LIMITATIONS NOTED BELOW. INSTALL TRAPEZE HANGERS WHERE NECESSARY TO SUPPORT PIPING FROM APPROPRIATE STRUCTURAL FRAMING MEMBERS.
12. THE MAXIMUM DISTANCE BETWEEN AFSS PIPING HANGERS SHALL NOT EXCEED: 12’ FOR STEEL PIPE 1 1/4” AND SMALLER; 15’ FOR STEEL PIPE 1 1/2” AND LARGER; 12’ FOR THREADED LIGHTWALL STEEL PIPE 1” TO 3”.
13. PROVIDE ONE HANGER MINIMUM ON EACH SECTION OF PIPE, BETWEEN EACH BRANCH LINE AT MAINS, AND AT THE ENDS OF MAINS. HANGER CLEARANCE TO UPRIGHT SPRINKLER SHALL BE 3” MINIMUM.
14. WOOD FRAMING SUPPORTING AFSS PIPING HANGERS SHALL COMPLY WITH THE FOLLOWING: DO NOT SUPPORT PIPING FROM STRUCTURAL PANELS OR 2X AND SMALLER FRAMING/DECKING UNO. SUPPORT PIPING 2” AND SMALLER FROM 3X MINIMUM FRAMING/DECKING OR WITH THROUGH BOLTS TO THE SIDES OF 2X FRAMING. SUPPORT PIPING 2 1/2” TO 6” FROM 4X MINIMUM FRAMING. SUPPORT PIPING 8” FROM 6X MINIMUM FRAMING. DO NOT SUPPORT PIPING FROM FRAMING LESS THAN 8” DEEP. DO NOT SUPPORT MORE THAN ONE PIPING HANGER AT ANY MEMBER LESS THAN 6X MINIMUM. SCREWS OR BOLTS IN THE SIDES OF FRAMING SHALL NOT BE INSTALLED LESS THAN 3” OR 1/3 THE FRAMING DEPTH FROM THE BOTTOM.
15. STEEL FRAMING SUPPORTING AFSS PIPING HANGERS SHALL COMPLY WITH THE FOLLOWING: DO NOT SUPPORT PIPING FROM BARE STEEL DECK. DO NOT SUPPORT PIPING 2 1/2” AND GREATER FROM CONCRETE FILLED STEEL DECK OR CONCRETE SLABS. DO NOT SUPPORT PIPING FROM FRAMING LESS THAN 8” DEEP. DO NOT SUPPORT MORE THAN ONE PIPING HANGER AT ANY MEMBER LESS THAN 12” DEEP.
16. LATERAL BRACING SHALL BE PROVIDED ON ALL FEED AND CROSS MAINS REGARDLESS OF PIPING SIZE, ON ALL OTHER PIPING 2 1/2” AND LARGER, AND SHALL BE SPACED AT A MAXIMUM OF 40’ ON CENTER. THE LAST LENGTH OF PIPE AT THE END OF PIPE RUNS BEING BRACED SHALL BE PROVIDED WITH A BRACE WITHIN 6’ OF THE END OF THE PIPE.
17. LONGITUDINAL BRACING SHALL BE PROVIDED ON ALL FEED AND CROSS MAIN PIPING, AND SHALL BE SPACED AT A MAXIMUM OF 80’ ON CENTER. PROVIDE A BRACE WITHIN 40’ OF EACH END OF EACH RUN OF PIPE.
18. LONGITUDINAL BRACES SHALL BE ALLOWED TO ACT AS LATERAL BRACES IF THEY ARE WITHIN 24” OF THE CENTER LINE OF THE PIPING BRACED LATERALLY. LATERAL BRACES SHALL BE ALLOWED TO ACT AS LONGITUDINAL BRACES IF THEY ARE WITHIN 24" OF THE CENTERLINE OF THE PIPING BRACED LONGITUDINALLY AND THE LATERAL BRACE IS ON A PIPE OF EQUAL OR GREATER SIZE THAN THE PIPE BEING BRACED LONGITUDINALLY.
19. EACH RUN OF PIPE BETWEEN CHANGES IN DIRECTION SHALL BE PROVIDED WITH BOTH LATERAL AND LONGITUDINAL BRACING OTHER THAN PIPE RUNS LESS THAN 12’ LONG.
20. BRACE ATTACHMENT TO PIPING SHALL BE LOCATED WITHIN 6” OF A HANGER OF A TYPE THAT PREVENTS UPWARD MOVEMENT OF THE PIPE. HANGER L/R AT BRACE SHALL NOT EXCEED 200.
21. BRACES SHALL BE ATTACHED DIRECTLY TO FEED AND CROSS MAINS. INSTALL SO THAT CONNECTIONS ARE TIGHT AND IN STRAIGHT LINES TO AVOID ECCENTRIC LOADINGS ON BRACES, COMPONENTS, AND FASTENERS. POWER ACTUATED FASTENERS, LAG SCREWS, OR C-TYPE CLAMPS SHALL NOT BE USED TO ATTACH BRACES TO THE BUILDING STRUCTURE.
22. THREADED PIPE USED AS PART OF A BRACE ASSEMBLY SHALL BE SCHEDULE 40 MINIMUM.
23. TOPS OF RISERS EXCEEDING 3’ IN LENGTH SHALL BE PROVIDED WITH A FOUR-WAY BRACE.
24. BRANCH LINE PIPING SHALL BE VERTICALLY AND LATERALLY RESTRAINED AT INTERVALS NOT EXCEEDING 40’ AND AT EACH END SPRINKLER ON A LINE. SPRIGS 4’ OR LONGER SHALL BE LATERALLY RESTRAINED.
25. AFSS SUBMITTAL DRAWINGS FOR STRUCTURAL REVIEW SHALL SHOW LOCATIONS AND SIZES OF ALL PIPING, HANGERS, BRACING AND THEIR ATTACHMENTS TO THE BUILDING STRUCTURE. PROVIDE CALCULATIONS FOR MAXIMUM VERTICAL AND LATERAL LOADS FOR EACH HANGER TYPE, AND DETAILS FOR HANGERS, BRACES AND ANCHORS SHOWING MATERIALS FOR ANCHORAGE, ETC. INCLUDE IN SUBMITTAL ICC REPORTS FOR ALL ANCHORS INDICATING ALLOWABLE LOADS FOR THE SPECIFIC CONFIGURATION OF STRUCTURE CONNECTED TO.

WATER QUALITY ENVIRONMENTAL PROTECTION

Q2

1. PROVIDE MEASURES NECESSARY TO ASSURE COMPLIANCE WITH REGULATORY REQUIREMENTS AND ENVIRONMENTAL PROTECTIONS FOR WORK OVER AND ADJACENT TO THE SACRAMENTO RIVER.
2. MEANS AND METHODS FOR IMPLMENTATION OF ENVIRONMENTAL PROTECTION PROCEDURES SHALL BE DETERMINED BY THE CONTRACTOR IN COMPLIANCE WITH REGULATORY REQUIREMENTS.
3. THE ENVIRONMENTAL PROTECTION DESIGN FEATURES SHALL PROTECT WATER QUALITY THROUGH THE PREVENTION OR MINIMIZATION OF CONTAMINANTS AND FOREIGN MATERIAL ENTERING INTO THE SACRAMENTO RIVER.
4. THE FOLLOWING ENVIRONMENTAL PROTECTION DESIGN FEATURES SHALL BE CONSIDERED FOR IMPLEMENTATION AS PART OF THE PLANNED PROJECT CONSTRUCTION.
   - DEBRIS SCREEN/MESH BARRIER: PROVIDE DEBRIS SCREENS OR MESH BARRIERS SUSPENDED ABOVE THE WATER BETWEEN THE PILINGS OR SCAFFOLDING TO CATCH DEBRIS THAT MAY FALL FROM THE WORK AREA AND OTHERWISE ENTER THE WATER. IF THE SCREENS OR NETTING WERE SUBSTANTIAL ENOUGH THIS OPTION COULD ALSO PROTECT WORKERS FROM POTENTIAL FALLS. EXAMPLE: (CONSTRUCTION SAFETY NET | ORDER FALL PROTECTION NETTING - US NETTING) https://www.usnetting.com/safety-netting/fall-safety-netting
   - FLOATING BOOM: PROVIDE FLOATING BOOMS BENEATH THE WORK AREA TO CONTAIN ANY FLOATING DEBRIS THAT FALLS INTO THE WATER. THESE CAN BE MOVED THROUGHOUT THE WORK AREA ON WATER. EXAMPLES: (FLOATING BOOM | DEBRIS BARRIERS FOR SALE (WATER-POLLUTIONSOLUTIONS.COM) https://www.water-pollutionsolutions.com/floating-boom.html FLOATING MATERIAL CAPTURED BY THE BOOMS SHOULD BE REMOVED ON A REGULAR BASIS (E.G., DAILY OR WEEKLY). MATERIAL THAT SINKS OR DISSOLVES IN THE WATER WOULD NOT BE CAPTURED BY THIS SYSTEM.
   - WORK DURING PERIODS OF LOW WATER ON THE SACRAMENTO RIVER WHEN POSSIBLE. THIS MAY HELP PREVENT DEBRIS FROM ENTERING THE WATER IF A SPILL OR ACCIDENT OCCURS. CURRENT TIDE PREDICTIONS CAN BE FOUND HERE: TIDE PREDICTIONS - NOAA TIDES & CURRENTS. https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=9416174&legacy=1
   - STANDARD WATER QUALITY PROTECTION BEST MANAGEMENT PRACTICES (BMPS): THESE SHALL BE IMPLEMENTED FOR ANY WORK AREAS/STAGING AREAS ON THE GROUND (NOT ABOVE THE WATER): EXAMPLES: (NATIONAL MENU OF BEST MANAGEMENT PRACTICES (BMPS) FOR STORMWATER-CONSTRUCTION | US EPA) https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater-construction (BEST MANAGEMENT PRACTICES (BMPS) (SACCOUNTY.GOV) https://waterresources.saccounty.gov/stormwater/Pages/best-management-practices.aspx
   - WORKER EDUCATION: PROVIDE TRAINING FOR ALL ONSITE PERSONNEL ON THE IMPORTANCE OF PROTECTION OF THE WATER QUALITY IN THE SACRAMENTO RIVER AND THE POSSIBLE PENALTIES FOR NON-COMPLIANCE WITH WATER QUALITY PROTECTION MEASURES (E.G., VIOLATION OF SPILL CONTAINMENT MEASURES).
   - SPILL CONTAINMENT AND CLEAN-UP PLAN: PROVIDE DOCUMENT DESCRIBING PROCEDURES FOR EXPEDITIOUSLY STOPPING, CONTAINING, AND CLEANING UP SPILLS, LEAKS, AND OTHER RELEASES.

STRUCTURAL GENERAL NOTES

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210927. Q2

1. THE STRUCTURAL NOTES AND TYPICAL DETAILS, WHETHER SPECIFICALLY REFERENCED OR NOT, ARE GENERAL AND APPLY TO ALL CONSTRUCTION DOCUMENTS. PROVIDE ALL STRUCTURAL ELEMENTS INDICATED IN THE STRUCTURAL NOTES AND TYPICAL DETAILS AS REQUIRED TO CONFORM TO THE FINISHED PROJECT AS INDICATED THE CONSTRUCTION DOCUMENTS.
2. CONSTRUCTION DOCUMENTS ARE DEFINED AS THE DRAWINGS AND SPECIFICATIONS APPROVED BY THE ENFORCEMENT AGENCY. SUPPLEMENTAL DOCUMENTS INCLUDING, BUT NOT LIMITED TO, ADDENDA, ARCHITECT’S SUPPLEMENTAL INSTRUCTIONS, REVISED DRAWINGS, FIELD INSTRUCTIONS AND OTHER MODIFICATIONS TO THE INITIALLY APPROVED CONSTRUCTION DOCUMENTS SHALL ALSO BE CONSIDERED CONSTRUCTION DOCUMENTS. REQUIREMENTS OF THE INITIALLY APPROVED CONSTRUCTION DOCUMENTS SHALL APPLY TO THE SUPPLEMENTAL DOCUMENTS. ADDITIONAL DOCUMENTS PROVIDED FOR INFORMATION ONLY INCLUDING, BUT NOT LIMITED TO, GEOTECHNICAL REPORTS, EXHIBITS, HAZARDOUS MATERIALS REPORTS AND ABATEMENT INFORMATION, SHALL NOT BE CONSIDERED CONSTRUCTION DOCUMENTS.
3. WHEN SPECIFICATIONS HAVE BEEN PROVIDED AS A PART OF THE CONSTRUCTION DOCUMENTS THEY SHALL BE USED IN CONJUNCTION WITH THE DRAWINGS. WORK INDICATED IN THE DRAWINGS AND NOT MENTIONED IN THE SPECIFICATIONS, OR VICE VERSA, SHALL BE PROVIDED AS THOUGH FULLY REQUIRED BY BOTH. IF CONFLICTS OCCUR BETWEEN THE SPECIFICATIONS AND DRAWINGS, THE GREATER QUANTITY AND HIGHER QUALITY SHALL BE ASSUMED TO BE PROVIDED.
4. WHERE THE CONSTRUCTION DOCUMENTS INDICATE TO NOTIFY THE STRUCTURAL ENGINEER, SUCH NOTIFICATION SHALL BE SUBMITTED IN WRITING WITH SUFFICIENT ALLOWANCE FOR A REASONABLE TIME PERIOD FOR REVIEW, DESIGN, ENFORCEMENT AGENCY APPROVAL AS REQUIRED AND WRITTEN RESPONSE SO AS NOT TO AFFECT THE CONSTRUCTION SCHEDULE. OBTAIN WRITTEN RESPONSE BEFORE PROCEEDING WITH THE AFFECTED WORK.
5. CAREFULLY EXAMINE THE CONSTRUCTION DOCUMENTS AND NOTIFY THE STRUCTURAL ENGINEER OF ANY CONFLICTS OR DISCREPANCIES WITHIN THE STRUCTURAL CONSTRUCTION DOCUMENTS. STRUCTURAL ELEMENTS SHALL NOT BE REMOVED OR MODIFIED UNLESS INDICATED IN THE STRUCTURAL CONSTRUCTION DOCUMENTS.
6. DEVIATIONS SHALL NOT BE MADE FROM THE STRUCTURAL MEMBERS, ELEMENTS, PRODUCTS, REQUIREMENTS, OR DETAILS OF CONSTRUCTION INDICATED IN THE CONSTRUCTION DOCUMENTS. DEVIATIONS SHALL BE CORRECTED AT NO ADDITIONAL COST TO THE OWNER. NOTIFY THE STRUCTURAL ENGINEER OF ANY DEVIATIONS. CORRECTIVE WORK SHALL CONFORM WITH THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS.
7. IF SUBSTITUTIONS ARE REQUESTED FOR STRUCTURAL ELEMENTS INDICATED IN THE CONSTRUCTION DOCUMENTS, NOTIFY THE STRUCTURAL ENGINEER. SUBMIT DATA AND DOCUMENTATION INCLUDING, BUT NOT LIMITED TO, COMPARATIVE QUALITY, SUITABILITY, PERFORMANCE, STRUCTURAL CAPACITY, EVALUATION SERVICE APPROVALS AND ENFORCEMENT AGENCY ACCEPTABILITY SUBSTANTIATING THE COMPLETE COMPLIANCE OF EACH PROPOSED SUBSTITUTION WITH THE CONSTRUCTION DOCUMENTS. ONLY ONE REQUEST FOR SUBSTITUTION WILL BE ALLOWED FOR EACH STRUCTURAL ELEMENT. SUBSTITUTIONS WILL NOT BE CONSIDERED WHEN SUBSTITUTION DOCUMENTS ARE INCOMPLETE OR ACCEPTANCE WOULD REQUIRE REVISIONS TO THE CONSTRUCTION DOCUMENTS. IF A PROPOSED SUBSTITUTION SUBMITTAL IS NOT COMPLETE, NOT ACCEPTABLE TO THE STRUCTURAL ENGINEER, OR NOT APPROVED BY THE ENFORCEMENT AGENCY PROVIDE THE SPECIFIED ITEM AS INDICATED IN THE CONSTRUCTION DOCUMENTS. THE STRUCTURAL ENGINEER WILL BE THE SOLE JUDGE OF THE ACCEPTABILITY OF THE PROPOSED SUBSTITUTION VERSUS THE SPECIFIED ITEM. ACCEPTANCE OF A SUBSTITUTION SHALL NOT BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS.
8. REIMBURSE OWNER FOR STRUCTURAL AND NONSTRUCTURAL DESIGN PROFESSIONAL SERVICES AND REGULATORY FEES REQUIRED TO CORRECT DEVIATIONS AND EVALUATE SUBSTITUTIONS INCLUDING THE REVIEW, DESIGN, COORDINATION, PROCESSING, ADMINISTRATION AND OBTAINMENT OF ENFORCEMENT AGENCY APPROVALS.
9. PORTIONS OF THESE CONSTRUCTION DOCUMENTS ARE DIAGRAMMATIC ONLY. ITEMS INCLUDING, BUT NOT LIMITED TO, LOCATIONS, SIZES, QUANTITIES, ACCESSORIES AND CONNECTIONS ARE INDICATED IN A REPRESENTATIONAL MANNER AND MAY NOT BE COMPLETELY SHOWN. PROVIDE ALL WORK AND MATERIALS NECESSARY TO COMPLETE THE PROJECT AS REPRESENTED IN THE CONSTRUCTION DOCUMENTS.
10. DIMENSIONS, RADIUSES, SLOPES, ANGLES, ELEVATIONS AND LEVELS INDICATED ARE FOR STRUCTURAL ELEMENTS ONLY, UNO. DO NOT SCALE DRAWINGS.
11. STRUCTURAL ELEMENT DESIGNATIONS FOLLOW INDUSTRY AND MATERIAL SPECIFIC CONVENTIONS AS DEFINED IN THE REFERENCED STANDARDS, CODES AND REGULATIONS, UNO. STRUCTURAL ELEMENTS MAY BE DENOTED USING NOMINAL SIZES, ACTUAL DIMENSIONS, OR INDUSTRY RECOGNIZED LABELS, MARKS, OR TAGS.
12. THE STRUCTURAL DOCUMENTS INDICATE THE FIRST LEVEL (OR GROUND FLOOR) REFERENCE ELEVATION AS A DATUM ELEVATION FOR CONSTRUCTION, UNO. THIS HYPOTHETICAL DATUM ELEVATION IS NOT AN ACTUAL GROUND ELEVATION ABOVE MEAN SEA LEVEL, UNO. STRUCTURAL ELEVATIONS SHOWN ELSEWHERE ARE RELATIVE TO THE REFERENCE ELEVATION. STRUCTURAL ELEVATIONS ABOVE THE FIRST LEVEL ARE GREATER THAN AND THOSE BELOW ARE LESS THAN THE REFERENCE ELEVATION.
13. REFERENCES TO STANDARDS, CODES AND REGULATIONS SHALL BE TO THE LATEST EDITION AS ADOPTED BY THE ENFORCEMENT AGENCY AT THE TIME OF CONSTRUCTION DOCUMENT APPROVAL. SEE THE REFERENCED STANDARDS, CODES AND REGULATIONS FOR ABBREVIATIONS, ACRONYMS, OR SYMBOLS NOT DEFINED IN THE CONSTRUCTION DOCUMENTS.
14. WHERE A STRUCTURAL ITEM OR DETAIL/SECTION IS INDICATED, THE REQUIREMENTS OF THE REFERENCED ITEM OR DETAIL/SECTION SHALL APPLY AT ALL SIMILAR CONDITIONS WITHIN THE CONSTRUCTION DOCUMENTS WHETHER GRAPHICALLY INDICATED OR NOT. THE SAME REQUIREMENTS APPLY TO STRUCTURAL ITEMS OR DETAIL/SECTIONS DENOTED AS TYPICAL OR SIMILAR.
15. PROVIDE ALL NECESSARY LABOR, EQUIPMENT, AND MATERIALS TO PERFORM PROJECT WORK INDICATED SO THAT COMPLETED CONSTRUCTION IS READY FOR USE OR OPERATION. FURNISH SHALL MEAN TO SUPPLY AND DELIVER ITEM TO PROJECT SITE READY FOR USE OR INSTALLATION. INSTALL SHALL MEAN TO PLACE, CONNECT, AND ANCHOR IN PROPER POSITION AND LOCATION SO THAT ITEM IS READY FOR OPERATION AND USE OR SERVICE. PROVIDE SHALL MEAN TO FURNISH AND INSTALL ITEM NECESSARY TO COMPLETE THE WORK.
16. COORDINATE AND OBTAIN ALL REGULATORY AND ENFORCEMENT AGENCY APPROVALS, INSPECTIONS, AND DOCUMENTATION REQUIRED DURING CONSTRUCTION.
17. SCHEDULES, LEGENDS, ABBREVIATIONS, TYPICAL NOTES AND TYPICAL DETAILS ON THE STRUCTURAL CONSTRUCTION DOCUMENTS MAY REFERENCE STRUCTURAL ELEMENTS OR REQUIREMENTS NOT SPECIFICALLY INDICATED OR REQUIRED ELSEWHERE IN THE CONSTRUCTION DOCUMENTS.
18. THE CONSTRUCTION DOCUMENTS AND THE DESIGNS INCORPORATED THEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, ARE NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT.
19. THE STRUCTURAL CONSTRUCTION DOCUMENTS ARE NOT COMPLETE AND READY FOR CONSTRUCTION UNTIL THEY ARE APPROVED BY THE ENFORCEMENT AGENCY AND SIGNED BY THE STRUCTURAL ENGINEER.

STRUCTURAL CONSTRUCTION LOADS

Q2

1. DESIGN FOR CONSTRUCTION LOADS IN CONFORMANCE WITH ASCE 37-DESIGN LOADS ON STRUCTURES DURING CONSTRUCTION. THE LOADS APPLY TO THE DESIGN OF THE PARTIALLY COMPLETED STRUCTURE, TEMPORARY STRUCTURES, AND TEMPORARY SUPPORTS AND STABILITY BRACING USED DURING CONSTRUCTION.
2. SELECT AND RETAIN AN ENGINEER TO PROVIDE DESIGN RESPONSIBILITY FOR CONSTRUCTION LOADS. DESIGN SHALL BE PERFORMED BY A CIVIL OR STRUCTURAL ENGINEER LICENSED IN THE STATE IN WHICH THE PROJECT IS LOCATED. WHEN SUBMITTALS ARE REQUIRED, ALL SUBMITTAL DOCUMENTS AND SUBSTANTIATING CALCULATIONS SHALL BE STAMPED AND SIGNED BY THE SAME DESIGN ENGINEER.
3. PARTIALLY COMPLETED STRUCTURES AND TEMPORARY STRUCTURES SHALL POSSESS SUFFICIENT STRUCTURAL INTEGRITY, UNDER ALL STAGES OF CONSTRUCTION, TO REMAIN STABLE AND RESIST THE SPECIFIED LOADS. STABILITY OF THE INCOMPLETE STRUCTURE AND THE POSSIBILITY OF PROGRESSIVE COLLAPSE SHALL BE CONSIDERED.
4. THE EFFECTS OF CONSTRUCTION LOADS OR CONDITIONS SHALL NOT ADVERSELY AFFECT THE SERVICEABILITY OR PERFORMANCE OF THE COMPLETED STRUCTURE.
5. ALL LOADS SHALL BE CONSIDERED INCLUDING DEAD, LIVE, CONSTRUCTION, ENVIRONMENTAL, HYDROSTATIC AND LATERAL EARTH PRESSURE. IN ADDITION, FORCES RESULTING FROM THE INTERACTION BETWEEN THE PARTIALLY COMPLETED STRUCTURE AND TEMPORARY SUPPORTING OR BRACING STRUCTURES SHALL BE CONSIDERED.
6. ENVIRONMENTAL LOADS INCLUDE EARTHQUAKE, WIND, THERMAL, RAIN, SNOW AND ICE. ENVIRONMENTAL LOADS SHALL CONFORM TO THE REQUIREMENTS OF ASCE 7 EXCEPT AS MODIFIED BY ASCE 37. THE MINIMUM RISK CATEGORY UTILIZED FOR ENVIRONMENTAL LOADS SHALL BE TAKEN AS RISK CATEGORY II. CONSTRUCTION OF ALTERATIONS OR ADDITIONS SHALL MATCH THE RISK CATEGORY OF THE EXISTING STRUCTURE. CONSTRUCTION ADJACENT TO EXISTING STRUCTURES SHALL MATCH THE RISK CATEGORY OF THE EXISTING STRUCTURE WHEN THE COLLAPSE OF CONSTRUCTION COULD IMPACT THE EXISTING STRUCTURE.
7. CONSTRUCTION LOADS SHALL INCLUDE THOSE IMPOSED ON THE PARTIALLY COMPLETED STRUCTURE OR TEMPORARY STRUCTURE DURING AND AS A RESULT OF THE CONSTRUCTION PROCESS. CONSTRUCTION LOADS INCLUDE, BUT ARE NOT LIMITED TO, MATERIALS, PERSONNEL, AND EQUIPMENT LOADS IMPOSED ON THE STRUCTURES DURING THE CONSTRUCTION PROCESS. LOADS DUE TO ERECTION FORCES, FORM PRESSURES AND SHORING SHALL BE CONSIDERED. THE DESIGN CONSTRUCTION LOAD SHALL INCLUDE THE CRITICAL COMBINATION OF THE ABOVE LOADS.
8. THE EFFECTS ON THE LOADS IMPARTED UPON THE STRUCTURES THAT ARE CREATED BY THE METHODS AND SEQUENCING OR SCHEDULING OF THE CONSTRUCTION DURING THE PROGRESSIVE STAGES OF THE WORK SHALL BE CONSIDERED.
9. LOAD EFFECTS ON PARTIALLY COMPLETED STRUCTURES, ON TEMPORARY STRUCTURES, AND ON THEIR RESPECTIVE INDIVIDUAL COMPONENTS SHALL BE DETERMINED BY ACCEPTED METHODS OF STRUCTURAL AND GEOTECHNICAL ANALYSIS, TAKING INTO ACCOUNT SECOND-ORDER EFFECTS.

STRUCTURAL CONSTRUCTION

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1. CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS CONTAINED IN THE CONSTRUCTION DOCUMENTS. CONSTRUCTION SHALL COMPLY WITH ALL BUILDING, HEALTH AND SAFETY STANDARDS, CODES AND REGULATIONS APPLICABLE TO THIS PROJECT. NOTHING IN THE CONSTRUCTION DOCUMENTS SHALL BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE STANDARDS, CODES AND REGULATIONS.
2. REMOVE AND REPLACE CONSTRUCTION THAT IS NOT IN CONFORMANCE WITH THE REQUIREMENTS CONTAINED IN THE CONSTRUCTION DOCUMENTS.
3. REMOVE CONSTRUCTION WASTE MATERIALS PROMPTLY FROM SITE AND PROPERLY DISPOSE, UON.
4. PROVIDE MEASURES NECESSARY FOR SAFEGUARDS DURING CONSTRUCTION TO PROTECT THE PROJECT, STRUCTURES, SITE, ADJACENT PROPERTIES AND LIFE.
5. PROVIDE MEASURES NECESSARY TO CONTROL AND PREVENT NUISANCE ITEMS TO THE PROJECT, SITE, ADJACENT PROPERTIES AND THE PUBLIC THAT ARE CREATED AS A RESULT OF ANY CONSTRUCTION OPERATIONS.
6. CONSTRUCTION SHALL BE PERFORMED IN A MANNER TO PREVENT DAMAGE TO ALREADY CONSTRUCTED ELEMENTS WHETHER CONCEALED OR NOT. REPLACE DAMAGED ELEMENTS OR RESTORE TO THEIR ORIGINAL CAPACITY AND CONDITION.
7. CONSTRUCT ELEMENTS AND ASSEMBLIES OF PROJECT SO THAT THEY CONFORM TO THE TOLERANCE REQUIREMENTS OF THE REFERENCED STANDARDS OF EACH CONSTRUCTION MATERIAL AND AS DENOTED IN THE CONSTRUCTION DOCUMENTS. COORDINATE CONFLICTING TOLERANCES BETWEEN DIFFERENT CONSTRUCTION MATERIALS TO MEET THE MOST RESTRICTIVE TOLERANCE REQUIRED. PROVIDE MEASURES NECESSARY TO ASSESS, CONFIRM AND CORRECT CONSTRUCTION TO COMPLY WITH REQUIRED TOLERANCES PRIOR TO PROCEEDING TO CONSTRUCTION OF THE NEXT PROJECT MATERIAL, SEQUENCE OR PHASE.
8. CONSTRUCT ELEMENTS OF PROJECT SO THAT FINISHED WORK IS TRUE TO THE DIMENSIONS, LINES, AND ELEVATIONS INDICATED. VERTICAL ELEMENTS SHALL BE PLUMB AND HORIZONTAL ELEMENTS SHALL BE LEVEL UNO. CURVED AND RADIUSED ELEMENTS SHALL HAVE SMOOTH AND UNIFORM ROUNDED PROFILES OR SURFACES. ANGLED AND SKEWED ELEMENTS SHALL HAVE CONSISTENT ORIENTATION AND DIRECTION. SLOPED ELEMENTS SHALL HAVE UNIFORM INCLINES BETWEEN THE ENDS OF ELEMENTS NOTED.
9. ADJACENT ELEMENTS INDICATED IN THE SAME PLANE SHALL HAVE FLUSH SURFACES. INTERSECTING ELEMENTS SHALL HAVE UNIFORM TRANSITIONS BETWEEN SURFACES. JOINTS OF ADJACENT ELEMENTS SHALL BE SMOOTH AND TIGHT FITTING. BEARING SURFACES OF ELEMENTS SHALL HAVE FULL CONTACT OVER ENTIRE SURFACE UNO.
10. WHEN SAW-CUTTING STRUCTURAL ELEMENTS, DO NOT OVERCUT. INTERSECTING SAW-CUTS SHALL NOT OVERLAP. SAW-CUTS MAY INTERSECT AT SMALL DIAMETER CORED/DRILLED HOLES. SAW-CUTS SHALL BE TANGENT TO AND SHALL NOT EXTEND BEYOND THE CORED/DRILLED HOLES. CAREFULLY REMOVE REMAINING MATERIAL AT THE CORED/DRILLED HOLE TO THE EDGE OF THE SAW-CUT LINE.
11. WHEN SAW-CUTTING OR DRILLING/CORING HOLES AT STRUCTURAL ELEMENTS, DO NOT DAMAGE ALREADY CONSTRUCTED ELEMENTS INCLUDING ANCHORS, CONNECTORS, ATTACHMENTS, EMBEDS OR REINFORCING (REBAR OR PRE/POST-TENSIONED STRANDS). MAINTAIN A MINIMUM CLEARANCE OF TWO INCHES BETWEEN THE ANCHOR, CONNECTOR, ATTACHMENT, EMBED OR REINFORCING AND THE HOLE. PRIOR TO SAW-CUTTING OR DRILLING/CORING HOLES AT CONCRETE OR MASONRY, LOCATE EMBEDS AND REINFORCING AT AFFECTED AREAS USING NON-DESTRUCTIVE MEANS.
12. REPETITIVE STRUCTURAL ELEMENT SPACING INDICATED SHALL BE THE MAXIMUM ON CENTER SPACING OVER THE EXTENT INDICATED. IF NO SPECIFIC EXTENT IS INDICATED THEN THE REPETITIVE SPACING SHALL OCCUR FOR THE FULL WIDTH, LENGTH, HEIGHT AND/OR DEPTH OF THE STRUCTURAL SYSTEM. PROVIDE STRUCTURAL ELEMENTS INDICATED AT SPECIFIC LOCATIONS AND AS REQUIRED BY THE STRUCTURAL DETAILS IN ADDITION TO THE REPETITIVE ELEMENTS.
13. STRUCTURAL ELEMENTS INDICATED SHALL BE CONTINUOUS, ONE PIECE, BETWEEN SUPPORTS. SPLICES ARE NOT PERMITTED UNLESS SPECIFICALLY DETAILED OR DENOTED.
14. FEATURES OF CONSTRUCTION INDICATED ARE TYPICAL. WHERE FEATURES ARE NOT FULLY OR SPECIFICALLY INDICATED BY THE CONSTRUCTION DOCUMENTS, THEIR CONSTRUCTION SHALL BE AS INDICATED FOR IDENTICAL OR SIMILAR FEATURES ELSEWHERE IN THE CONSTRUCTION DOCUMENTS. IF ANY CONDITIONS REQUIRE CONSTRUCTION DIFFERENT THAN THAT INDICATED ON THE CONSTRUCTION DOCUMENTS, NOTIFY THE STRUCTURAL ENGINEER.
15. STRUCTURAL ELEMENTS REPRESENTED IN THE CONSTRUCTION DOCUMENTS ARE INDICATED IN THEIR COMPLETED CONFIGURATION. THE CONSTRUCTION DOCUMENTS DO NOT INDICATE MEANS, METHODS OR SEQUENCES OF CONSTRUCTION UNLESS SPECIFICALLY NOTED OTHERWISE. PROVIDE MEASURES NECESSARY FOR THE PROTECTION OF LIFE AND PROPERTY AND TO ASSURE THE CORRECT AND ACCURATE STRUCTURE GEOMETRY AND STABILITY DURING EACH STAGE OF CONSTRUCTION. MEASURES SHALL REMAIN IN PLACE UNTIL THE STRUCTURAL ELEMENTS AND ALL OTHER STRUCTURAL ELEMENTS USED TO SUPPORT THEM HAVE BEEN COMPLETED AND HAVE ATTAINED THEIR REQUIRED DESIGN STRENGTHS.
16. STRUCTURAL DESIGN LOADS, STRENGTHS, CAPACITIES AND CRITERIA INDICATED ON THE CONSTRUCTION DOCUMENTS ARE FOR THE COMPLETED STRUCTURE ONLY. THE USE OF ANY PART OR PARTS OF THE INCOMPLETE OR COMPLETED STRUCTURE FOR THE SUPPORT OF CONSTRUCTION ITEMS INCLUDING, BUT NOT LIMITED TO, OTHER PORTIONS OF THE STRUCTURE, PERSONNEL, MATERIALS AND EQUIPMENT IS LIMITED TO THE SAFE CAPACITY OF THE STRUCTURE AT THE TIME IT IS TO BE USED FOR SUCH SUPPORT. PROVIDE MEASURES NECESSARY TO EVALUATE AND PREVENT OVERLOADING, EXCESSIVE MOVEMENT AND DAMAGE TO ANY PART OR PARTS OF THE STRUCTURE.
17. WHERE MANUFACTURER’S PRODUCTS, MATERIALS AND SYSTEMS ARE DENOTED, COMPLY WITH THEIR RECOMMENDATIONS AND REQUIREMENTS FOR USE, INSTALLATION, INSPECTION AND CONSTRUCTION, UNO.

STRUCTURAL COORDINATION

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1. STRUCTURAL CONSTRUCTION DOCUMENTS SHALL BE USED IN CONJUNCTION WITH THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS FOR THIS PROJECT. SEE THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS FOR COMPLETE PROJECT REQUIREMENTS AND COORDINATE ACCORDINGLY FOR ALL NONSTRUCTURAL COMPONENTS AND CONSTRUCTION INDICATED.
2. REFERENCES TO THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS ARE TO THE ENFORCEMENT AGENCY APPROVED DRAWINGS AND SPECIFICATIONS AND TO THE OWNER PROVIDED DOCUMENTS AND INFORMATION FOR THIS PROJECT THAT ARE NOT STRUCTURAL.
3. PROVIDE ALL STRUCTURAL ELEMENTS AND CONSTRUCTION INDICATED IN THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS. STRUCTURAL PROJECT WORK INDICATED IN THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS SHALL COMPLY WITH THE REQUIREMENTS OF THE STRUCTURAL CONSTRUCTION DOCUMENTS.
4. CAREFULLY EXAMINE THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS AND NOTIFY THE STRUCTURAL ENGINEER OF ANY CONFLICTS OR DISCREPANCIES WITH THE STRUCTURAL CONSTRUCTION DOCUMENTS. STRUCTURAL ELEMENTS SHALL NOT BE REMOVED OR MODIFIED UNLESS INDICATED IN THE STRUCTURAL CONSTRUCTION DOCUMENTS.
5. NONSTRUCTURAL OPENINGS/HOLES THROUGH STRUCTURAL ELEMENTS AND SYSTEMS MAY NOT BE INDICATED ON THE STRUCTURAL CONSTRUCTION DOCUMENTS. NOTIFY THE STRUCTURAL ENGINEER OF OPENINGS/HOLES AND THEIR SIZES, LOCATIONS AND QUANTITIES ON STRUCTURAL SUBMITTAL DOCUMENTS. PROVIDE COMPLETE LAYOUT AND INFORMATION FOR OPENINGS/HOLES WHETHER FRAMED/FORMED/BUILT, SAWCUT OR CORED/DRILLED. COMPLY WITH THE REQUIREMENTS OF THE STRUCTURAL TYPICAL DETAILS FOR LIMITATIONS OF OPENING/HOLE SIZES, LOCATIONS, ADJACENCIES, AND QUANTITIES AND PROVIDE THE ADDITIONAL REQUIRED STRUCTURAL FRAMING/REINFORCING ELEMENTS INDICATED.
6. NONSTRUCTURAL OPENING/HOLE SIZES INDICATED IN STRUCTURAL ELEMENTS SHALL NOT EXCEED THE OUTSIDE DIMENSION OF THE NONSTRUCTURAL ELEMENT PASSING THROUGH PLUS 1” ALL AROUND, UON. NONSTRUCTURAL ELEMENTS REQUIRED TO PASS THROUGH STRUCTURAL ELEMENTS SHALL BE ORIENTED PERPENDICULAR TO THE AXIS OR FACE OF THE STRUCTURAL ELEMENT UNO.
7. ROUGH OPENING DIMENSIONS AT STRUCTURAL ELEMENTS OR SYSTEMS FOR DOOR, WINDOW, HATCH, SKYLIGHT OR OTHER OPENING SYSTEMS SHALL BE AS REQUIRED BY THE MANUFACTURER AND AS INDICATED ON THE NONSTRUCTURAL DOCUMENTS.
8. NONSTRUCTURAL COMPONENTS AND CONSTRUCTION ARE THE NONSTRUCTURAL PARTS OR PORTIONS OF THE PROJECT THAT ARE PERMANENTLY SUPPORTED BY OR ATTACHED TO THE STRUCTURAL ELEMENTS OR SYSTEM. NONSTRUCTURAL COMPONENTS INCLUDES THE COMPONENTS (FURNISHINGS, FIXTURES, EQUIPMENT OR NONSTRUCTURAL ELEMENT), THEIR SUPPORTS (BOTH VERTICAL AND LATERAL), AND ATTACHMENTS (ANCHORAGE) TO THE STRUCTURAL ELEMENTS OR SYSTEM.
9. NONSTRUCTURAL COMPONENTS AND CONSTRUCTION MAY NOT BE INDICATED ON THE STRUCTURAL CONSTRUCTION DOCUMENTS. COMPLY WITH THE REQUIREMENTS OF ALL CONSTRUCTION DOCUMENTS AND PROVIDE THE ADDITIONAL STRUCTURAL ELEMENTS REQUIRED TO SUPPORT AND/OR ANCHOR THE NONSTRUCTURAL ITEMS. SEE THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS FOR ADDITIONAL INFORMATION REGARDING:
   - DIMENSIONS, RADIUSES, SLOPES, ANGLES, ELEVATIONS AND LEVELS
   - DEPRESSIONS, RECESSES, PITS AND CHANGES IN LEVEL/ELEVATION
   - RAISED CURBS, PADS, PLATFORMS AND PEDESTALS
   - WALKING SURFACES, RAMPS, STEPS, AND STAIRS
   - LIFTS, ELEVATORS, ESCALATORS AND CONVEYING SYSTEMS
   - SIZE, LOCATION AND QUANTITY OF OPENINGS/HOLES IN STRUCTURAL ELEMENTS
   - SLEEVES, INSERTS AND EMBEDDED ITEMS IN STRUCTURAL ELEMENTS
   - DRAINS, TRENCHES, SUMPS AND GRATES EMBEDDED IN STRUCTURAL ELEMENTS
   - CHAMFERS, GROOVES, AND REVEALS IN STRUCTURAL ELEMENTS
   - FINISHES, COLORS, TEXTURES, PATTERNS AND TOPPINGS
   - NONSTRUCTURAL WALLS/PARTITIONS AND THEIR SUPPORT AND ATTACHMENT
   - NONSTRUCTURAL CEILINGS/SOFFITS AND THEIR SUPPORT AND ATTACHMENT
   - EXTERIOR ENVELOPE, ROOFING, OPENINGS AND MOISTURE PROTECTION
   - ACOUSTIC AND THERMAL INSULATION ELEMENTS, SYSTEMS AND CONSTRUCTION
   - FIRE AND SMOKE PROTECTION ELEMENTS, SYSTEMS AND CONSTRUCTION
   - LIFE SAFETY AND ACCESSIBILITY INFORMATION
   - BASE, SUB-BASE, SUB-GRADE AND BUILDING PAD PREPARATION
   - FOUNDATION DAMPPROOFING, WATERPROOFING AND DRAINAGE SYSTEMS
   - EXTERIOR PAVING, GRADING, LANDSCAPING AND SITE ELEMENTS
   - UNDERGROUND SITE/BUILDING UTILITIES CROSSING OR ADJACENT TO FOOTINGS
   - NONSTRUCTURAL COMPONENT SIZES, WEIGHTS, LOCATIONS & QUANTITIES
   - NONSTRUCTURAL COMPONENT SUPPORTS AND ATTACHMENTS
   - PIPING, CONDUIT, DUCTING AND DISTRIBUTION SYSTEMS FOR ALL UTILITIES

STRUCTURAL EXISTING CONSTRUCTION

S- 020000_N002X
210924. Q2

1. EXISTING CONSTRUCTION INDICATED IN THE CONSTRUCTION DOCUMENTS IS BASED UPON INFORMATION SHOWN ON AVAILABLE EXISTING DRAWINGS AND/OR LIMITED VISUAL OBSERVATIONS. THE EXISTING CONSTRUCTION MAY VARY FROM THAT INDICATED ON THE CONSTRUCTION DOCUMENTS. PROVIDE ALL WORK AND MATERIALS NECESSARY TO COMPLETE THE PROJECT AS REPRESENTED IN THE CONSTRUCTION DOCUMENTS.
2. VERIFY ALL DIMENSIONS AND ELEVATIONS OF THE EXISTING CONSTRUCTION PRIOR TO STARTING CONSTRUCTION OR FABRICATION. DO NOT SCALE EXISTING DRAWINGS.
3. PROVIDE AND MAINTAIN A COMPLETE AND LEGIBLE COPY OF THE EXISTING CONSTRUCTION DOCUMENTS AND MAKE THEM AVAILABLE FOR USE ON THE JOB SITE.
4. CAREFULLY EXAMINE THE EXISTING CONSTRUCTION DOCUMENTS AND NOTIFY THE STRUCTURAL ENGINEER OF ANY CONFLICTS OR DISCREPANCIES WITH THE STRUCTURAL CONSTRUCTION DOCUMENTS.
5. EXISTING STRUCTURAL ELEMENTS SHALL NOT BE REMOVED OR MODIFIED UNLESS INDICATED IN THE STRUCTURAL CONSTRUCTION DOCUMENTS. IF EXISTING STRUCTURAL ELEMENTS INTERFERE WITH THE WORK INDICATED IN ANY CONSTRUCTION DOCUMENT, OR IF UNCERTAIN THAT AN ELEMENT IS STRUCTURAL, NOTIFY THE STRUCTURAL ENGINEER.
6. PROVIDE MEASURES NECESSARY FOR SAFEGUARDS DURING CONSTRUCTION TO PROTECT THE EXISTING STRUCTURE, ITS SITE, SUPPORTING UTILITIES AND OCCUPANTS.
7. PROVIDE BARRIERS TO SEPARATE EXISTING CONSTRUCTION FROM THE CONSTRUCTION OF THIS PROJECT. MAINTAIN EXISTING SITE FIRE AND LIFE SAFETY ACCESS AND EGRESS AND KEEP SEPARATE FROM CONSTRUCTION AREAS, UNO.
8. EXISTING FOUNDATIONS THAT MAY BE AFFECTED BY ANY EXCAVATIONS REQUIRED FOR THIS PROJECT SHALL BE UNDERPINNED, SHORED OR SUPPORTED ADEQUATELY TO PREVENT SETTLEMENT AND LATERAL MOVEMENT.
9. IF EXISTING STRUCTURAL ELEMENTS ARE DISCOVERED TO BE DAMAGED OR DIFFERENT THAN INDICATED IN THE CONSTRUCTION DOCUMENTS, NOTIFY THE STRUCTURAL ENGINEER. SUCH DAMAGE OR DIFFERENCE SHALL INCLUDE, BUT NOT BE LIMITED TO, DRY-ROT, WATER DAMAGE, INSECT DAMAGE, POOR WORKMANSHIP OR FIT-UP, BUCKLING, EXCESSIVE DEFLECTION, SAGGING, TWISTING, WARPING, AND DIFFERENT SIZE, ORIENTATION, GRADE, QUALITY OR MATERIAL.
10. COMPLY WITH THE REQUIREMENTS OF THE STRUCTURAL COORDINATION NOTES AND STRUCTURAL CONSTRUCTION NOTES FOR NONSTRUCTURAL COMPONENT ANCHORS, HOLES AND OPENINGS REQUIRED IN EXISTING CONSTRUCTION.
11. ALL CONSTRUCTION INDICATED IS NEW UNLESS SPECIFICALLY DENOTED AS EXISTING.

STRUCTURAL DEMOLITION

S- 020000_N003X
210924. Q2

1. STRUCTURAL CONSTRUCTION DOCUMENTS MAY NOT INDICATE THE COMPLETE STRUCTURAL DEMOLITION SCOPE OF WORK. SEE THE NONSTRUCTURAL CONSTRUCTION DOCUMENTS FOR THE FULL SCOPE OF STRUCTURAL DEMOLITION WORK.
2. CONSTRUCTION DOCUMENTS DO NOT INDICATE OR DENOTE EVERY ITEM FOR STRUCTURAL DEMOLITION AND MAY DIAGRAMMATICALLY REPRESENT A SCHEMATIC SENSE OF THE SCOPE OF WORK. THE DEMOLITION SCOPE OF WORK INDICATED IS BASED UPON INFORMATION SHOWN ON AVAILABLE EXISTING DRAWINGS AND/OR LIMITED VISUAL OBSERVATIONS. STRUCTURAL DEMOLITION MAY INCLUDE THE COMPLETE REMOVAL AND/OR THE MODIFICATION OF EXISTING STRUCTURAL ELEMENTS. VERIFY EXTENT OF STRUCTURAL DEMOLITION REQUIRED AND PROVIDE ALL WORK AND MATERIALS NECESSARY TO COMPLETE THE PROJECT AS REPRESENTED IN THE CONSTRUCTION DOCUMENTS.
3. THE STRUCTURAL CONSTRUCTION DOCUMENTS DO NOT INCLUDE HAZARDOUS MATERIALS IDENTIFICATION, DEMOLITION, OR ABATEMENT. IF KNOWN OR SUSPECTED HAZARDOUS MATERIALS ARE ENCOUNTERED IN THE EXECUTION OF THE SCOPE OF WORK FOR THIS PROJECT, NOTIFY THE OWNER.
4. CAREFULLY EXAMINE THE STRUCTURAL DEMOLITION SCOPE OF WORK INDICATED IN THE CONSTRUCTION DOCUMENTS AND NOTIFY THE STRUCTURAL ENGINEER OF ANY CONFLICTS OR DISCREPANCIES WITH THE EXISTING CONSTRUCTION DOCUMENTS.
5. COORDINATE WITH THE OWNER AND PERFORM DEMOLITION WORK DURING TIMES AND IN A MANNER WHICH WILL NOT CONFLICT WITH ANY SYSTEM, BUILDING, FACILITY OR SITE OPERATION WHICH IS TO REMAIN FUNCTIONAL DURING THE COURSE OF THE PROJECT.
6. PROVIDE MEASURES NECESSARY FOR SAFEGUARDS DURING DEMOLITION TO PROTECT THE PROJECT, SITE, ADJACENT PROPERTIES AND LIFE.
7. PROVIDE MEASURES NECESSARY TO CONTROL AND PREVENT NUISANCE ITEMS TO THE PROJECT, SITE, ADJACENT PROPERTIES AND THE PUBLIC THAT ARE CREATED AS A RESULT OF ANY DEMOLITION OPERATIONS.
8. PROVIDE BARRIERS TO SEPARATE DEMOLITION AREA FROM THE REMAINDER OF THE PROJECT. MAINTAIN EXISTING MEANS OF EGRESS AND KEEP SEPARATE FROM DEMOLITION AREAS, UNO. MAINTAIN THE UNINTERRUPTED CONTINUITY OF EXISTING WEATHER PROTECTION, VAPOR CONTROL, THERMAL, ACOUSTIC, FIRE RATED AND/OR SMOKE BARRIER ASSEMBLIES AND SYSTEMS, UNO.
9. PROVIDE SHORING AND BRACING NECESSARY FOR THE VERTICAL AND LATERAL STABILITY AND SUPPORT OF THE REMAINING EXISTING STRUCTURE AND STRUCTURAL ELEMENTS DURING DEMOLITION. SHORING AND BRACING SHALL REMAIN IN PLACE UNTIL SUPPORTING STRUCTURAL CONSTRUCTION IS COMPLETE AND HAS ATTAINED REQUIRED DESIGN STRENGTH.
10. DEMOLITION OF EXISTING ELEMENTS SHALL BE PERFORMED IN A MANNER TO PREVENT DAMAGE TO REMAINING EXISTING ELEMENTS WHETHER CONCEALED OR NOT. REPLACE OR RESTORE DAMAGED REMAINING EXISTING ELEMENTS.
11. WHEN EXISTING ELEMENTS ARE INDICATED TO BE DEMOLISHED, REMOVE THE STRUCTURAL ELEMENT AND ALL ATTACHED ITEMS DOWN TO THE SURFACE OF THE SUPPORTING STRUCTURAL ELEMENTS INDICATED TO REMAIN, UON.
12. WHEN EXISTING ASSEMBLIES OF ELEMENTS ARE INDICATED TO BE DEMOLISHED, REMOVE ALL COMPONENTS OF THE ASSEMBLY INCLUDING THOSE ELEMENTS CONCEALED FROM VIEW, UNO.
13. CUTS AT EXISTING STRUCTURAL ELEMENTS SHALL BE MADE IN A MANNER TO ENSURE ACCURATE, CLEAN AND ALIGNED INTERFACES WITH STRUCTURAL CONSTRUCTION, UNO.
14. EXISTING REBAR EXPOSED AT SAW CUTS THAT WILL NOT BE COVERED WITH CONCRETE OR MASONRY SHALL BE PROTECTED FROM CORROSION. CHIP AROUND AND CLIP REBAR OFF 1” BELOW CUT SURFACE TYP, UNO. CLIP REBAR OFF 2” BELOW CUT SURFACE AT LOCATIONS EXPOSED TO EARTH OR WEATHER. PERFORM CHIPPING CAREFULLY TO PREVENT ANY DAMAGE TO THE EXISTING ADJACENT SURFACES. PREPARE AND PATCH CHIPPED AREA FLUSH WITH THE SAW CUT SURFACE WITH A CONCRETE BONDING EPOXY.
15. REMOVE DEMOLITION MATERIALS PROMPTLY FROM SITE AND PROPERLY DISPOSE, UON.
16. ITEMS INDICATED TO BE REMOVED SHALL BE DEMOLISHED AS NOTED, UNO. ITEMS NOT SPECIFICALLY INDICATED TO BE REMOVED OR DEMOLISHED SHALL REMAIN, UNO.
17. ITEMS INDICATED TO BE RETAINED SHALL BE REMOVED UNDAMAGED IN OPERATING CONDITION AND STORED IN A SECURE WEATHER TIGHT AREA FOR USE BY THE OWNER.
18. ITEMS INDICATED TO BE RELOCATED SHALL BE REMOVED UNDAMAGED, RESTORED AND REINSTALLED IN THE LOCATIONS NOTED, UNO.
19. ITEMS INDICATED TO BE REPLACED SHALL BE REMOVED AND REPLACEMENT ITEMS SHALL BE PROVIDED THAT MATCH THE ORIGINAL EXISTING ITEM IN EVERY RESPECT, UNO.
20. ITEMS INDICATED TO BE RESTORED SHALL BE REFURBISHED IN ALL ASPECTS TO MATCH THE ORIGINAL EXISTING CONSTRUCTION IN EVERY RESPECT. THE ITEM SHALL BE RETURNED TO ITS FULL STRUCTURAL CAPACITY AND FUNCTIONING/OPERATING CONDITION, UNO.

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CONSULTANT

SEAL

FOR REVIEW ONLY, NOT FOR CONSTRUCTION

PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST,
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
GENERAL NOTES

SHEET
S-002

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WIND

WS- 000000_N000A 180625. Q2

NOT USED

WIND REQUIREMENTS (SECTION 1704.3.3)

1. DESCRIPTION OF MAIN WIND-FORCE-RESISTING SYSTEM AND DESIGNATED WIND RESISTING COMPONENTS SUBJECT TO SPECIAL INSPECTIONS IN ACCORDANCE WITH SECTION 1705.11:

   <Description of main wind force resisting system, R=>

2. THE EXTENT OF THE MAIN WIND-FORCE-RESISTING SYSTEM AND WIND RESISTING COMPONENTS IS DEFINED IN MORE DETAIL IN THE CONSTRUCTION DOCUMENTS.

SPECIAL INSPECTION FOR WIND REQUIREMENTS

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. STRUCTURAL WOOD				
■ INSPECT FIELD GLUING OPERATIONS OF ELEMENTS OF THE MAIN WIND-FORCE-RESISTING SYSTEM.	X	---	---	1705.11.1
□ INSPECT NAILING, BOLTING, ANCHORING, AND OTHER FASTENING OF COMPONENTS WITHIN THE MAIN WIND-FORCE-RESISTING SYSTEM, INCLUDING WOOD SHEAR WALLS, WOOD DIAPHRAGMS, COLLECTORS (DRAG STRUTS), BRACES AND HOLD-DOWNS.	---	X		
2. COLD-FORMED STEEL FRAMING				
□ WELDING OF ELEMENTS OF THE MAIN WIND-FORCE-RESISTING SYSTEM.	---	X	---	1705.11.2
□ INSPECTION OF SCREW ATTACHMENTS, BOLTING, ANCHORING, AND OTHER FASTENING OF COMPONENTS WITHIN THE MAIN WIND-FORCE-RESISTING SYSTEM INCLUDING SHEAR WALLS, BRACES, DIAPHRAGMS, COLLECTORS (DRAG STRUTS) AND HOLD-DOWNS.	---	X		
3. WIND-RESISTING COMPONENTS				
□ ROOF CLADDING.	---	X	---	1705.11.3
□ WALL CLADDING.	---	X		

SEISMIC

WS- 000000_N000A 200615. Q2

SEISMIC REQUIREMENTS (SECTION 1704.3.2)

1. DESCRIPTION OF SEISMIC-FORCE-RESISTING SYSTEM AND DESIGNATED SEISMIC SYSTEMS SUBJECT TO SPECIAL INSPECTIONS AS PER SECTION 1705.12 AND 1705.13:

   STEEL ORDINARY CANTILEVER COLUMN SYSTEM, R= 1.25

2. THE EXTENT OF THE SEISMIC-FORCE-RESISTING SYSTEM IS DEFINED IN MORE DETAIL IN THE CONSTRUCTION DOCUMENTS.

SPECIAL INSPECTION FOR SEISMIC RESISTANCE

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ SPECIAL INSPECTION OF STRUCTURAL STEEL ELEMENTS IN THE SEISMIC-FORCE-RESISTING SYSTEM IN ACCORDANCE WITH THE QUALITY ASSURANCE REQUIREMENTS OF AISC 341.	X	---		1705.12.1
2. STRUCTURAL WOOD				
□ INSPECT FIELD GLUING OPERATIONS OF ELEMENTS OF THE SEISMIC-FORCE-RESISTING SYSTEM.	X	---	---	1705.12.2
■ INSPECT NAILING, BOLTING, ANCHORING, AND OTHER FASTENING OF COMPONENTS WITHIN THE SEISMIC FORCE-RESISTING SYSTEM, INCLUDING WOOD SHEAR WALLS, WOOD DIAPHRAGMS, COLLECTORS (DRAG STRUTS), BRACES, SHEAR PANELS AND HOLD-DOWNS.	---	X		
3. COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION				
□ WELDING OF ELEMENTS OF THE SEISMIC-FORCE-RESISTING SYSTEM.	---	X	---	1705.12.3
□ INSPECTION OF SCREW ATTACHMENTS, BOLTING, ANCHORING, AND OTHER FASTENING OF COMPONENTS WITHIN THE SEISMIC-FORCE-RESISTING SYSTEM INCLUDING SHEAR WALLS, BRACES, DIAPHRAGMS, COLLECTORS (DRAG STRUTS) AND HOLD-DOWNS.	---	X		
4. STORAGE RACKS AND ACCESS FLOORS				
□ ANCHORAGE OF STORAGE RACKS 8 FEET OR GREATER IN HEIGHT AND ACCESS FLOORS.	---	X	---	1705.12.7
5. ARCHITECTURAL COMPONENTS				
□ INSPECT ERECTION AND FASTENING OF EXTERIOR CLADDING WEIGHING MORE THAN 5 PSF AND HIGHER THAN 30 FEET ABOVE GRADE OR WALKING SURFACE.	---	X	---	1705.12.5
□ INSPECT ERECTION AND FASTENING OF VENEER WEIGHING MORE THAN 5 PSF AND HIGHER THAN 30 FEET ABOVE GRADE OR WALKING SURFACE.	---	X		
□ INSPECT ERECTION AND FASTENING OF ALL EXTERIOR NON-BEARING WALLS HIGHER THAN 30 FEET ABOVE GRADE OR WALKING SURFACE.	---	X		
□ INSPECT ERECTION AND FASTENING OF ALL INTERIOR NON-BEARING WALLS WEIGHING MORE THAN 15 PSF AND HIGHER THAN 30 FEET ABOVE GRADE OR WALKING SURFACE.	---	X		
6. MECHANICAL, ELECTRICAL, AND PLUMBING COMPONENTS				
□ INSPECT ANCHORAGE OF ELECTRICAL EQUIPMENT FOR EMERGENCY OR STAND-BY POWER SYSTEMS.	---	X	---	1705.12.6
□ INSPECT ANCHORAGE OF NON-EMERGENCY ELECTRICAL EQUIPMENT.	---	X		
■ INSPECT INSTALLATION OF PIPING SYSTEMS AND ASSOCIATED MECHANICAL UNITS CARRYING FLAMMABLE, COMBUSTIBLE, OR HIGHLY TOXIC CONTENTS.	---	X		
□ INSPECT INSTALLATION OF HVAC DUCTWORK THAT CONTAINS HAZARDOUS MATERIALS.	---	X		
□ INSPECT INSTALLATION OF VIBRATION ISOLATION SYSTEMS WHERE REQUIRED BY SECTION 1705.12.6.5.	---	X		
■ INSPECT THE MECHANICAL AND ELECTRICAL EQUIPMENT, INCLUDING DUCT WORK, PIPING SYSTEMS, AND THEIR STRUCTURAL SUPPORTS, WHERE AUTOMATIC FIRE SPRINKLER SYSTEMS ARE INSTALLED. VERIFY MINIMUM AND NOMINAL CLEARANCE UNLESS FLEXIBLE SPRINKLER FITTINGS ARE USED.				
7. □ VERIFY THAT THE EQUIPMENT LABEL AND ANCHORAGE OR MOUNTING CONFORMS TO THE CERTIFICATE OF COMPLIANCE WHEN MECHANICAL AND ELECTRICAL EQUIPMENT MUST BE SEISMICALLY QUALIFIED.	---	---	---	1705.12.4
8. □ SEISMIC ISOLATION SYSTEM: INSPECTION OF ISOLATION SYSTEM PER ASCE 7 - SECTION 17.8.	---	X	---	1705.12.8
9. □ OBTAIN MILL CERTIFICATES FOR REINFORCING STEEL, VERIFY COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS, AND VERIFY STEEL SUPPLIED CORRESPONDS TO CERTIFICATE.	---	---	---	1704.5
10. □ STRUCTURAL STEEL: INVOKE THE QAP QUALITY ASSURANCE REQUIREMENTS IN AISC 341.	---	---	---	1705.13.1
11. □ OBTAIN CERTIFICATE THAT EQUIPMENT HAS BEEN SEISMICALLY QUALIFIED.	---	---	---	1704.5
12. □ OBTAIN SYSTEM TESTS AS REQUIRED BY ASCE 7 SECTION 17.8.	---	---	---	

SOIL

WS- 000000_N000A 180625. Q2

NOT USED

REQUIRED VERIFICATION AND INSPECTION OF SOIL

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ VERIFY MATERIALS BELOW FOOTINGS ARE ADEQUATE TO ACHIEVE THE DESIRED BEARING CAPACITY.	---	X	---	TABLE 1705.6
2. □ VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	---	X		
3. □ PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	---	X		
4. □ VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	---		
5. □ PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	---	X		

DEEP DRIVEN FOUNDATION ELEMENTS

WS- 000000_N000A 180625. Q2

REQUIRED VERIFICATION AND INSPECTION OF DEEP DRIVEN FOUNDATION ELEMENTS

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ VERIFY ELEMENT MATERIALS, SIZES AND LENGTHS COMPLY WITH THE REQUIREMENTS.	X	---	---	TABLE 1705.7
2. ■ DETERMINE CAPACITIES OF TEST ELEMENTS AND CONDUCT ADDITIONAL LOAD TESTS, AS REQUIRED.	X	---		
3. ■ OBSERVE DRIVING OPERATIONS AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ELEMENT.	X	---		
4. ■ VERIFY LOCATIONS OF PILES AND THEIR PLUMBNESS, CONFIRM TYPE AND SIZE OF HAMMER, RECORD NUMBER OF BLOWS PER FOOT OF PENETRATION, DETERMINE REQUIRED PENETRATIONS TO ACHIEVE DESIGN CAPACITY, RECORD TIP AND BUTT ELEVATIONS AND DOCUMENT ANY DAMAGE TO FOUNDATION ELEMENT.	X	---		
5. ■ FOR STEEL ELEMENTS, PERFORM ADDITIONAL INSPECTIONS IN ACCORDANCE WITH SECTION 1705.2.	---	---		
6. □ FOR CONCRETE ELEMENTS AND CONCRETE FILLED ELEMENTS, PERFORM ADDITIONAL INSPECTIONS IN ACCORDANCE WITH SECTION 1705.3.	---	---		
7. □ OTHER (I.E. SPECIALTY PILES)	---	---		

DEEP C.I.P. FOUNDATION ELEMENTS

WS- 000000_N000A 180625. Q2

NOT USED

REQUIRED VERIFICATION AND INSPECTION OF CAST-IN-PLACE DEEP FOUNDATION ELEMENTS

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ OBSERVE DRILLING OPERATIONS AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ELEMENT.	X	---	---	TABLE 1705.8
2. □ VERIFY PLACEMENT LOCATIONS AND PLUMBNESS, CONFIRM ELEMENT DIAMETERS, BELL DIAMETERS (IF APPLICABLE), LENGTHS, EMBEDMENT INTO BEDROCK (IF APPLICABLE), AND ADEQUATE END-BEARING STRATA CAPACITY. RECORD CONCRETE OR GROUT VOLUMES.	X	---		
3. □ FOR CONCRETE ELEMENTS, PERFORM ADDITIONAL INSPECTIONS IN ACCORDANCE WITH SECTION 1705.3.	---	---		

HELICAL PILE FOUNDATIONS

WS- 000000_N000A 180625. Q2

NOT USED

INSPECTION OF HELICAL PILE FOUNDATIONS

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. □ RECORD INSTALLATION EQUIPMENT USED, PILE DIMENSIONS, TIP ELEVATIONS, FINAL DEPTH, FINAL INSTALLATION TORQUE.	X	---	---	1705.9 1705.3

SPRAYED FIRE-RESISTANT MATERIALS

WS- 000000_N000A 180625. Q2

NOT USED

INSPECTION OF SPRAYED FIRE-RESISTANT MATERIALS

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
PHYSICAL AND VISUAL TESTS				
1. CONDITION OF SUBSTRATES:				
■ INSPECT SURFACE FOR ACCORDANCE WITH THE APPROVED FIRE-RESISTANCE DESIGN AND THE APPROVED MANUFACTURER'S WRITTEN INSTRUCTIONS.	---	---		1705.14.2
□ VERIFY MINIMUM AMBIENT TEMPERATURE BEFORE AND AFTER APPLICATION.				1705.14.3
□ VERIFY VENTILATION OF AREA DURING AND AFTER APPLICATION.	---	X		1705.14.3
2. □ MEASURE AVERAGE THICKNESS.	---	---	ASTM E605	1705.14.4
3. □ VERIFY DENSITY OF MATERIAL FOR CONFORMANCE WITH THE APPROVED FIRE-RESISTANT DESIGN.	---	---	ASTM E605	1705.14.5
4. □ TEST COHESIVE/ADHESIVE BOND STRENGTH.	---	---		1705.14.6
5. □ CONDITION OF FINISHED APPLICATION.				1705.14.1

MISCELLANEOUS FIRE

WS- 000000_N000A 180625. Q2

NOT USED

VERIFICATION AND INSPECTION OF MISCELLANEOUS (FIRE)

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. □ MASTIC AND INTUMESCENT FIRE RESISTANT COATING.	---	---	---	1705.15
2. □ EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS). WATER-RESISTIVE BARRIER COATING WHEN INSTALLED OVER A SHEATHING SUBSTRATE.	---	---	---	1705.16
3. □ FIRE RESISTANT PENETRATIONS AND JOINTS.	--- ---	--- ---	--- ---	1705.17
4. □ SMOKE CONTROL SYSTEM.	---	---		1705.18

CONCRETE

WS- 000000_N000A 200615. Q2

INSPECTION OF CONCRETE

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ INSPECTION OF REINFORCING STEEL, INCLUDING PRESTRESSING TENDONS AND PLACEMENT.	---	X	ACI 318, CH 20, 25.2, 25.3, 26.6.6.1-26.6.3	1908.4
2. □ INSPECTION OF REINFORCING STEEL WELDING IN ACCORDANCE WITH TABLE 1705.3.	---	x	AWS D1.4 ACI 318 26.6.4	---
3. ■ INSPECTION OF BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO AND DURING PLACEMENT OF CONCRETE	---	X	ACI 318 17.8.2	
4. □ INSPECTION OF ANCHORS INSTALLED IN HARDENED CONCRETE.	X	---	ACI 318 17.8.2.4, 17.8.2	
5. ■ VERIFYING USE OF REQUIRED DESIGN MIX.	---	X	ACI 318 CH19 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. ■ AT TIME FRESH CONCRETE IS SAMPLED TO FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	---	ASTM C 172 ASTM C 31 ACI 318 26.5, 26.12	1908.10
7. ■ INSPECTION OF CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	---	ACI 318 26.5	1908.6, 1908.7, 1908.8
8. ■ INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	---	X	ACI 318 26.5.3-26.5.5	1908.9
9. INSPECTION OF PRESTRESSED CONCRETE:				
□ APPLICATION OF PRESTRESSING FORCES.	X	---	ACI 318 26.10	---
□ GROUTING OF BONDED PRESTRESSING TENDONS IN THE SEISMIC FORCE-RESISTING SYSTEM.	X	---	ACI 318 26.10	
10. □ ERECTION OF PRECAST CONCRETE MEMBERS.	---	X	ACI 318 26.9	---
11 □ VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POSTTENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	---	X	ACI 318 26.11.2	---
12. ■ INSPECT FORMWORK FOR SHAPE, LOCATION, AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	---	X	ACI 318 26.11.1.2(b)	---

MASONRY

WS- 000000_N000A 200615. Q2

NOT USED

INSPECTION OF LEVEL 2 MASONRY

INSPECTION TASK	C[a]	P[a]	TMS 402	TMS 602
1. AS MASONRY CONSTRUCTION BEGINS, VERIFY THE FOLLOWING ARE IN COMPLIANCE:				
■ PROPORTIONS OF SITE-PREPARED MORTAR.	X	---		ART 2.1, 2.6 A, & 2.6 C
□ GRADE AND SIZE OF PRESTRESSING TENDONS AND ANCHORAGES.	X	---		ART. 2.4 B, 2.4 H
■ GRADE, TYPE, AND SIZE OF REINFORCEMENT, CONNECTORS, ANCHOR BOLTS, AND PRESTRESSING TENDONS AND ANCHORAGES.			SEC 6.1	ART 3.4 & 3.6 C
□ PRESTRESSING TECHNIQUE.	X	---	---	ART 3.6 B
□ PROPERTIES OF THIN-BED MORTAR FOR AAC MASONRY	X[b]	X[c]	---	ART 2.1 C.1
■ SAMPLE PANEL CONSTRUCTION	X	---	---	ART 1.6 D
2. PRIOR TO GROUTING, VERIFY THE FOLLOWING ARE IN COMPLIANCE:				
■ GROUT SPACE	X	---	---	ART 3.2 D & 3.2 F
□ PLACEMENT OF PRESTRESSING TENDONS & ANCHORAGE	X	---	SEC 10.8 & 10.9	ART 2.4 & 3.6
■ PLACEMENT OF REINFORCEMENT, CONNECTORS AND ANCHOR BOLTS.	X	---	SEC 6.1, 6.3.1, 6.3.6, & 6.3.7	ART 3.2 E & 3.4
□ PROPORTIONS OF SITE-PREPARED GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS.	X	---	---	ART 2.6 B & 2.4 G.1.b
3. VERIFY THE COMPLIANCE OF THE FOLLOWING DURING CONSTRUCTION:				
■ MATERIALS AND PROCEDURES WITH THE APPROVED SUBMITTALS	X	---	---	ART 1.5
■ PLACEMENT OF MASONRY UNITS AND MORTAR JOINT CONSTRUCTION	X	---	---	ART 3.3 B
■ SIZE AND LOCATION OF STRUCTURAL MEMBERS.	X	---	---	ART 3.3 F
■ TYPE, SIZE, AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION.			SEC 1.2.2 (e) 1.16.1	---
■ WELDING OF REINFORCING.			SEC 6.1.6.1.2	---
■ PREPARATION, CONSTRUCTION, AND PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40 DEGREES F (4.4 DEG C)) OR HOT WEATHER (TEMPERATURE ABOVE 90 DEGREES F(32.2 DEG C)).	X	---	---	ART. 1.8 C, 1.8 D
□ APPLICATION AND MEASUREMENT OF PRESTRESSING FORCE.	---	X	---	ART 3.6 B
□ PLACEMENT OF GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS IS IN COMPLIANCE.	---	X	---	ART 3.5, 3.6C
□ PLACEMENT OF AAC MASONRY UNITS AND CONSTRUCTION OF THIN-BED MORTAR JOINTS.	X[b]	X[c]	---	ART 3.3B.9 & 3.3 G.1.b
4. □ OBSERVE PREPARATION OF GROUT SPECIMENS, MORTAR SPECIMENS, AND/OR PRISMS	X	---	---	ART 1.4 B.2.a.3, 1.4 B.2.b.3 1.4 B.2.c.3 1.4 B.3, & 1.4 B.4

VERIFICATION AND INSPECTION	C[a]	P[a]	TMS 402	TMS 602
1. ■ COMPLIANCE WITH REQUIRED INSPECTION PROVISIONS OF THE CONSTRUCTION DOCUMENTS AND THE APPROVED SUBMITTALS SHALL BE VERIFIED.	X	---	---	ART. 1.5
2. ■ VERIFICATION OF F'M AND F'AAC PRIOR TO CONSTRUCTION EXCEPT WHERE SPECIFICALLY EXEMPTED BY THIS CODE.	X	---	---	ART. 1.4B
3. ■ VERIFICATION OF SLUMP FLOW AND VSI AS DELIVERED TO THE SITE FOR SELF CONSOLIDATING GROUT.	---	X	---	ART. 1.5B.1.B.3

NOTES:
a. FREQUENCY REFERS TO THE FREQUENCY OF INSPECTION, WHICH MAY BE CONTINUOUS DURING THE LISTED TASK OR PERIODICALLY DURING THE LISTED TASK, AS DEFINED IN THE TABLE. NR = NOT REQUIRED, P = PERIODIC, C = CONTINUOUS
b. REQUIRED FOR THE FIRST 5000 SQUARE FEET OF AAC MASONRY.
c. REQUIRED AFTER THE FIRST 5000 SQUARE FEET OF AAC MASONRY.

STEEL

WS- 000000_N000A 180625. Q2

INSPECTION OF STEEL

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS.				
■ IDENTIFICATION MARKING TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	---	X	AISC 360: A3.3 AND APPLICABLE ASTM MATERIAL STANDARDS	1705.2.1
□ INSPECT FABRICATOR'S FABRICATION AND QUALITY CONTROL PROCEDURES.	---	X	AISC 360: N5	---
2. INSPECTION OF HIGH-STRENGTH BOLTING:				
■ SNUG-TIGHT JOINTS.	---	X	AISC 360: M2.5, N5	1705.2.1
■ PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITH MATCHMARKING, TWIST-OFF BOLT OR DIRECT TENSION INDICATOR METHODS OF INSTALLATION.	---	X		
□ PRETENSIONED AND SLIP-CRITICAL JOINTS USING TURN-OF-NUT WITHOUT MATCHMARKING OR CALIBRATED WRENCH METHODS OF INSTALLATION.	---	X		
3. MATERIAL VERIFICATION OF STRUCTURAL STEEL AND COLD-FORMED STEEL DECK.				
■ FOR STRUCTURAL STEEL, IDENTIFICATION MARKINGS TO CONFORM TO AISC 360.	---	X	AISC 360: A3.1	1705.2.2
■ FOR OTHER STEEL, IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS.	---	X	APPLICABLE ASTM MATERIAL STANDARDS	
□ MANUFACTURER'S CERTIFIED TEST REPORTS.	---	X		
4. MATERIAL VERIFICATION OF WELD FILLER MATERIALS:				
■ IDENTIFICATION MARKING TO CONFORM TO AWS SPECIFICATION IN THE APPROVED CONSTRUCTION DOCUMENTS.	---	X	AISC 360: A3.5 AND APPLICABLE AWS A5 DOCUMENTS	---
■ MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED.	---	X	---	---
5. INSPECTION OF WELDING:				
A. STRUCTURAL STEEL AND COLD-FORMED STEEL DECK:				
■ COMPLETE AND PARTIAL JOINT PENETRATION GROOVE WELDS.	X	---	AWS D1.1 AWS D1.8	
■ MULTIPASS FILLET WELDS.	X	---		
■ SINGLE-PASS FILLET WELDS > 5/16"	X	---		
■ PLUG AND SLOT WELDS.	X	---		
■ SINGLE-PASS FILLET WELDS <= 5/16"	---	X		
■ FLOOR AND ROOF DECK WELDS.	---	X	AWS D1.3	
B. REINFORCING STEEL				
□ VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A 706	---	X	AWS D1.4 AND ACI 318-14:26.6.4.1. 18.2.5.25.5.7.4	1705.3.1
□ REINFORCING STEEL RESISTING FLEXURAL AND AXIAL FORCES IN INTERMEDIATE AND SPECIAL MOMENT FRAMES, AND BOUNDARY ELEMENTS OF SPECIAL STRUCTURAL WALLS OF CONCRETE AND SHEAR REINFORCEMENT.	X	---		
□ SHEAR REINFORCEMENT.	X	---		
□ OTHER REINFORCING STEEL.	---	X		
6. INSPECTION OF STEEL FRAME JOINT DETAILS FOR COMPLIANCE:				
□ DETAILS SUCH AS BRACING AND STIFFENING.	---	X	AISC 360: 16.2	1705.2.1
□ MEMBER LOCATIONS.	---	X		
□ APPLICATION OF JOINT DETAILS AT EACH CONNECTION.	---	X		

WELDING

WS- 000000_N000A 180625. Q2

INSPECTION OF WELDING

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ WELDED STUDS WHEN USED FOR STRUCTURAL DIAPHRAGMS.	---	X	AWS D1.4	---
2. ■ WELDING OF COLD-FORMED STEEL FRAMING MEMBERS.	---	X		
3. ■ WELDING OF STAIRS AND RAILING SYSTEMS.	---	X		

WOOD

WS- 000000_N000A Q1

INSPECTION OF WOOD

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ INSPECT PREFABRICATED WOOD STRUCTURAL ELEMENTS AND ASSEMBLIES IN ACCORDANCE WITH SECTION 1704.2.5	---	---	---	1705.5
2. □ INSPECT SITE BUILT ASSEMBLIES.	---	---		
3. INSPECT HIGH-LOAD DIAPHRAGMS:				
□ VERIFY GRADE AND THICKNESS OF SHEATHING.	---	X	---	1705.5.1
□ VERIFY NOMINAL SIZE OF FRAMING MEMBERS AT ADJOINING PANEL EDGES.	---	X		
□ VERIFY NAIL OR STAPLE DIAMETER AND LENGTH.	---	X		
□ VERIFY NUMBER OF FASTENER LINES.	---	X		
□ VERIFY SPACING BETWEEN FASTENERS IN EACH LINE AND AT EDGE MARGINS.	---	---		
4. □ METAL-PLATE-CONNECTED WOOD TRUSSES SPANNING 60 FEET OR GREATER: VERIFY TEMPORARY INSTALLATION RESTRAINT/BRACING AND THE PERMANENT INDIVIDUAL TRUSS MEMBER BRACING ARE INSTALLED IN ACCORDANCE WITH THE APPROVED TRUSS SUBMITTAL PACKAGE.	---	X	---	1705.5.2

MISCELLANEOUS

WS- 000000_N000A Q1

NOT USED

MISCELLANEOUS

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
5. SEISMIC RESISTANCE				
□ SUSPENDED CEILING SYSTEMS AND THEIR ANCHORAGE.	---	---	---	1705.13.2
6. WIND RESISTANCE				
□ ROOF CLADDING AND ROOF FRAMING CONNECTIONS.	---	---	---	
□ WALL CONNECTIONS TO ROOF AND FLOOR DIAPHRAGMS AND FRAMING.			---	
□ ROOF AND FLOOR DIAPHRAGM SYSTEMS, INCLUDING COLLECTORS, DRAG STRUTS AND BOUNDARY ELEMENTS.	---	---	---	
□ VERTICAL WIND-FORCE-RESISTING SYSTEMS, INCLUDING BRACED FRAMES, MOMENT FRAMES, AND SHEAR WALLS.	---	---	---	
□ WIND-FORCE-RESISTING SYSTEM CONNECTIONS TO THE FOUNDATION.	---	---	---	
□ FABRICATION AND INSTALLATION OF SYSTEMS OR COMPONENTS REQUIRED TO MEET THE IMPACT RESISTANCE REQUIREMENTS OF SECTION 1609.1.2.	---	---	---	

FABRICATORS

WS- 000000_N000A Q1

INSPECTION OF FABRICATORS

VERIFICATION AND INSPECTION	C	P	REFERENCED STANDARD	CBC REFERENCE
1. ■ INSPECT FABRICATOR'S FABRICATION AND QUALITY CONTROL PROCEDURES.	---	---	---	1704.2.5

STATEMENT OF SPECIAL INSPECTIONS

WS- 000000_N000A 180625. Q1

1. SPECIAL INSPECTIONS AND TESTING WILL BE PERFORMED IN ACCORDANCE WITH THE APPROVED PLANS AND SPECIFICATIONS, THIS STATEMENT AND CBC SECTIONS 1704, 1705, 1706, 1707, AND 1708. INTERIM REPORTS WILL BE SUBMITTED TO THE BUILDING OFFICIAL AND THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE IN ACCORDANCE WITH CBC SECTION 1704.1.2.
2. A FINAL REPORT OF SPECIAL INSPECTIONS DOCUMENTING REQUIRED SPECIAL INSPECTIONS, TESTING AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED PRIOR TO ISSUANCE OF A CERTIFICATE OF USE AND OCCUPANCY (SECTION 1704.1.2). THE FINAL REPORT WILL DOCUMENT:
   - REQUIRED SPECIAL INSPECTIONS.
   - CORRECTION OF DISCREPANCIES NOTED IN INSPECTIONS.
3. THE OWNER RECOGNIZES HIS OR HER OBLIGATION TO ENSURE THAT THE CONSTRUCTION COMPLIES WITH THE APPROVED PERMIT DOCUMENTS AND TO IMPLEMENT THIS PROGRAM OF SPECIAL INSPECTIONS. IN PARTIAL FULFILLMENT OF THESE OBLIGATIONS, THE OWNER WILL RETAIN AND DIRECTLY PAY FOR THE SPECIAL INSPECTIONS AS REQUIRED IN CBC SECTION 1704.1.
4. THIS PLAN HAS BEEN PREPARED BY THE REGISTERED DESIGN PROFESSIONAL IN CHARGE AND DEVELOPED WITH THE UNDERSTANDING THAT THE BUILDING OFFICIAL WILL:
   - REVIEW AND APPROVE THE QUALIFICATIONS OF THE SPECIAL INSPECTORS WHO WILL PERFORM THE INSPECTIONS.
   - MONITOR SPECIAL INSPECTION ACTIVITIES ON THE JOB SITE TO ASSURE THAT THE SPECIAL INSPECTORS ARE QUALIFIED AND ARE PERFORMING THEIR DUTIES AS CALLED FOR IN THIS STATEMENT OF SPECIAL INSPECTION.
   - REVIEW SUBMITTED INSPECTION REPORTS.
5. PERFORM INSPECTIONS AS REQUIRED BY THE LOCAL BUILDING CODE
6. VERIFICATION AND INSPECTION CRITERIA FOR ITEMS NOTED ON THIS SHEET WITH FILLED-IN CHECK BOXES SHALL BE REQUIRED.
7. TERMINOLOGY USED FOR VERIFICATION AND INSPECTION CRITERIA SHALL INCLUDE:
   C INDICATES CONTINUOUS INSPECTION
   P INDICATES PERIODIC INSPECTION
   X PLACED IN BOX INDICATES EITHER CONTINUOUS OR PERIODIC INSPECTION IS REQUIRED.
   --- PLACED IN A BOX INDICATES AN ACTIVITY THAT IS EITHER A ONE-TIME ACTIVITY OR ONE WHOSE FREQUENCY IS DEFINED IN SOME OTHER MANNER.

STRUCTURAL TESTING & INSPECTION

S- 014500_N002A 170125. Q2

1. SPECIAL INSPECTION IS DEFINED AS THE INSPECTION OF THE MATERIALS, INSTALLATION, FABRICATION, ERECTION OR PLACEMENT OF COMPONENTS AND CONNECTIONS REQUIRING SPECIAL EXPERTISE TO ENSURE COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS AND REFERENCED STANDARDS.
2. THE OWNER SHALL EMPLOY ONE OR MORE SPECIAL INSPECTORS TO PERFORM INSPECTIONS DURING CONSTRUCTION ON THE TYPES OF WORK MARKED IN THE LIST BELOW IN CONFORMANCE WITH THE ENFORCEMENT AGENCY REGULATORY REQUIREMENTS. THESE INSPECTIONS ARE IN ADDITION TO THE INSPECTIONS REQUIRED BY THE ENFORCEMENT AGENCY.
   A. TESTING
      - □ COMPACTED FILL
      - ■ CONCRETE
      - □ MASONRY
      - □ MORTAR & GROUT
      - ■ EXPANSION, EPOXY, SCREW ANCHORS
      - □ SHOT-IN ANCHORS

   B. SPECIAL INSPECTIONS
      - □ EXCAVATION, GRADING & FILLING FOR ALL FOUNDATION WORK
      - ■ PILE DRIVING & TESTING
      - ■ PLACEMENT OF CONCRETE & REINFORCEMENT
      - □ PLACEMENT OF MASONRY & REINFORCEMENT & DURING GROUTING OPERATIONS
      - ■ SHOP WELDS NOT DONE IN FABRICATOR'S SHOP REGISTERED & APPROVED BY THE BUILDING OFFICIAL
      - ■ FIELD WELDING
      - ■ HIGH-STRENGTH BOLTING
      - ■ EXPANSION, EPOXY, SCREW ANCHORS
      - □ SPRAY-APPLIED FIRE PROOFING
      - □ SHOTCRETE
      - □ GLU-LAM FABRICATION
      - □ I-JOIST FABRICATION
      - □ WELDED SHEAR STUDS
3. THE SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE ENFORCEMENT AGENCY AND THE ARCHITECT/STRUCTURAL ENGINEER, FOR THE INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.
4. SPECIAL INSPECTORS SHALL KEEP RECORDS OF INSPECTIONS. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE ENFORCEMENT AGENCY, OWNER, CONTRACTOR AND ARCHITECT/STRUCTURAL ENGINEER. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS OR WAS NOT COMPLETED IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS.
5. DISCREPANCIES IN THE INSPECTED WORK SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THEY ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENFORCEMENT AGENCY, OWNER, CONTRACTOR AND ARCHITECT/STRUCTURAL ENGINEER PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK.
6. A FINAL REPORT DOCUMENTING REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED TO THE ENFORCEMENT AGENCY, OWNER, CONTRACTOR AND ARCHITECT/STRUCTURAL ENGINEER AT THE COMPLETION OF THE WORK INCLUDED IN THE CONSTRUCTION DOCUMENTS.
7. SCHEDULE AND COORDINATE ALL STRUCTURAL TESTS AND SPECIAL INSPECTIONS. NOTIFY THE SPECIAL INSPECTOR 48 HOURS MINIMUM PRIOR TO PERFORMING ANY WORK REQUIRING THE SPECIAL INSPECTOR'S PRESENCE. COORDINATE WITH THE SPECIAL INSPECTOR SO THAT THE WORK REQUIRING THE TESTS AND INSPECTIONS NOTED ABOVE IS ACCESSIBLE AND EXPOSED FOR TESTING AND INSPECTION PURPOSES. REMOVE AND/OR REPLACE MATERIALS AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER TO ALLOW TESTS AND INSPECTIONS.

STRUCTURAL OBSERVATION

S- 014500_N001A 170125. Q2

1. STRUCTURAL OBSERVATION IS THE VISUAL OBSERVATION OF THE STRUCTURAL SYSTEM BY THE STRUCTURAL OBSERVER (THE STRUCTURAL ENGINEER OR OWNER'S DESIGNATED REPRESENTATIVE) FOR GENERAL CONFORMANCE TO THE ENFORCEMENT AGENCY APPROVED CONSTRUCTION DOCUMENTS AT SIGNIFICANT CONSTRUCTION STAGES AND AT COMPLETION OF THE STRUCTURAL SYSTEM.
2. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR THE INSPECTIONS REQUIRED BY THE ENFORCEMENT AGENCY OR BY OTHER SECTIONS OF THE BUILDING CODE. REQUIRED INSPECTIONS DO NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR STRUCTURAL OBSERVATION.
3. STRUCTURAL OBSERVATION DOES NOT INCLUDE THE SUPERVISION OF CONSTRUCTION FOR PROPER EXECUTION OF THE WORK SHOWN IN THE CONSTRUCTION DOCUMENTS.
4. THE FOLLOWING COMPLETED CONSTRUCTION STAGES MARKED ARE SUBJECT TO STRUCTURAL OBSERVATION IF DEEMED NECESSARY DURING CONSTRUCTION BY THE STRUCTURAL OBSERVER:
   - □ FOUNDATION EXCAVATIONS AND REINFORCEMENT PRIOR TO CONCRETE PLACEMENT
   - □ FORMWORK CONSTRUCTION AND REINFORCEMENT PRIOR TO CONCRETE PLACEMENT
   - □ CONCRETE TILT-UP PANEL INSTALLATION
   - □ CONCRETE PRE-CAST ELEMENT PANEL INSTALLATION
   - □ MASONRY INSTALLATION AND REINFORCEMENT PRIOR TO GROUT PLACEMENT
   - ■ STEEL FRAMING ERECTION
   - ■ STEEL DECK INSTALLATION AND REINFORCEMENT PRIOR TO CONCRETE FILL PLACEMENT
   - □ STEEL DECK INSTALLATION ON FRAMING
   - □ WOOD FRAMING ERECTION
   - ■ WOOD STRUCTURAL PANEL INSTALLATION ON FRAMING
   - ■ WOOD HARDWARE AND CONNECTOR INSTALLATION ON STRUCTURAL FRAMING
   - □ COLD-FORMED STEEL FRAMING ERECTION
   - ■ PRE-FABRICATED STRUCTURAL ELEMENT INSTALLATION
   - ■ PRIOR TO THE CLOSING OF ANY PHASE
   - ■ STRUCTURAL SYSTEM COMPLETION
5. NOTIFY THE STRUCTURAL OBSERVER 48 HOURS MINIMUM IN ADVANCE OF THE COMPLETION OF THE ABOVE CONSTRUCTION STAGES TO FACILITATE STRUCTURAL OBSERVATIONS BY THE STRUCTURAL OBSERVER. COORDINATE WITH THE STRUCTURAL OBSERVER SO THAT THE WORK FOR THE CONSTRUCTION STAGES NOTED ABOVE IS ACCESSIBLE AND EXPOSED FOR STRUCTURAL OBSERVATION PURPOSES. REMOVE AND/OR REPLACE MATERIALS AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER TO ALLOW STRUCTURAL OBSERVATION.
6. DEVIATIONS FROM THE CONSTRUCTION DOCUMENTS NOTED DURING STRUCTURAL OBSERVATIONS SHALL BE CORRECTED AT NO ADDITIONAL COST TO THE OWNER.
7. PROVIDE OWNER REIMBURSEMENT FOR DESIGN PROFESSIONAL COSTS INCURRED TO CORRECT DEVIATIONS AND TO MAKE REVISIONS TO THE CONSTRUCTION DOCUMENTS, INCLUDING OBTAINMENT OF ENFORCEMENT AGENCY APPROVAL AS REQUIRED.
8. CORRECTIVE WORK SHALL COMPLY WITH THE REQUIREMENTS OF THE ENFORCEMENT AGENCY APPROVED CONSTRUCTION DOCUMENTS AND THE BUILDING CODE.
9. AT THE COMPLETION OF THE WORK INCLUDED IN THE CONSTRUCTION DOCUMENTS, THE STRUCTURAL OBSERVER SHALL SUBMIT TO THE ENFORCEMENT AGENCY A WRITTEN STATEMENT THAT THE STRUCTURAL OBSERVATIONS HAVE BEEN MADE AND IDENTIFY ANY REPORTED DEFICIENCIES THAT, TO THE BEST OF THE STRUCTURAL OBSERVER'S KNOWLEDGE, HAVE NOT BEEN RESOLVED.

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CONSULTANT

SEAL

REGISTERED PROFESSIONAL ENGINEER KERRY ... No. S3737 STRUCTURAL STATE OF CALIFORNIA

FOR REVIEW ONLY, NOT FOR CONSTRUCTION

PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST,
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
TESTING & INSPECTION, STATEMENT OF SPECIAL INSPECTIONS, & STRUCTURAL OBSERVATION

SHEET
S-003

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STRUCTURAL STEEL

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1. THE DESIGN, FABRICATION AND ERECTION OF STEEL SHALL BE IN ACCORDANCE WITH AISC 360 AND AISC 341 INCLUDING ANY ENFORCEMENT AGENCY AMENDMENTS.

2. STEEL MATERIALS SHALL CONFORM TO THE FOLLOWING, UNO:

STEEL PRODUCT	ASTM SPECIFICATION, UNO	COMMENTS
W & WT SHAPES	A992, GRADE 50	Fy = 50ksi
HP SHAPES	A572, GRADE 50	Fy = 50ksi
M, MT, S & ST SHAPES	A572, GRADE 50	Fy = 50ksi
CHANNELS (C & MC)	A992, GRADE 50	Fy = 50ksi
ANGLES	A572, GRADE 50	Fy = 50ksi
PLATES & BARS	A36,TYP, UNO	Fy = 36ksi
	A572, GRADE 50	Fy = 50ksi
RODS, PLAIN & ALL-THREADED	A36	Fy = 36ksi
RAISED-PATTERN FLOOR PLATE	A786, MEETING ASTM A36	Fy = 36ksi
PIPES	A53, GRADE B	Fy = 35ksi
ROUND HSS	A500, GRADE C	Fy = 50ksi
RECTANGULAR & SQUARE HSS	A500, GRADE C	Fy = 50ksi
HIGH-STRENGTH BOLTS	F3125, GRADE A325, TYPE 1	Fu = 120ksi
TWIST-OFF-TYPE TENSION-CONTROL BOLTS	F3125, GRADE F1852, TYPE I	Fu = 120ksi
BOLTS	A307, GRADE A, HEX	Fu = 60ksi
WASHERS	F844	
PLATE WASHERS	A36	Fy = 36ksi
HARDENED WASHERS	F436, TYPE I	
DIRECT-TENSION INDICATOR WASHERS	F959, TYPE 325	
NUTS FOR HS & TENSION CONTROL BOLTS	A563, GRADE C, HEAVY HEX GRADE DH IF GALVANIZED	
NUTS FOR BOLTS & RODS	A563, HEAVY HEX, GRADE A TYP, UNO GRADE DH IF GALVANIZED GRADE DH W/ F1554 GRADE 105 BOLTS	
ANCHOR BOLTS & RODS (HEADED OR THREADED & NUTTED)	F1554, CLASS 2A, S3 GRADE 36 TYP, UNO	Fy = 36ksi
	GRADE 55, S1 & S4	Fy = 55ksi
	GRADE 105, S4 & S5	Fy = 105ksi
WELDED HEADED STUDS, SHEAR STUDS, & WELDED THREADED STUDS	A108, GRADES 1010 - 1020	
DEFORMED BAR ANCHORS	A496	Fy = 75ksi
WELD FILLER METAL	AWS D1.1	Fy = 70ksi
TURNBUCKLES	F1145 & AISI C-1035	
CLEVISES, CLEVIS PINS, COTTER PINS	A668, AISI C-1035	
EYENUTS & EYEBOLTS	AISI C-1030	
SLEEVE NUTS	AISI C-1018, GRADE 2	
RECESSED NUTS & PINS	A36	
COUPLING NUTS	AISI 12L14 CARBON STEEL	

3. FABRICATE ALL PIECES FOR TIGHT FIT. MILLING OF BEARING SURFACES IS NOT REQUIRED UNLESS SPECIFICALLY NOTED. PROVIDE SMALLEST POSSIBLE WELD ACCESS HOLES WHEN THEY ARE REQUIRED.

4. EXPOSED INTERIOR STEEL SHALL RECEIVE ONE COAT OF PRIMER PAINT, UNO. DO NOT PAINT SURFACES IN DIRECT CONTACT WITH CONCRETE OR MASONRY, WHERE FIELD WELDING IS REQUIRED, WHERE FIRE-PROOFING IS REQUIRED OR CONTACT SURFACES OF STEEL-TO-STEEL, AND DECK-TO-STEEL CONNECTIONS. CONCEALED STEEL DOES NOT REQUIRE PAINT, UNO.

5. EXPOSED EXTERIOR STEEL AND FASTENERS SHALL BE HOT-DIP GALVANIZED PER ASTM A123, UNO. FABRICATE HOT-DIP GALVANIZED STEEL ELEMENTS PER ASTM A384 AND A385. BEAM COPES AND WELD ACCESS HOLES IN SHAPES THAT ARE TO BE GALVANIZED SHALL BE GROUND TO BRIGHT METAL. REPAIR DAMAGED OR REMOVED AREAS OF HOT-DIP GALVANIZED COATINGS PER ASTM A780. PROVIDE FILL AND VENT HOLES AT ENCLOSED SPACES OF HOLLOW PIECES. SEAL HOLES WATER-TIGHT AFTER GALVANIZING. PROVIDE DRAIN HOLES AS REQUIRED AT SOLID PIECES. HOLE SIZES AND LOCATIONS SHALL NOT DETRIMENTALLY AFFECT THE PIECES STRUCTURAL CAPACITY AND ARE SUBJECT TO THE STRUCTURAL ENGINEERS REVIEW.

6. WHEN WATER CAN COLLECT INSIDE INTERIOR HOLLOW STEEL PIECES DURING CONSTRUCTION, PROVIDE DRAIN HOLES AT THE BASE OF EACH PIECE. EXPOSED EXTERIOR HOLLOW STEEL PIECES SHALL HAVE 1/4" MINIMUM CAP PLATES AT ALL OPENINGS AND BE SEAL WELDED ALL AROUND. WHEN WATER CAN COLLECT ON EXPOSED EXTERIOR STEEL PIECES WITH HORIZONTAL SURFACES, THE MEMBER SHALL BE PROVIDED WITH DRAIN HOLES ALLOWING WATER TO DRAIN TO AND OUT AT THE LOWEST POINT OF THE MEMBER.

7. EXPOSED STRUCTURAL STEEL MEMBERS AND CONNECTIONS VISIBLE TO THE PUBLIC AND BUILDING OCCUPANTS (OTHER THAN MAINTENANCE AREAS) SHALL MEET THE FOLLOWING CRITERIA:

   A. FABRICATION, HANDLING, AND SHIPPING SHALL EMPLOY SPECIAL CARE TO ENSURE ACCEPTABLE FINISHED APPEARANCE.
   B. WELDS SHALL BE GROUND SMOOTH. GROOVE WELDS SHALL BE MADE FLUSH (+ 1/16", -0"). OVERSIZE WELDS AS REQUIRED.
   C. FIELD-WELDING AIDS AND ERECTION AIDS SHALL BE REMOVED AND STEEL SHALL BE REPAIRED AND GROUND SMOOTH.
   D. SHOP PIECE MARKS AND MILL MARKS SHALL BE LOCATED SUCH THAT THEY ARE FULLY HIDDEN IN THE FINAL STRUCTURE OR ARE MADE WITH SUCH MEDIA TO PERMIT FULL REMOVAL AFTER ERECTION.
   E. GRIND EDGES OF SHEARED, PUNCHED OR FLAME CUT STEEL IN AREAS WITHIN REACH TO TOUCH BY THE PUBLIC AND BUILDING OCCUPANTS.
   F. ALIGN AND ORIENT BOLTED CONNECTIONS TO BE UNIFORM AND CONSISTENT.

8. PROVIDE CONCRETE / MASONRY COVER AT STEEL BELOW GRADE. STEEL EMBEDDED IN CONCRETE CAST AGAINST EARTH SHALL HAVE 3" MIN COVER. STEEL EMBEDDED IN FORMED CONCRETE OR MASONRY SHALL HAVE 2" MIN COVER.

9. WELDING MATERIALS & PROCEDURES SHALL CONFORM WITH AWS D1.1. AND AWS D1.8 WHERE APPLICABLE. FABRICATE ALL STEEL MEMBERS AND PIECES SUCH THAT WELD FIT-UP COMPLIES WITH THE AWS REQUIREMENTS FOR GEOMETRY AND DIMENSIONAL LIMITATIONS.

10. FABRICATE FILLET WELDS WITH EQUAL LEG SIZES UNO. SIZE OF FILLET WELDS NOTED ON CONSTRUCTION DOCUMENTS IS THE MINIMUM LEG DIMENSION. SINGLE PASS WELDS SHALL BE USED FOR ALL FILLET WELDS 5/16" AND SMALLER. MINIMUM SIZE OF FILLET WELDS SHALL BE (MATERIAL THICKNESS IS FOR THINNER PART JOINED): 1/8" FOR MATERIAL 1/8" TO 1/4" THICK, 3/16" FOR MATERIAL OVER 1/4" TO 1/2" THICK, 1/4" FOR MATERIAL OVER 1/2" TO 3/4" THICK, AND 5/16" FOR MATERIAL OVER 3/4" THICK. MINIMUM EFFECTIVE LENGTH OF FILLET WELDS SHALL BE NOT LESS THAN FOUR TIMES THE FILLET SIZE. MINIMUM EFFECTIVE LENGTH OF INTERMITTENT FILLET WELDS SHALL BE 1 1/2". TERMINATE FILLET WELDS A DIMENSION EQUAL TO THE WELD LEG SIZE FROM THE END OF THE BASE METAL.

11. GROOVE WELDS SHALL BE COMPLETE JOINT PENETRATION WELDS, UNO. GROOVE WELDS SHALL BE TERMINATED AT THE END OF JOINTS IN A MANNER THAT WILL ENSURE SOUND WELDS. USE WELD TABS AND BACKING BARS ALIGNED TO PROVIDE AN EXTENSION OF THE JOINT PREPARATION. REMOVE EXTENSIONS UPON COMPLETION & COOLING OF THE WELD. GRIND ENDS OF THE WELD SMOOTH AND FLUSH WITH THE EDGES OF THE ABUTTING PARTS.

12. WHERE "ALL AROUND" FILLET WELDS ARE INDICATED AT CONCEALED/NON-EXPOSED SQUARE OR RECTANGULAR HSS CONNECTIONS TO PLATES, FILLET WELDS ARE NOT REQUIRED AT RADIUSED CORNERS , UNO.

13. BOLTS FOR STEEL-TO-STEEL CONNECTIONS SHALL BE PLACED IN STANDARD SIZE HOLES, TYP UNO. BOLTS FOR STEEL-TO-CONCRETE/MASONRY CONNECTIONS SHALL BE PLACED IN ANCHOR ROD HOLES, TYP UNO. USE STANDARD AISC PITCH & GAGE FOR BOLTED CONNECTIONS, UNO.

14. BOLTS AND RODS SHALL BE CUT-THREAD TYPE WITH FULL DIAMETER BODY STYLE MEETING REQUIREMENTS OF ASME B18.2.1. THE BODY DIAMETER SHALL NOT BE LESS THAN THE MINIMUM MAJOR DIAMETER WHEN THREADS ARE CUT. REDUCED DIAMETER BODY STYLE ROLLED THREAD BOLTS OR RODS ARE NOT PERMITTED.

15. STEEL-TO-STEEL BOLTED CONNECTIONS SHALL BE ASSEMBLED UTILIZING HIGH-STRENGTH OR TWIST-OFF-TYPE TENSION CONTROL BOLT ASSEMBLIES, UNO. A BOLT ASSEMBLY CONSISTS OF A MINIMUM OF A BOLT, A HARDENED WASHER AND A NUT. THE HARDENED WASHER SHALL BE PLACED UNDER THE TURNED ELEMENT OF THE BOLT ASSEMBLY. ALSO PROVIDE A HARDENED WASHER AT BOLT HEADS OR NUTS BEARING ON SHORT SLOTTED HOLES. ALSO PROVIDE A 5/16" MINIMUM THICKNESS PLATE WASHER OR CONTINUOUS BAR WITH STD HOLES AT BOLT HEADS OR NUTS BEARING ON LONG SLOTTED HOLES.

16. IF DIRECT-TENSION-INDICATOR (DTI) WASHERS ARE USED, A "DTI" BOLT ASSEMBLY CONSISTS OF A MINIMUM OF A HIGH STRENGTH BOLT, A HARDENED WASHER, A "DTI" WASHER AND A NUT. INSTALL THE "DTI" WITH THE BUMPS FACING THE UNDERSIDE OF THE BOLT HEAD OR NUT. THE HARDENED WASHER SHALL BE PLACED UNDER THE TURNED ELEMENT OF THE "DTI" BOLT ASSEMBLY. IF THE "DTI" IS PLACED UNDER THE TURNED ELEMENT OF THE BOLT ASSEMBLY, PLACE THE HARDENED WASHER BETWEEN THE "DTI" AND THE TURNED ELEMENT. ALSO PROVIDE A HARDENED WASHER AT "DTI"s, BOLT HEADS OR NUTS BEARING ON OVERSIZE OR SHORT SLOTTED HOLES. ALSO PROVIDE A 5/16" MINIMUM THICKNESS PLATE WASHER OR CONTINUOUS BAR W/ STD HOLES AT "DTI"s, BOLT HEADS OR NUTS BEARING ON LONG SLOTTED HOLES.

17. BOLT HEADS, NUTS OR "DTI"S OF BOLTED STEEL-TO-STEEL AND STEEL-TO-CONCRETE/ MASONRY CONNECTIONS BEARING ON SLOPING SURFACES SHALL USE A BEVELED HARDENED WASHER IN THE BOLT ASSEMBLY AT THAT SURFACE.

18. HIGH-STRENGTH BOLT ASSEMBLIES SHALL BE PRE-TENSIONED. FAYING SURFACES OF HIGH-STRENGTH BOLT ASSEMBLIES SHALL BE PREPARED AS REQUIRED FOR CLASS A OR BETTER SLIP-CRITICAL JOINTS.

19. WOOD MEMBERS IN PARALLEL CONTACT WITH STEEL SHALL BE BOLTED WITH 5/8" DIA WELDED THREADED STUDS STAGGERED AT 2'-8" OC MAX, TYP. PROVIDE ADDITIONAL STUDS @ 5" MIN AND 9" MAX FROM ENDS, SPLICES & HOLES OR NOTCHES GREATER THAN 1/3 THE WOOD MEMBER WIDTH.

STEEL DECKING

S- 053100_N001A
231013_Q2

1. STEEL DECKING WORK, MATERIALS, CONSTRUCTION AND QUALITY SHALL BE IN ACCORDANCE WITH THE BUILDING CODE.

2. PRODUCTS SHALL POSSESS CURRENT EVALUATION AGENCY APPROVALS WITH SECTION DIMENSIONS, PROPERTIES AND MATERIALS IN COMPLIANCE WITH THE EVALUATION REPORT. SEE CONSTRUCTION DOCUMENTS FOR STEEL DECK TYPE AND GAGE.

3. WELDING MATERIALS AND PROCEDURES SHALL CONFORM TO AWS D1.3. WELDING TO STRUCTURAL STEEL SHALL ALSO CONFORM TO AWS D1.1. ELECTRODES USED FOR WELDING SHALL HAVE A MINIMUM 60KSI FILLER METAL YIELD STRENGTH.

4. CONCRETE FILLED STEEL DECK SHALL BE MANUFACTURED BY
   - " ASC STEEL DECK" PER IAPMO ER 0329
   - "VERCO DECKING" PER IAPMO ER 2018
   - "EPIC METALS CORPORATION" PER ICC ESR 2047

5. SHEET STEEL ACCESSORIES SHALL BE MANUFACTURED PER A1003 STRUCTURAL WITH G90 COATING PER ASTM A653. MEMBERS 18 GA OR LIGHTER SHALL BE GRADE 33 TYPE H (ST33H), AND 16 GA OR HEAVIER SHALL BE GRADE 50, TYPE H (ST50H). THICKNESS OF SHEET STEEL ACCESSORIES SHALL NOT BE LESS THAN ADJACENT STEEL DECK, UNO.

6. STEEL DECK SHALL BE FABRICATED FROM GALVANIZED SHEET STEEL CONFORMING TO ASTM A653, STRUCTURAL STEEL (SS) DESIGNATION, MINIMUM GRADE AS INDICATED IN EVALUATION AGENCY REPORT.

7. STEEL DECK AND ACCESSORIES SHALL BE GALVANIZED ZINC-COATED IN CONFORMANCE WITH ASTM A653 WITH COATING WEIGHTS AS FOLLOWS UNO:
   STANDARD DECK COATING SHALL BE G60, DECK COATING AT EXTERIOR PERMANENTLY EXPOSED LOCATIONS SHALL BE G90, DECK COATING IN MARINE ENVIRONMENTS SHALL BE G185.

8. STEEL DECK SHALL BE CONTINUOUS OVER MULTIPLE SPANS WHERE FRAMING PERMITS. LAYOUT STEEL DECK TO PROVIDE TWO SPANS MINIMUM AND THREE SPANS OR GREATER WHERE POSSIBLE. SINGLE SPANS SHALL OCCUR ONLY WHERE CONTINUITY CANNOT BE MADE ONTO ADJACENT SPANS.

9. STEEL DECK SHALL BE INSTALLED WITH A MINIMUM INTERMEDIATE AND END BEARING OF 2" OVER STRUCTURAL SUPPORTS. STEEL DECK SPLICES SHALL BE BUTTED WITH RIBS ALIGNED, UNO. BARE STEEL DECK MAY BE LAP SPLICED WITH A MINIMUM LAP OF 2" PROVIDED THE DECK ENDS ARE DIE SET, UNO.

10. STEEL DECK SPLICES SHALL BE CENTERED OVER A COMMON MEMBER.

11. ARC SPOT WELDS SHALL HAVE A MINIMUM 1/2" DIAMETER EFFECTIVE SIZE. ARC SPOT WELD MINIMUM DECK EDGE DISTANCE SHALL BE 1.5 TIMES THE VISIBLE WELD DIAMETER MEASURED FROM THE CENTER OF THE WELD.

12. ARC SEAM WELDS MAY BE SUBSTITUTED FOR ARC SPOT WELDS. ARC SEAM WELDS SHALL HAVE A MINIMUM 3/8" WIDE BY 1" LONG EFFECTIVE SIZE. ARC SEAM WELD MINIMUM DECK EDGE DISTANCE SHALL BE 1.5 TIMES THE VISIBLE WELD DIAMETER MEASURED FROM THE LONGITUDINAL AXIS OR FROM THE CENTER OF THE END RADIUS OF THE WELD.

13. THE MINIMUM CLEAR DISTANCE BETWEEN ADJACENT WELDS AND BETWEEN A WELD AND THE DECK EDGE SHALL BE NO LESS THAN THE VISIBLE WELD DIAMETER.

14. FILLET WELDS SHALL HAVE A MINIMUM LEG SIZE EQUAL TO THE THICKNESS OF THE THINNEST SHEET STEEL BEING ATTACHED. FILLET WELDS SHALL HAVE A MINIMUM LENGTH OF 3/4".

15. FLARE GROOVE WELDS SHALL HAVE A MINIMUM WELD THROAT SIZE EQUAL TO THE THICKNESS OF THE THINNEST SHEET STEEL BEING ATTACHED. FLARE GROOVE WELDS SHALL HAVE A MINIMUM LENGTH OF 3/4".

16. STEEL DECK PANELS AT CANTILEVERED CONDITIONS AND AT PARTIAL WIDTH PANELS SHALL HAVE CONNECTIONS FOR THE ENTIRE LENGTH OF THE DECK PANEL AS FOLLOWS:
    CONNECTIONS TO EACH STRUCTURAL SUPPORT AT EACH LOW FLUTE AND SIDE SEAM CONNECTIONS AT ENDS AND 12" ON CENTER MAXIMUM.

17. ACCESSORIES SHALL BE FASTENED TO SUPPORTING STEEL DECK AND STRUCTURAL MEMBERS BY CONNECTIONS SPACED AT 12" MAXIMUM ON CENTER AND AT EACH END.

18. PROVIDE EDGE FORMS, FLASHING, CLOSURE PLATES, AND SUPPLEMENTARY SUPPORTS FOR DECK EDGES AT BUILDING PERIMETER, AT OPENINGS AND AT PENETRATIONS THROUGH DECK.

19. SUPPORTS OR ANCHORS FOR ITEMS NOT PERMITTED TO BE ATTACHED TO STEEL DECK SHALL BE SUPPORTED BY STRUCTURAL FRAMING. PROVIDE ADDITIONAL TRAPEZE HANGERS OR SUPPLEMENTARY FRAMING AS NECESSARY.

20. DO NOT SUSPEND OR ATTACH SUPPORTS FOR NONSTRUCTURAL COMPONENTS FROM CONCRETE FILLED STEEL DECK WHERE THE ATTACHMENT WILL SUPPORT GREATER THAN 250 LBS.

21. STEEL DECK WITH CONCRETE FILL SHALL BE COMPOSITE STEEL DECK UNO.

22. PROVIDE SHORING WHEN THE SPAN OF CONCRETE FILLED STEEL DECK EXCEEDS THE MAXIMUM PERMISSIBLE UNSHORED SPAN OF THE STEEL DECK AS INDICATED IN THE EVALUATION AGENCY REPORT.

23. CONCRETE FILLED NON-CELLULAR STEEL DECK SHALL BE VENTED WITH FACTORY PUNCHED HOLES, EXCEPT WHERE DECK UNDERSIDE IS PERMANENTLY EXPOSED.

24. WHERE WELDED HEADED STUD CONNECTORS TO STRUCTURAL SUPPORTS ARE USED THEY MAY REPLACE A REQUIRED STEEL DECK CONNECTION.

25. NO PIPES, DUCTS OR CONDUITS ARE TO BE EMBEDDED IN CONCRETE FILL OVER STEEL DECK UNLESS SPECIFICALLY DETAILED ON THE STRUCTURAL CONSTRUCTION DOCUMENTS.

REINFORCED CONCRETE

S- 033000_N002A
180809_Q2

1. CONCRETE MATERIALS, QUALITY CONTROL AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 318.

   - SEE CONCRETE MIX DESIGN TABLE FOR REQUIRED CONCRETE PROPERTIES.

2. PORTLAND CEMENT SHALL CONFORM TO ASTM C150, TYPE II.

3. AGGREGATES SHALL CONFORM TO ASTM C33 FOR NORMAL-WEIGHT AND ASTM C330 FOR LIGHTWEIGHT CONCRETE. MAXIMUM AGGREGATE SIZE USED IN MIXES SHALL BE APPROPRIATE FOR FORM AND REBAR CLEARANCES TO BE ENCOUNTERED.

4. REINFORCING STEEL SHALL CONFORM TO ASTM A706, GRADE 60, OR ASTM A615, GRADE 60.

5. REINFORCING STEEL TO BE WELDED SHALL CONFORM TO ASTM A706, GRADE 60. WELD FILLER METAL FOR REINFORCING STEEL SHALL COMPLY WITH AWS D1.4, Fu=80 KSI. WELDING SHALL CONFORM WITH AWS D1.4.

6. WELDED WIRE REINFORCEMENT SHALL BE COMPOSED OF FLAT SHEETS AND CONFORM TO ASTM A1064.

7. DIMENSIONS LOCATING REINFORCING STEEL ARE TO THE FACE OF REINFORCING STEEL AND DENOTE CLEAR COVERAGE. MINIMUM CONCRETE COVER SHALL BE AS FOLLOWS, UNO:
   A. CONCRETE CAST AGAINST EARTH (EXCEPT SLAB ON GRADE) - 3"
      - SLAB ON GRADE - CENTER REINF IN SLAB, UNO
   B. CONCRETE FORMED & EXPOSED TO EARTH OR WEATHER:
      - #6 THRU #18 BARS - 2"
      - #5 BAR, W31 OR D31 WIRE, & SMALLER - 1 1/2"
   C. CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH THE GROUND:
      - BEAMS & COLUMNS - 1 1/2"
      - SLABS & WALLS: #14 & #18 BARS - 1 1/2", #11 BAR & SMALLER - 3/4"

8. SPLICES IN CONTINUOUS REINFORCING SHALL BE LAPPED AS NOTED IN THE TYPICAL DETAIL, UNO. SPLICES IN ADJACENT BARS SHALL BE STAGGERED SO THERE IS NO OVERLAP. LAP SPLICES OF #14 & #18 REBAR IS NOT PERMITTED AND BARS SHALL BE CONTINUOUS ONE PIECE FOR THE FULL LENGTH SHOWN. LAP SPLICES OF REBAR IN A BUNDLE SHALL BE EQUAL TO THE LAP SPLICE LENGTH REQUIRED FOR THE INDIVIDUAL BARS WITHIN THE BUNDLE MULTIPLIED BY 1.33. INDIVIDUAL BAR SPLICES WITHIN A BUNDLE SHALL NOT OVERLAP. ENTIRE BUNDLES SHALL NOT BE LAP SPLICED.

9. UNLESS DETAILED OTHERWISE: REINFORCING IN CONTINUOUS BEAMS AND SPANDRELS SHALL HAVE THE TOP BARS SPLICED AT MID-SPAN AND THE BOTTOM BARS SPLICED AT THE CENTERLINE OF SUPPORTS. REINFORCING IN CONTINUOUS SOIL-BEARING GRADE BEAMS OR FOOTINGS SHALL HAVE THE TOP BARS SPLICED AT CENTERLINE OF COLUMN SUPPORTS AND THE BOTTOM BARS SPLICED AT MID-SPAN. AT DISCONTINUOUS ENDS, THE BARS SHALL BE TERMINATED WITH A STANDARD HOOK EXTENDED TO THE FAR FACE OF THE SUPPORT OR BEAM.

10. PROVIDE FOUNDATION DOWELS TO MATCH GRADE, QUANTITY, SIZE & SPACING OF WALL/COLUMN REINFORCEMENT. EXTEND DOWELS INTO FOOTINGS AND TERMINATE WITH A STANDARD HOOK 3" ABOVE BOTTOM OF FOOTING, UNO. PROVIDE STANDARD LAP AT DOWELS TO EACH WALL/COLUMN REBAR.

11. HOOKS SHALL BE STANDARD HOOKS, UNO.

12. ITEMS TO BE EMBEDDED IN CONCRETE, SUCH AS REINFORCING, DOWELS, BOLTS, ANCHORS, SLEEVES, ETC SHALL BE SECURELY TIED AND SUPPORTED PRIOR TO PLACING CONCRETE.

13. THE LOCATION OF SLAB ON GRADE JOINTS SHALL BE AS INDICATED ON THE DRAWINGS. SLAB ON GRADE JOINT SPACINGS ARE NOT TO EXCEED 12'-0" IN EITHER DIRECTION, UNO. SUBMIT LOCATION PLAN FOR ALL PROPOSED JOINTS FOR REVIEW.

14. SURFACE OF CONSTRUCTION JOINTS SHALL BE CLEANED AND LAITANCE REMOVED IMMEDIATELY BEFORE CONCRETE IS PLACED. CONSTRUCTION JOINTS SHALL BE WETTED AND STANDING WATER REMOVED. CONSTRUCTION JOINT SURFACES SHALL BE ROUGHENED TO A 1/4" MINIMUM AMPLITUDE, UNO.

15. FORM 3/4" CHAMFER AT ALL EXPOSED WALL AND COLUMN EDGES AND CORNERS, UNO.

16. EXTERIOR SLABS INCLUDING SIDEWALKS SHALL BE 4" MIN THICKNESS AND HAVE 6x6-W1.4xW1.4 WWR IN CENTER OF SLAB, UNO.

17. NO CONDUIT, PIPE, OR SLEEVES LARGER THAN 1" OD SHALL BE PLACED IN OR THROUGH CONCRETE BEAMS OR SLABS UNLESS SPECIFICALLY DETAILED AND APPROVED BY THE STRUCTURAL ENGINEER. CONDUIT OR PIPES 1" OD AND SMALLER SHALL BE SPACED & POSITIONED SUCH THAT THE EFFECTIVENESS OF THE REBAR IS NOT REDUCED.

CONCRETE MIX DESIGN

S- 033000_N002B
220302_Q2

MIX DESIGN TABLE

LOCATION	REQ SCM (% BY WEIGHT OF TOTAL CEMENTITIOUS MATERIALS)	REQ EARLY COMPRESSIVE STRENGTH (PSI)	REQ 28 DAY COMPRESSIVE STRENGTH (PSI)	AIR CONTENT	MAX W/C RATIO	MAX AIR-DRY WEIGHT (LBS/FT³)	ACI EXPOSURE CLASS
CONCRETE FILL OVER STEEL DECK	15	3000 PRIOR TO LOADING	4000	7% MAX *	0.45	145	F0, S0, W0, C1

* AIR CONTENT AND WEIGHT SHALL CONFORM TO UL LISTING REQUIREMENTS AT FIRE RATED SLAB CONDITIONS. EXERCISE SPECIAL CARE TO PREVENT DELAMINATION W/ LIGHTWEIGHT CONCRETE UTILIZING AIR CONTENT GREATER THAN 3 PERCENT.

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CONSULTANT

SEAL

PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST.
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
TYPICAL NOTES

SHEET
S-011

0 1/4" 1/2" 1" 2"

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY

ROUGH CARPENTRY

S- 061100_N003A
170125. Q2

1. SAWN LUMBER FRAMING SHALL BE IDENTIFIED BY THE GRADE MARK OF AN APPROVED LUMBER GRADING OR INSPECTION AGENCY IN CONFORMANCE WITH DOC PS-20. EACH PIECE OF FRAMING SHALL BE IDENTIFIED BY THE GRADE MARK SIGNIFYING CONFORMANCE WITH THE SPECIES, GRADE, SIZE AND SEASONING PROVISIONS. FRAMING LUMBER SHALL HAVE A MAXIMUM MOISTURE CONTENT OF 19% WHEN INSTALLED. FRAMING 4X AND LARGER SHALL BE FREE OF HEART CENTER. SPECIES SHALL BE DOUGLAS FIR-LARCH WITH THE FOLLOWING MINIMUM GRADES:
   - 2X & 3X FRAMING — NO. 2
   - 4X FRAMING — NO. 1
   - 6X AND LARGER FRAMING — SELECT STRUCTURAL
2. WOOD STRUCTURAL PANELS SHALL CONFORM TO THE REQUIREMENTS FOR THEIR TYPE. PLYWOOD PANELS SHALL CONFORM TO THE REQUIREMENTS OF DOC PS-1. WOOD-BASED STRUCTURAL-USE PANELS SHALL CONFORM TO THE REQUIREMENTS OF DOC PS-2. EACH PANEL SHALL BE IDENTIFIED FOR GRADE AND ADHESIVE BOND CLASSIFICATION TYPE BY THE TRADEMARKS OF AN APPROVED TESTING AND GRADING AGENCY. EACH PANEL SHALL BEAR A "SIZED FOR SPACING" MARK. PANEL SPAN INDEX AND THICKNESS SHALL BE AS INDICATED FOR THE INSTALLED LOCATION.
3. WOOD STRUCTURAL PANELS PERMANENTLY EXPOSED IN OUTDOOR APPLICATIONS SHALL HAVE AN EXTERIOR ADHESIVE BOND CLASSIFICATION. ROOF SHEATHING PERMANENTLY EXPOSED TO THE OUTDOORS ONLY ON THE UNDERSIDE OF PROTECTED OVERHANGS IS PERMITTED TO HAVE AN EXPOSURE 1 ADHESIVE BOND CLASSIFICATION. WOOD STRUCTURAL PANELS FOR ALL OTHER USES SHALL HAVE AN EXPOSURE 1 ADHESIVE BOND CLASSIFICATION, UNO.
4. PRESERVATIVE-TREATED WOOD PRODUCTS SHALL CONFORM TO THE REQUIREMENTS OF AWPA STANDARD U1. EACH PIECE SHALL BEAR AN AWPA QUALITY MARK OF AN ALSC APPROVED INSPECTION AGENCY. CARE FOR PRODUCTS SHALL CONFORM TO THE REQUIREMENTS OF AWPA STANDARD M4. UNTREATED SURFACES EXPOSED BY DAMAGE OR FIELD FABRICATION SHALL BE FIELD TREATED. PRODUCTS SHALL HAVE A MAXIMUM MOISTURE CONTENT OF 19% WHEN INSTALLED.
5. PRESERVATIVE-TREATED WOOD PRODUCTS SHALL BE USED FOR STRUCTURAL MEMBERS (ALL FRAMING AND STRUCTURAL PANELS) AT THE FOLLOWING LOCATIONS, UNO:
   - ALL FLOOR FRAMING AND STRUCTURAL PANELS WHEN JOISTS OR PANELS ARE LESS THAN 18", OR GIRDERS ARE LESS THAN 12" TO EXPOSED EARTH IN UNDER-FLOOR SPACES LOCATED WITHIN THE BUILDING FOUNDATION PERIMETER
   - MEMBERS SUPPORTED BY EXTERIOR FOUNDATIONS AND LESS THAN 8" FROM EXPOSED EARTH
   - MEMBERS IN CONTACT WITH EXTERIOR OR BELOW GRADE CONCRETE OR MASONRY WALLS
   - MEMBERS IN CONTACT WITH CONCRETE OR MASONRY SLABS ON GRADE OR FOOTINGS
   - MEMBERS SUPPORTING EXTERIOR WOOD SIDING THAT IS LESS THAN 6" FROM EXPOSED EARTH OR LESS THAN 2" FROM HORIZONTAL CONCRETE OR MASONRY SURFACES
   - MEMBERS PERMANENTLY EXPOSED TO WEATHER AND NOT FULLY PROTECTED
   - MEMBERS IN CONTACT WITH EARTH
6. THE INSTALLATION OF FASTENERS SHALL BE IN ACCORDANCE WITH THE NATIONAL DESIGN SPECIFICATION (NDS) FOR WOOD CONSTRUCTION. THE NUMBER AND SIZE OF FASTENERS CONNECTING WOOD MEMBERS SHALL NOT BE LESS THAN SPECIFIED IN THE BUILDING CODE, UNO. FASTENER MATERIALS SHALL COMPLY WITH THE BENDING YIELD STRENGTHS LISTED IN NDS APPENDIX I. FASTENERS SHALL BE TIGHTENED ON INSTALLATION & RETIGHTENED JUST PRIOR TO CLOSING IN.
7. FASTENERS AND WOOD CONSTRUCTION CONNECTORS (PREMANUFACTURED OR AS INDICATED) THAT ARE: PERMANENTLY EXPOSED TO WEATHER, IN CONTACT WITH PRESERVATIVE-TREATED WOOD OR IN CONTACT WITH FIRE-RETARDANT-TREATED WOOD SHALL BE HOT-DIPPED, ZINC-COATED GALVANIZED STEEL OR STAINLESS STEEL. THE COATING WEIGHTS FOR ZINC-COATED FASTENERS SHALL BE IN ACCORDANCE WITH ASTM A153. FASTENERS OTHER THAN NAILS, WOOD SCREWS AND LAG SCREWS SHALL BE PERMITTED TO BE OF MECHANICALLY DEPOSITED ZINC-COATED STEEL WITH COATING WEIGHTS IN ACCORDANCE WITH ASTM B695, CLASS 55 MINIMUM.
8. NAILS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F1667 INCLUDING THE NAIL BENDING YIELD STRENGTHS OF SUPPLEMENTARY REQUIREMENT S1. NAILS SHALL BE STEEL WIRE COMMON NAILS UNO, OF THE SIZE INDICATED. INSTALL NAILS SUCH THAT END DISTANCES, EDGE DISTANCES AND SPACINGS ARE SUFFICIENT TO PREVENT SPLITTING OF THE WOOD. PREDRILL NAIL HOLES IN WOOD MEMBERS EQUAL TO 75% OF NAIL DIAMETER WHEN NECESSARY TO PREVENT SPLITTING.
9. WOOD SCREWS SHALL CONFORM TO ANSI/ASME STANDARD B18.6.1. SCREWS SHALL BE MADE FROM HEAT TREATED CARBON STEEL WIRE WITH HEADS, LENGTHS AND SIZES AS INDICATED. SCREWS SHALL BE SELF DRILLING. INSTALL SCREWS SUCH THAT END DISTANCES, EDGE DISTANCES AND SPACINGS ARE SUFFICIENT TO PREVENT SPLITTING OF THE WOOD.
10. LAG SCREWS SHALL CONFORM TO ANSI/ASME STANDARD B18.2.1. LAG SCREWS SHALL HAVE HEX HEADS AND CONFORM TO THE MATERIAL REQUIREMENTS OF ASTM A307, GRADE A. LAG SCREW SHANK AND THREADS SHALL BE THE SAME FULL BODY DIAMETER SPECIFIED.
11. BOLTS SHALL CONFORM TO ANSI/ASME STANDARD B18.2.1. BOLTS SHALL HAVE HEX HEADS AND CONFORM TO ASTM A307, GRADE A. PROVIDE HEX NUTS AT BOLTS THAT CONFORM TO ASTM A563, GRADE A. BOLT SHANK AND THREADS SHALL BE THE SAME FULL BODY DIAMETER SPECIFIED.
12. BOLTS AND LAG SCREWS SHALL BE PROVIDED WITH A STANDARD CUT WASHER UNDER HEADS AND NUTS WHICH BEAR ON WOOD, UNO. SEE ROUGH CARPENTRY WASHER SCHEDULE FOR SIZE, OF PLATE OR MALLEABLE IRON WASHERS WHERE REQ. WHERE BOLT OR LAG SCREW SPACING CAUSES WASHERS TO OVERLAP, PROVIDE A CONTINUOUS PLATE WASHER (ONE PIECE) THAT MATCHES WIDTH, THICKNESS AND HOLE DIAMETER SHOWN IN WASHER SCHEDULE.
13. PREDRILL HOLES IN WOOD MEMBERS FOR BOLTS AND LAG SCREWS. BOLT HOLES SHALL BE 1/16" LARGER THAN THE BOLT DIAMETER FOR THE FULL DEPTH OF BOLT. LAG SCREW HOLES SHALL BE THE SAME DIAMETER & DEPTH AS THE UNTHREADED LAG SCREW SHANK. PROVIDE HOLES EQUAL TO 50% OF FASTENER DIAMETER FOR THE THREADED PORTION OF LAG SCREWS. HOLES SHALL BE PERPENDICULAR, UNO, TO CONNECTED SURFACES AND ACCURATELY ALIGNED IN MAIN MEMBERS AND SIDEPLATES. FASTENERS SHALL NOT BE FORCIBLY DRIVEN.
14. INSTALL BOLTS AND LAG SCREWS SUCH THAT END DISTANCES, EDGE DISTANCES AND SPACINGS ARE SUFFICIENT TO PREVENT SPLITTING OF THE WOOD. SPACE BOLTS AND LAG SCREWS FOUR DIAMETERS CENTER TO CENTER, FOUR DIAMETERS FROM WOOD EDGES, EIGHT DIAMETERS FROM WOOD ENDS AND TWO DIAMETERS FROM STEEL SIDE PLATE EDGES OR ENDS, UNO.
15. PREFABRICATED WOOD CONSTRUCTION CONNECTORS INDICATED IN THE DRAWINGS ARE PER THE LATEST EDITION OF THE "WOOD CONSTRUCTION CONNECTORS" CATALOG BY THE SIMPSON STRONG-TIE COMPANY INC. CONNECTORS USED MUST BE LISTED IN A CURRENT AND VALID EVALUATION REPORT BY AN EVALUATION AGENCY RECOGNIZED BY THE ENFORCEMENT AGENCY. EACH CONNECTOR SHALL BE IDENTIFIED BY A FACTORY APPLIED MANUFACTURER'S STAMP. INSTALL CONNECTORS AND REQUIRED FASTENERS PER INSTRUCTIONS IN THE CATALOG AND REPORTS BEFORE LOADING THE CONNECTION. USE THE SPECIFIED FASTENER TYPE, SIZE, MATERIAL, FINISH AND QUANTITY, FILLING ALL FASTENER HOLES WITHOUT OVERDRIVING OR UNDERDRIVING THE FASTENER. ONLY BEND CONNECTORS ONCE THAT ARE SPECIFICALLY DESIGNED TO BE BENT. DO NOT BEND OR MODIFY CONNECTORS UNLESS SPECIFICALLY SHOWN.
16. HANGERS SHALL BE INSTALLED AT ALL BEAMS, RAFTERS AND JOISTS THAT DO NOT BEAR DIRECTLY ON A SUPPORTING WALL OR BEAM. HANGERS SHALL MATCH THE MEMBER SIZE, SLOPE AND SKEW, UNO. PROVIDE HANGERS WITH STRAIGHT OR CONCEALED FLANGES AS NECESSARY SO THAT FLANGE NAILS ARE PLACED INTO SIDE GRAIN OF CARRYING MEMBER. HANGERS AT 2X AND 3X FRAMING SHALL BE "SIMPSON" LUS AND HANGERS AT 4X AND LARGER FRAMING SHALL BE "SIMPSON" HU-TYPE, UNO.
17. POSTS IN STUD WALLS SHALL HAVE FRAMING ANGLES EACH SIDE AT TOP AND BOTTOM TO PLATES UNO. POSTS SUPPORTING OR SUPPORTED BY BEAMS SHALL HAVE MATCHING SIZE "SIMPSON" PC OR EPC POST CAPS, UNO. POSTS BEARING ON CONCRETE SHALL HAVE MATCHING SIZE "SIMPSON" ABU POST BASE, UNO.
18. FRAMING ANGLES SHALL BE BY "SIMPSON" AND OF THE FOLLOWING MINIMUM SIZES, UNO. INSTALL "A" ANGLES WITH 8D X 1 1/2" NAILS AND "LS" ANGLES WITH 10D X 1 1/2" NAILS.

NOMINAL FRAMING DEPTH/WIDTH	"SIMPSON" FRAMING ANGLE
4"	A34 OR LS30
6"	A35 OR LS50
8"	LS70
10" AND 12"	LS90

19. BEAMS, RAFTERS AND JOISTS SHALL BE BRACED AT ENDS AND AT POINTS OF SUPPORT TO PREVENT ROTATION AND/OR LATERAL DISPLACEMENT. BRACING SHALL BE BY 2X FULL DEPTH SOLID BLOCKING BETWEEN EACH MEMBER, BY CONNECTION TO A CONTINUOUS 2X MINIMUM FULL DEPTH SOLID BAND, RIM OR LEDGER MEMBER, OR BY PREFABRICATED FACE MOUNT HANGERS.
20. RAFTERS AND JOISTS OVER 10 INCH NOMINAL DEPTH SHALL BE BRACED BETWEEN ENDS AND BETWEEN POINTS OF SUPPORT TO PREVENT ROTATION AND/OR LATERAL DISPLACEMENT. BRACING SHALL BE BY 2X FULL DEPTH SOLID BLOCKING BETWEEN EACH MEMBER OR BY PREFABRICATED METAL BRIDGING INSTALLED BETWEEN EACH MEMBER SPACED AT INTERVALS NOT EXCEEDING 8'-0".
21. STUD WALLS SHALL BE BRACED BY MINIMUM 2X STUD DEPTH SOLID BLOCKING BETWEEN EACH STUD SPACED VERTICALLY AS FOLLOWS: AT 8'-0" OC MAXIMUM, AT EACH SP EDGE JOINT, AND AT 6'-0" OC MAXIMUM FOR WALLS WITHOUT SP OR GYPSUM BOARD APPLIED ON AT LEAST ONE FACE OF STUD.
22. HOLES REQUIRED FOR PASSING STRAPS OR HARDWARE THROUGH SP SHALL BE NEATLY DRILLED ROUND HOLES OR NEATLY SLOTTED HOLES. DO NOT OVERCUT. THE DIMENSION OF HOLES OR SLOTS SHALL NOT EXCEED THE STRAP OR HARDWARE DIMENSION BY MORE THAN 1/4 INCH.
23. HOLES OR NOTCHES IN ANY MEMBERS SHALL COMPLY WITH TYPICAL DETAILS UNLESS SPECIFICALLY SHOWN OTHERWISE.
24. BLOCKING SHOWN ON THE STRUCTURAL DRAWINGS IS FOR STRUCTURAL PURPOSES ONLY. SEE ALL OTHER DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL BLOCKING REQUIRED FOR FINISHES, FIRE AND DRAFT STOPS, THE ATTACHMENT OF NONSTRUCTURAL ITEMS, OR ANY OTHER REASON.
25. FRAMING MEMBERS (INCLUDING BLOCKING) SHALL BE CUT TO PROVIDE TIGHT FIT AND FULL BEARING AT ALL CONTACT SURFACES. CUT MEMBERS TO MATCH SIZE, DEPTH, SLOPE OR ANGLE SHOWN WHERE SHAPED SURFACES OR NOTCHES ARE INDICATED. DO NOT OVERCUT.

WASHER SCHEDULE FOR BOLTS & LAG SCREWS IN WOOD

BOLT OR LAG DIA	STEEL PLATE WASHER SIZE & HOLE DIA AT CL	MALLEABLE IRON WASHER (ASTM A47)
1/2"	.229" x 3" SQ W/ 9/16" DIA HOLE	1/4" x 2 1/2" DIA
5/8"	.229" x 3" SQ W/ 11/16" DIA HOLE	5/16" x 2 3/4" DIA
3/4"	.229" x 3" SQ W/ 13/16" DIA HOLE	7/16" x 3" DIA
7/8"	5/16" x 3" SQ W/ 15/16" DIA HOLE	7/16" x 3 1/2" DIA
1"	3/8" x 3 1/2" SQ W/ 1 1/16" DIA HOLE	1/2" x 4" DIA

CARPENTRY NAILING SCHEDULE

S- 061100_N004A
170126. Q2

NAILING SCHEDULE (UNO)

CONNECTION / MEMBERS	FASTENING	LOCATION
JOISTS, RAFTERS, TIES, STRUTS, BRACES		
LAPS TO SIDES OF OTHER MEMBERS — FOR EACH 2" OF THE DEEPEST MEMBER DEPTH	(1) 16D	FACE NAIL
TO PERPENDICULAR BEARINGS — FOR EACH 2" OF BEARING LENGTH	(2) 8D	TOE NAIL STAG
TO PARALLEL BEARINGS	8D @ 6" OC	TOE NAIL STAG
DOUBLE MEMBERS — FOR EACH 4" OF MEMBER DEPTH	(1) 16D @ 16" OC	FACE NAIL
TO RIMS, BANDS, HIPS, OR RIDGES — TO 2x - FOR EACH 2" OF MEMBER DEPTH	(1) 16D	END NAIL
TO 3x OR GREATER - FOR EA 2" OF MEMBER DEPTH	(2) 8D	TOE NAIL STAG
DOUBLE TOP PLATES		
UPPER TO LOWER PLATE — FOR EACH 2" OF PLATE WIDTH	(1) 16D @ 16" OC	FACE NAIL
AT EA LAP SPLICE	(8) 16D	FACE NAIL
AT INTERSECTIONS - FOR EA 2" OF PLATE WIDTH	(1) 16D	FACE NAIL
STUDS		
TO TOP PLATES, SILL & SOLE PLATES OR BEAMS — TO 2x - FOR EA 2" OF STUD WIDTH	(1) 16D OR (2) 8D	END NAIL / TOE NAIL
TO 3x OR GREATER - FOR EACH 2" OF STUD WIDTH	(2) 8D	TOE NAIL
DOUBLE STUDS OR STUD LAP TO POST — FOR EACH 4" OF STUD WIDTH	(1) 16D @ 16" OC	FACE NAIL
SILL & SOLE PLATES		
TO PERPENDICULAR FRAMING OR BLOCKING — FOR EACH 2" OF PLATE WIDTH	(1) 16D	FACE NAIL
TO PARALLEL FRAMING OR BLOCKING	16D @ 6" OC	FACE NAIL
BLOCKING		
TO SIDES OF JOIST, RAFTERS OR STUDS — FOR EACH 4" OF BLOCKING DEPTH/WIDTH	(2) 8D	TOE NAIL STAG
TO PERPENDICULAR BEARINGS — FOR EACH 2" OF BEARING LENGTH	(2) 8D	TOE NAIL STAG
TO PARALLEL BEARINGS	8D @ 6" OC ((3) MIN)	TOE NAIL STAG
LEDGERS		
TO STUDS - FOR EA 2" OF LEDGER DEPTH	(1) 16D	FACE NAIL
TO PARALLEL BLOCKING OR FRAMING	16D @ 6" OC	FACE NAIL
BEAMS 4x AND LARGER		
TO KING STUD - FOR EA 2" OF BEAM DEPTH	(2) 16D	END NAIL
TO BEARINGS - FOR EACH 2" OF BEARING LENGTH	(2) 16D	TOE NAIL STAG
POSTS 4x AND LARGER		
TO TOP PLATES, SILL & SOLE PLATES OR BEAMS — TO 2x - FOR EACH 2" OF POST WIDTH	(2) 16D	END NAIL
TO 3x OR GREATER - FOR EACH 2" OF POST WIDTH	(2) 16D	TOE NAIL STAG

NOTES:
CONDITIONS SHOWN ARE FOR COMMON NAILS AT 2X FRAMING, UNO. WHERE 3x FRAMING OCCURS USE 40D BOX NAILS INSTEAD OF 16D COMMONS AT NOTED FACE NAIL CONNECTIONS.

SP NAILING SCHEDULE

S- 061100_N001A
170126. Q2

WOOD STRUCTURAL PANEL NAILING SCHEDULE (UNO)

- PROVIDE 1/8" SPACE BETWEEN SHEETS FOR ALL SP SHEATHING. - MIN SHEET WIDTH SHALL BE 24" FOR ROOF & FLOOR, 12" FOR WALLS.	
ROOF - 19/32" STRUCT I SP, APA SPAN RATED 40/20 ARRANGE SHEETS AS SHOWN ON ROOF FRAMING PLAN	
EN AT PERIMETER OF EA SHEET	8D @ 6" OC
FN AT INTERIOR CONTACTS OF EA SHEET	8D @ 12" OC
BN AT PERIMETER OF ROOF	8D @ 6" OC
SIDE JOINTS TO BE BLOCKED W/ 2X3 FLAT NAILED W/ (2) 8D EA END TO JOIST OR RAFTER.	
FLOOR - 23/32" T&G STURD-I-FLOOR SP, APA SPAN RATED 48/24 ARRANGE SHEETS AS SHOWN ON FLOOR FRAMING PLAN (NOT USED)	
EN AT SUPPORTED EDGE OF EA SHEET	10D @ 6" OC
FN AT INTERIOR CONTACTS OF EA SHEET	10D @ 12" OC
GLUE CONTACT SURFACE BETWEEN SP AND SUPPORTS WITH A SUBFLOOR ADHESIVE CONFORMING TO ASTM D3498	
WALL - 15/32" STRUCT I SP, APA SPAN RATED 32/16 PLACE SHEETS VERTICALLY ON STUDS	
EN AT PERIMETER OF EA SHEET	8D @ 6" OC
FN AT INTERIOR CONTACTS OF EA SHEET	8D @ 12" OC
HORIZONTAL JOINTS TO BE BLOCKED W/ 2X STUD THICKNESS WHERE 2X STUDS ARE INDICATED OR 3X STUD THICKNESS WHERE 3X STUDS ARE INDICATED	

JOIST HANGER SCHEDULE

S- 061100_N005A
201026. Q2

NOT USED

JOIST	"SIMPSON" JOIST HANGER	FASTENER INFO, UNO
2X6, 2X8, 2X10 W/ FMJH DBL 2X6, 2X8, 2X10 W/ FMJH 2X12 W/ FMJH DBL 2X12 W/ FMJH	LUS2X LUS2X-2 HU212 HU212-2	0.148" X 2 1/2" NAILS TO 3X LEDGER 0.162" X 2 1/2" NAILS TO 3X LEDGER
2X6, 2X8, 2X10, 2X12 W/ TFJH DBL 2X6, 2X8, 2X10, 2X12 W/ TFJH	F TF	0.162" X 2 1/2" NAILS TO 4X LEDGER
11 7/8", 14", 16", 18", 20" RED-I65 W/ FMJH DBL 11 7/8", 14", 16", 18", 20" RED-I65 W/ FMJH	MIU2.56/X MIU5.12/X	0.162" X 2 1/2" NAILS TO 3 1/2" WIDE LEDGER
11 7/8", 14", 16", 18", 20", 22", 24" RED-I65 W/ TFJH DBL 11 7/8", 14", 16", 18", 20", 22", 24" RED-I65 W/ TFJH	BA2.56/X (MAX) BA5.12/X (MAX)	0.162" X 2 1/2" NAILS TO 3 1/2" WIDE LEDGER

* "X" IN HANGER NOTATION IS THE JOIST DEPTH. FOR EXAMPLE, 2X10 W/ FMJH: FMJH IS LUS210. DBL 18" RED-I65 W/ TFJH: TFJH IS BA5.12/18 (MAX).

ROUGH CARPENTRY BOLTING

S- 061100_N002A
170126. Q2

NOT USED

1. FABRICATION OF STEEL SHALL BE IN ACCORDANCE WITH AISC SPECIFICATION.
2. STEEL SHALL CONFORM TO THE FOLLOWING, UNO ON PLANS:

STEEL PRODUCT	ASTM SPECIFICATION, UNO	COMMENTS
ANGLES	A36	Fy=36ksi
PLATES & BARS	A36 UNO	Fy=36ksi
BOLTS	A307, GRADE A, HEX	Fu=60ksi
WASHERS	F844	
PLATE WASHERS		Fy=36ksi
NUTS FOR BOLTS & RODS		
ANCHOR BOLTS & RODS (HEADED OR THREADED AND NUTTED)	F1554, CLASS 2A, S1, S3 GRADE 36 TYP, UNO GRADE 55, S4 GRADE 105, S5	Fy=36ksi Fy=55ksi Fy=105ksi

3. ALL EXPOSED EXTERIOR STEEL & FASTENERS SHALL BE GALVANIZED, UNO.
4. NO BOLTS WITH UPSET THREADS ARE ALLOWED FOR ANY APPLICATION. BOTH SHANK & THREADS SHALL BE THE SAME FULL DIA SPECIFIED.

METAL-PLATE WOOD TRUSSES

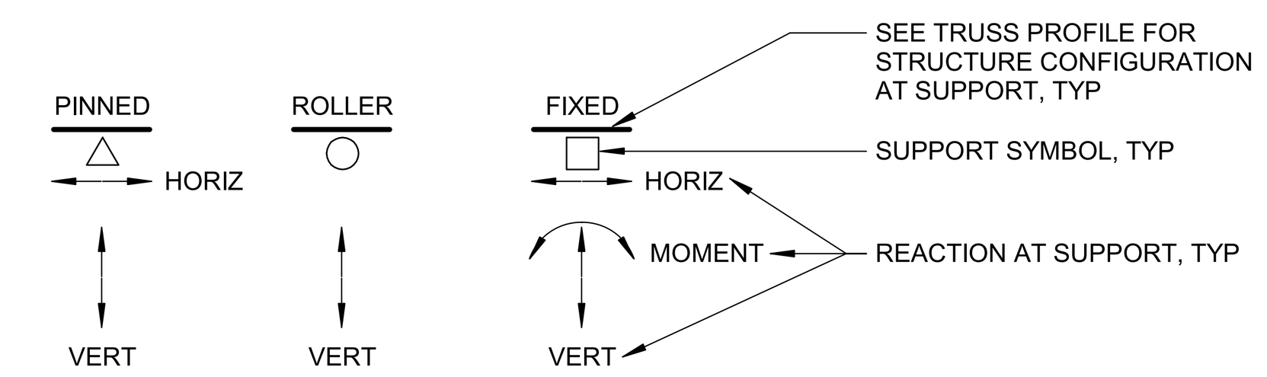
S- 061753_N001A
181001. Q2

1. DESIGN, MANUFACTURE AND PROVIDE QUALITY ASSURANCE FOR TRUSSES IN CONFORMANCE WITH CBC, SECTION 2303.4 AND ANSI/TPI 1, UNO.
2. TRUSS LOADING: TYP, UNO
   A. SEE TRUSS LOADING DIAGRAMS.
   B. PROVIDE ADDITIONAL DEAD LOAD AS REQUIRED TO SUPPORT MECHANICAL UNITS AS SHOWN ON FRAMING PLANS.
   C. PROVIDE ADDITIONAL DEAD LOAD AS REQUIRED TO SUPPORT FIRE SPRINKLER LINES AS SHOWN ON FIRE SPRINKLER PLANS.
   D. IN ADDITION TO ABOVE LOADS, ALL TRUSSES SHALL BE DESIGNED & DETAILED FOR AN ADDITIONAL NON-CONCURRENT 300# CONCENTRATED LIVE LOAD AT ANY POINT IN THE SPAN AT THE TOP OR BOTTOM CHORD.
3. INCREASE IN ALLOWABLE STRESSES FOR ASSEMBLIES OF REPETITIVE FRAMING SHALL BE USED ONLY FOR TOP CHORD MEMBERS WHERE THREE OR MORE TRUSSES ARE IN CONTACT OR SPACED NO MORE THAN 24" ON CENTER AND SHEATHED WITH ROOF OR FLOOR SP.
   A. DEFLECTION SHALL BE LIMITED TO THE FOLLOWING:
      VERTICAL DEFLECTIONS:
      AT ROOF: LL=SPAN/240, (LL+DL)=SPAN/180
      TOP CHORD PANELS: LL=SPAN/180, (LL+DL)=SPAN/120
      HORIZONTAL DEFLECTIONS:
      AT ROOF: LL=0.75", (LL+DL)=1.25"
4. UNBALANCED LOADS SHALL BE USED WHERE SUCH LOADING WILL RESULT IN LARGER MEMBERS OR CONNECTIONS. TRUSSES SHALL BE DESIGNED TO RESIST THE STRESSES CAUSED BY UNIT LIVE OR SNOW LOADS ON ONE HALF OF THE SPAN IF SUCH LOADING RESULTS IN REVERSE STRESSES, OR STRESSES GREATER IN ANY PORTION THAN THE STRESSES PRODUCED BY THE REQUIRED UNIT LIVE OR SNOW LOAD UPON THE ENTIRE SPAN.
5. MINIMUM MEMBER SIZES UNO: TOP CHORD 4X6, BOTTOM CHORD 4X6, WEBS 4X4. MINIMUM GRADE OF LUMBER: STRESSED RATED LUMBER FOR ALL PIECES WITH NO 2 OR BETTER AT CHORDS. EACH PIECE OF WOOD SHALL BE CUT FROM GRADE STAMPED LUMBER. MAXIMUM MOISTURE CONTENT OF EACH PIECE SHALL NOT EXCEED 19% AT THE TIME OF FABRICATION UNLESS LATERAL RESISTANCE VALUES OF THE METAL CONNECTOR PLATES ARE REDUCED PER TPI. MOISTURE CONTENT OF FINISHED TRUSSES SHALL NOT EXCEED 19% AT TIME OF INSTALLATION.
6. DESIGN CAMBER FOR 11/2 TIMES DEAD LOAD.
7. TRUSS DESIGN DRAWINGS AND CALCULATIONS, STAMPED & SIGNED BY A CIVIL ENGINEER LICENSED IN THE STATE OF CALIFORNIA, AND ICC APPROVALS FOR THE METAL CONNECTOR PLATES SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW PRIOR TO FABRICATION. TRUSS SUBMITTAL PACKAGE MUST BE APPROVED BY THE ENFORCEMENT AGENCY PRIOR TO FABRICATION.
8. TRUSS PLACEMENT DIAGRAMS SHALL BE INCLUDED WITH THE TRUSS SUBMITTAL PACKAGE. THE TRUSS PLACEMENT DIAGRAM SHALL IDENTIFY THE PROPOSED LOCATIONS FOR EACH INDIVIDUALLY DESIGNATED TRUSS AND REFERENCE THE CORRESPONDING TRUSS DESIGN DRAWING. TRUSS PLACEMENT DIAGRAMS THAT DEVIATE FROM THE CONSTRUCTION PERMIT DRAWINGS ARE REQUIRED TO BEAR THE SEAL OR SIGNATURE OF THE TRUSS DESIGNER.
9. DESIGN AND PROVIDE ALL PERMANENT TRUSS BRACING REQUIRED FOR LATERAL STABILITY AND LOAD CARRYING CAPACITY OF TRUSSES, INCLUDING ANY STRESS REVERSALS DUE TO REQUIRED LOADING. DESIGN AND PROVIDE PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT / BRACING IN ACCORDANCE WITH BCSI-B1, B3 & B7. PERMANENT INDIVIDUAL RESTRAINT BRACING SHALL BE BY CONTINUOUS LATERAL RESTRAINTS WITH DIAGONAL BRACES TO THE BUILDING LATERAL FORCE RESISTING SYSTEMS OR BY FULL LENGTH INDIVIDUAL WEB REINFORCEMENT. TOP CHORDS NOT SHEATHED BY SP SHOWN ON PLANS SHALL BE BRACED @ 34" OC MAX. BOTTOM CHORDS WITHOUT GYPSUM SHEATHING SHALL BE BRACED @ 10'-0" OC MAX. FLOOR TRUSS BOTTOM CHORDS SHALL BE BRACED WITH STRONG BACKS @ 10'-0" OC MAX. WEBS OF GABLE END TRUSSES SHALL BE BRACED IF OVER 6'-0" LONG.
10. PROVIDE "SIMPSON" DTC ROOF TRUSS CLIPS AT ALL CROSS POINTS BETWEEN TRUSS MEMBERS AND NON-LOAD-BEARING WALLS TO PROVIDE FOR ALIGNMENT CONTROL AND VERTICAL TRUSS MOVEMENT WHEN FULL DEAD LOADS ARE APPLIED. INSTALL SLOT NAILS AT THE MIDDLE OF THE SLOT.
11. DIMENSIONS SHOWN FOR EXTERIOR TRUSS REACTION POINTS ARE TO OUTSIDE FACE OF SUPPORTING MEMBER, UNO. VERIFY ALL DIMENSIONS AND BEARING LENGTHS PRIOR TO DESIGN AND FABRICATION.
12. DESIGN AND DETAIL CONNECTIONS OF MULTI-PLY TRUSSES. USE THE FOLLOWING MINIMUM CONNECTIONS AT EACH CHORD AND WEB IN CONTACT:
    TWO-PLY TRUSSES - (2) 10D @ 12" OC
    THREE-PLY TRUSSES - "SIMPSON" SDW22438 @ 12" OC
    FOUR-PLY TRUSSES - "SIMPSON" SDW22600 @ 12" OC
13. METAL CONNECTOR PLATES SHALL BE MANUFACTURED BY A COMPANY MAINTAINING A CURRENT ICC REPORT. CONNECTOR PLATES SHALL HAVE A G90 GALV COATING, TYP UNO. GALV COATING SHALL BE G185 AT PRESSURE TREATED LUMBER AND AT EXTERIOR LOCATIONS.
14. TRUSSES SHALL BE HANDLED DURING FABRICATION, DELIVERY AND AT JOBSITE SO AS NOT TO BE SUBJECTED TO EXCESSIVE LATERAL BENDING. CUTTING AND ALTERING OF TRUSSES IS NOT PERMITTED. CONCENTRATED LOADS SHALL NOT BE PLACED ATOP TRUSSES UNTIL ALL SPECIFIED BRACING HAS BEEN INSTALLED AND DECKING IS PERMANENTLY NAILED IN PLACE. BRACE TRUSSES SUFFICIENTLY DURING INSTALLATION TO PREVENT TOPPLING OR DOMINOING. TEMPORARY INSTALLATION RESTRAINT / BRACING DURING INSTALLATION SHALL BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF BCSI-B1, B2 & B7.

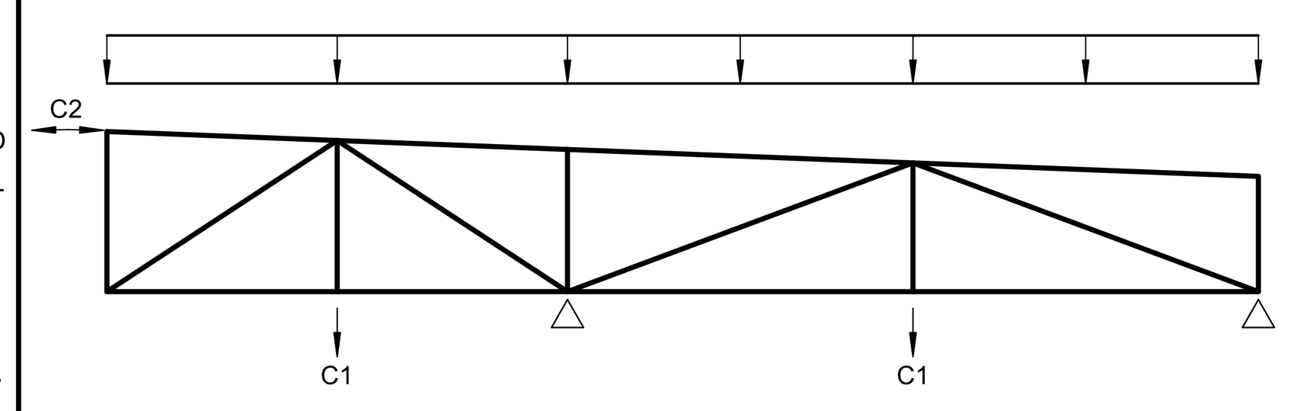
TRUSS LOADING DIAGRAMS

Q2

1. SEE PLANS AND DETAILS FOR TRUSS TYPES, IDENTIFICATION MARKS, LOCATIONS, DIMENSIONS, CONFIGURATIONS, SLOPES, SPACINGS, AND SUPPORTS.
2. TRUSSES SHALL BE DESIGNED USING THE LOADS NOTED ON THE DIAGRAMS AND THE ADDITIONAL LOADS DEFINED IN THE TRUSS NOTES. DESIGN TRUSSES USING CODE REQUIRED LOAD COMBINATIONS. TRUSSES SHALL BE DESIGNED TO TRANSFER VERTICAL AND HORIZONTAL LOADS TO SUPPORTS INDICATED. DIRECTION OF LOADS SHALL BE AS INDICATED BY ARROWS. VERTICAL LOADS ARE DOWNWARD ACTING UNLESS DENOTED AS UPLIFT OR WITH A NEGATIVE (-) SIGN.
3. LOAD TYPE DEFINED AS FOLLOWS:
   C = CONCENTRATED LOAD IN POUNDS
   U = UNIFORM LOAD IN POUNDS PER LINEAL FOOT
   V = HORIZONTAL CONCENTRATED LOAD IN POUNDS
4. LOAD SOURCE DEFINED AS FOLLOWS:
   D = DEAD LOAD
   E = EARTHQUAKE LOAD
   F = FLUID LOAD
   Fa = FLOOD LOAD
   H = EARTH LOAD
   L = FLOOR LIVE LOAD
   Lr = ROOF LIVE LOAD
   R = RAIN LOAD
   S = SNOW LOAD
   T = SELF-STRAINING LOAD
   Wm = WIND LOAD MAIN (NON-CONCURRENT WITH Wc)
   Wc = WIND LOAD COMPONENTS AND CLADDING (NON-CONCURRENT WITH Wm)
5. SUPPORT TYPE AND REACTIONS LEGEND (SHOWN VERTICAL DOWN BUT MAY OCCUR IN ANY ORIENTATION)

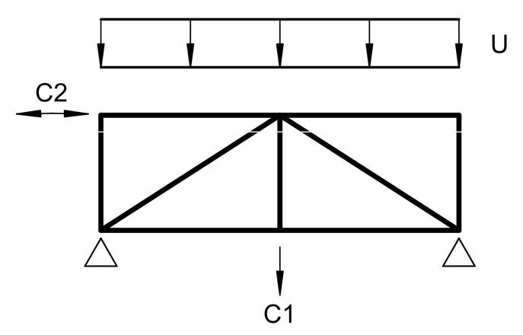


TRUSS PROFILE 1



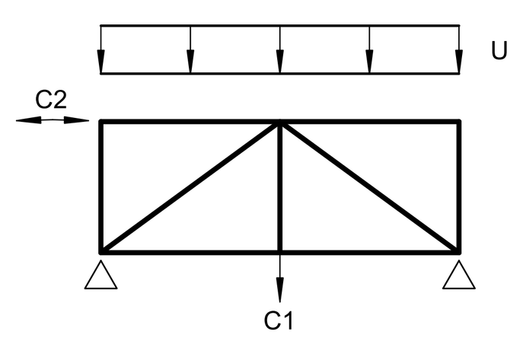
C1 = 250D
U = 186L_r, 223D, -214W_M, 87W_M, 165W_C, -515W_C
C2 = 7246E, 6001W_M

TRUSS PROFILE 2



C1 = 250D
U = 60L_r, 72D, -69W_M, 28W_M, 53W_C, -166W_C
C2 = 1520E, 563W_M

TRUSS PROFILE 3



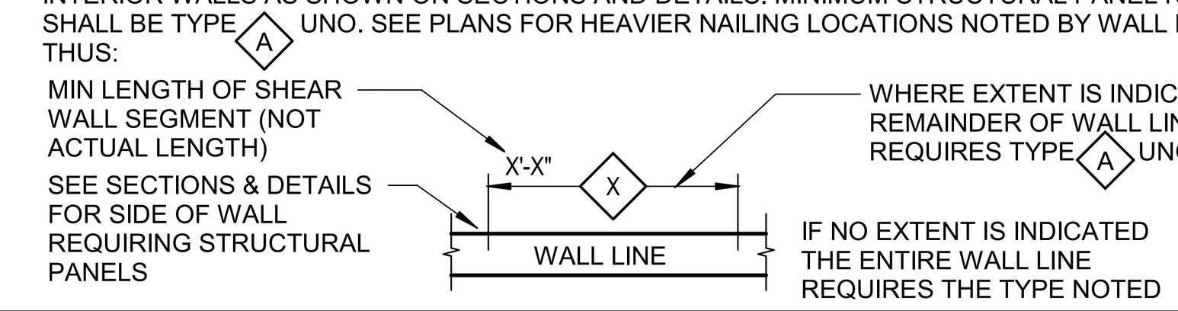
C1 = 250D
U = 80L_r, 96D, -92W_M, 38W_M, 71W_C, -222W_C
C2 = 5606E, 2078W_M

SHEAR WALL SCHEDULE

S- 060600_N001A
201020. Q2

WALL MARK	SP EDGE NAILING	SILL PLATE THICKNESS	STUDS OR BLKG AT PANEL EDGES	SILL PLATE ANCHORAGE: AB'S TO CONC	SILL PLATE ANCHORAGE: NAILS TO WOOD FRAMING	STRUCTURAL PANEL 15/32" STRUCT I
A	8D @ 6" OC	2X	2X	5/8" DIA @ 48" OC	16D @ 6" OC	ONE SIDE
B	8D @ 4" OC	3X	3X	5/8" DIA @ 40" OC	SEE SECTIONS AND DETAILS	ONE SIDE
C	8D @ 3" OC	3X	3X	5/8" DIA @ 32" OC		ONE SIDE
D	8D @ 2" OC	3X	3X	5/8" DIA @ 24" OC		ONE SIDE
E	8D @ 4" OC	3X	3X	5/8" DIA @ 16" OC		BOTH SIDES
F	8D @ 3" OC	3X	3X	5/8" DIA @ 8" OC		BOTH SIDES

1. EDGE NAILING OCCURS AT EVERY PANEL EDGE. FIELD NAILING SHALL BE 8D @ 12" OC.
2. NAILS SHALL BE STEEL WIRE COMMON TYPE OF THE SIZES DENOTED. DRIVE STRUCTURAL PANEL NAILS SO THAT THE NAIL HEADS ARE FLUSH WITH THE SURFACE OF THE PANEL. DO NOT OVERDRIVE NAILS. STAGGER NAILS AT EACH SIDE OF JOINTS.
3. STRUCTURAL PANELS SHALL HAVE A PANEL SPAN RATING OF 32/16. OSB OR 5-PLY/5-LAYER PLYWOOD.
4. BLOCK PANEL EDGES WITH FULL STUD WIDTH BLOCKING OF THICKNESS SPECIFIED.
5. SILL PLATE NAILING IS TO PARALLEL FRAMING BELOW (WHETHER BLKG OR CONT). PROVIDE (2) ADDITIONAL NAILS OF SIZE SHOWN TO EA PERPENDICULAR FRAMING BELOW.
6. PREDRILL NAIL HOLES IF SPLITTING OCCURS. STAGGER NAILING TO PREVENT SPLITTING.
7. WHERE STRUCTURAL PANELS OCCUR AT BOTH SIDES OF WALL, STAGGER PANEL JOINTS AT EACH FACE SO THEY DO NOT FALL ON THE SAME STUD OR BLOCKING.
8. PROVIDE STRUCTURAL PANELS FULL LENGTH AND HEIGHT OF ALL EXTERIOR WALLS AND AT INTERIOR WALLS AS SHOWN ON SECTIONS AND DETAILS. MINIMUM STRUCTURAL PANEL NAILING SHALL BE TYPE A UNO. SEE PLANS FOR HEAVIER NAILING LOCATIONS NOTED BY WALL MARKS THUS:



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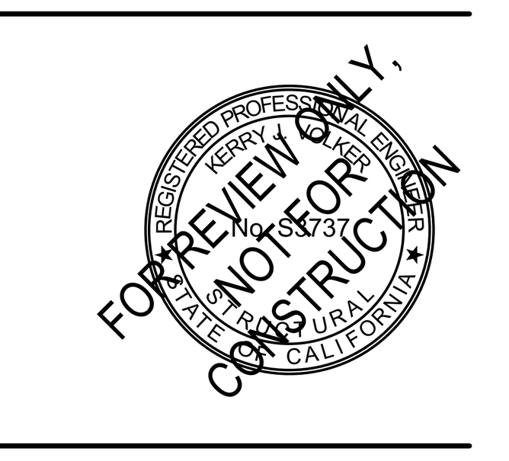


PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST,
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
TYPICAL NOTES

SHEET
S-012

INTERNALLY THREADED SCREW ANCHOR

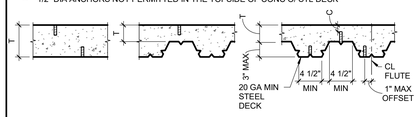
S- 056000_N010A
190805. Q2

1. EMBEDMENT SHALL BE AS INDICATED IN THE TABLE BELOW, TYP UNO. ALL EMBEDMENTS SPECIFIED ARE NOMINAL EMBEDMENT DEPTHS REQUIRED.

"DEWALT" SNAKE+ INSTALLED IN
NORMAL WEIGHT OR LIGHT WEIGHT CONCRETE (f'c = 3000 PSI MIN)
(ICC REPORT ESR 2272)

	GENERAL CONCRETE & TOPSIDE OF CONC O/ STL DECK					UNDERSIDE OF CONC OVER STEEL DECK				
	LOWER FLUTE					UPPER FLUTE				
ANCHOR DIA	3/8"	1/2"**				3/8"	1/2"		3/8"	1/2"
STD EMBED, Hnom TYP UNO	1 5/8"	2 3/16"				1 5/8"	2 3/16"		1 5/8"	2 3/16"
MIN CONC THICKNESS, T	4"*	4"	SEE DIAGRAM BELOW T = 3" MIN IN LOWER FLUTE C = 1" MIN							
MAX INSTALLATION TORQUE (LB-FT)	8	36				8	36		8	36
TORQUE TEST LOAD (LB-FT)	4	18				4	18		4	18

* T= 3 1/4" AT TOPSIDE OF CONC O/ STEEL DECK
** 1/2" DIA ANCHORS NOT PERMITTED IN THE TOPSIDE OF CONC O/ STL DECK



GENERAL CONC | TOPSIDE OF CONC O/ STEEL DECK | UNDERSIDE OF CONC O/ STEEL DECK

ADHESIVE ANCHORS IN CONCRETE

S- 056000_N004A
190805. Q2

1. REFERENCES TO "EPOXY" OR "CHEMICAL" ANCHORS EMBEDDED IN CONCRETE SHALL REFER TO THESE NOTES.
2. ACCEPTABLE ADHESIVE PRODUCTS ARE:
   - "HILTI" HIT-RE 500 V3 (ICC ESR-3814)
   - "HILTI" HIT-HY-200 (ICC ESR-3187)
   - "SIMPSON" SET-XP (ICC ESR-2508)
   - "SIMPSON" SET-3G (ICC ESR-4057)
   - "SIMPSON" AT-XP (IAPMO ER-263)
   - "DEWALT" PURE 110+ (ICC ESR-3298)
   - "DEWALT" AC200+ GOLD (ICC ER-4027)
3. THREADED ROD AND REBAR USED W/ ADHESIVE ANCHORS SHALL MEET THE REQUIREMENTS OF THE EVALUATION AGENCY REPORT.
4. EMBEDMENT DEPTHS SHALL BE 8 TIMES THE NOMINAL DIAMETER OF ANCHOR, UNO.
5. CONCRETE SHALL MEET THE SPECIFIED DESIGN STRENGTH PRIOR TO INSTALLATION, AND SHALL HAVE A MINIMUM AGE OF 21 DAYS, UNO.
6. TEST LOADS SHALL BE AS INDICATED IN DRAWINGS. IF NO TEST LOAD IS SPECIFIED, TEST LOAD SHALL BE 1000 LBS.

SCREW ANCHORS IN CONCRETE

S- 056000_N004A
190805. Q2

1. EMBEDMENT SHALL BE AS INDICATED IN THE TABLE BELOW, TYP UNO. ALL EMBEDMENTS SPECIFIED ARE NOMINAL EMBEDMENT DEPTHS REQUIRED.

"HILTI" KWIK HUS-EZ (KH-EZ) / KWIK HUS-EZ1 (KH-EZ1) INSTALLED IN
NORMAL WEIGHT OR LIGHT WEIGHT CONCRETE (f'c = 3000 PSI MIN)
(ICC REPORT ESR 3027)

	GENERAL CONCRETE & TOPSIDE OF CONC O/ STL DECK					UNDERSIDE OF CONC OVER STEEL DECK					
						LOWER FLUTE			UPPER FLUTE		
ANCHOR DIA	1/4"	3/8"	1/2"	5/8"	3/4"	1/4"	3/8"	1/2"	1/4"	3/8"	1/2"
STD EMBED, Hnom TYP UNO	1 5/8"	1 5/8"	3"	5"	6 1/4"	1 5/8"	2 1/2"	3"	1 5/8"	1 5/8"	2 1/4"
MIN CONC THICKNESS, T	* 3 1/4"	3 1/4"	4 3/4"	7"	8 1/4"	SEE DIAGRAM BELOW T = 3 1/4" MIN, C = 1 1/4" MIN					
MAX INSTALLATION TORQUE (LB-FT)	18	40	45	85	95	18	40	45	18	40	45
TORQUE TEST LOAD (LB-FT)	9	20	23	43	58	9	20	23	9	20	23

* T= 2 1/2" AT TOPSIDE OF CONC O/ STEEL DECK

"SIMPSON" TITEN HD INSTALLED IN
NORMAL WEIGHT OR LIGHT WEIGHT CONCRETE (f'c = 3000 PSI MIN)
(ICC REPORT ESR 2713)

	GENERAL CONCRETE & TOPSIDE OF CONC O/ STL DECK					UNDERSIDE OF CONC OVER STEEL DECK					
						LOWER FLUTE			UPPER FLUTE		
ANCHOR DIA	1/4"	3/8"	1/2"	5/8"	3/4"	1/4"	3/8"	1/2"	1/4"	3/8"	1/2"
STD EMBED, Hnom TYP UNO	1 5/8"	2 1/2"	3 1/4"	4"	5 1/2"	1 5/8"	2 1/2"	3 1/2"	1 5/8"	1 7/8"	2"
MIN CONC THICKNESS, T	3 1/4"	* 4"	5"	6"	8 3/4"	SEE DIAGRAM BELOW T = 1 1/2" MIN IN LOWER FLUTE T = 3 1/4" MIN IN UPPER FLUTE C = 3/4" MIN					
MAX INSTALLATION TORQUE (LB-FT)	24	50	65	100	150	24	50	65	24	50	65
TORQUE TEST LOAD (LB-FT)	12	25	33	50	75	12	25	33	12	25	33

* T= 3 1/4" AT TOPSIDE OF CONC O/ STEEL DECK

"DEWALT" SCREWBOLT+ INSTALLED IN
NORMAL WEIGHT OR LIGHT WEIGHT CONCRETE (f'c = 3000 PSI MIN)
(ICC REPORT ESR 3889)

	GENERAL CONCRETE & TOPSIDE OF CONC O/ STL DECK					UNDERSIDE OF CONC OVER STEEL DECK					
						LOWER FLUTE			UPPER FLUTE		
ANCHOR DIA	1/4"	3/8"	1/2"	5/8"	3/4"	3/8"	1/2"	5/8"		3/8"	1/2"
STD EMBED, Hnom TYP UNO	1 5/8"	2"	3"	4"	4 1/4"	2"	3"	4"		2"	2 1/2"
MIN CONC THICKNESS, T	3 1/4"*	3 1/2"*	5 1/4"	6"	6"	SEE DIAGRAM BELOW T = 2 1/2" MIN IN LOWER FLUTE T = 3 1/4" MIN IN UPPER FLUTE C = 3/4" MIN					
MAX INSTALLATION TORQUE (LB-FT)	19	25	45	60	70	25	45	60		25	45
TORQUE TEST LOAD (LB-FT)	9	12	25	30	35	12	25	30		12	25

* T= 2 1/2" AT TOPSIDE OF CONC O/ STEEL DECK

* UNLESS LARGER OFFSET PERMITTED BY EVALUATION AGENCY REPORT

GENERAL CONC | TOPSIDE OF CONC O/ STEEL DECK | UNDERSIDE OF CONC O/ STEEL DECK

EXPANSION ANCHORS IN CONCRETE

S- 056000_N003A
210729. Q2

1. EMBEDMENT SHALL BE AS INDICATED IN THE TABLE BELOW, TYP UNO. ALL EMBEDMENTS SPECIFIED ARE NOMINAL EMBEDMENT DEPTHS. REFER TO EVALUATION AGENCY REPORT FOR EFFECTIVE EMBEDMENTS.

"HILTI" KWIK BOLT-TZ2 INSTALLED IN
NORMAL WEIGHT OR LIGHT WEIGHT CONCRETE (f'c = 3000 PSI MIN)
(ICC REPORT ESR 4266)

	GENERAL CONCRETE & TOPSIDE OF CONC O/ STEEL DECK					UNDERSIDE OF CONC O/ STEEL DECK				
ANCHOR DIA	1/4"	3/8"	1/2"	5/8"	3/4"	1/4"	3/8"	1/2"	5/8"	
STD EMBED, Hnom TYP UNO	1 3/4"	2 1/2"	** 3 3/4"	4 1/2"	5 1/2"	1 3/4"	2 1/2"	3 3/4"	4 1/2"	
MIN CONC THICKNESS, T	* 3 1/4"	* 4"	* 5 1/2"	6"	8"	SEE DIAGRAM BELOW T = 2 1/2" MIN, C = 5/8" MIN				
CARBON STEEL TORQUE TEST LOAD (LB-FT)	4	30	50	40	110	4	30	50	40	
STAINLESS STEEL TORQUE TEST LOAD (LB-FT)	6	30	40	60	125	6	30	40	60	

* T = 2 1/2" MIN AT TOPSIDE OF CONC O/ STEEL DECK
** STD EMBED = 2 1/2" W/ T = 3 1/4" MIN AT TOPSIDE OF CONC O/ STEEL DECK
*** FOR ANCHORS AT TOPSIDE OR UNDERSIDE OF CONC O/ STEEL DECK ONLY CARBON STEEL ANCHORS ARE ALLOWED, DO NOT USE STAINLESS STEEL ANCHORS.

"SIMPSON" STRONG-BOLT 2 INSTALLED IN
NORMAL WEIGHT OR LIGHT WEIGHT CONCRETE (f'c = 3000 PSI MIN)
(ICC REPORT ESR 3037)

	GENERAL CONCRETE & TOPSIDE OF CONC O/ STEEL DECK					UNDERSIDE OF CONC O/ STEEL DECK			
ANCHOR DIA	1/4"	3/8"	1/2"	5/8"	3/4"	3/8"	1/2"	5/8"	
STD EMBED, Hnom TYP UNO	1 3/4"	1 7/8"	**3 7/8"	3 3/8"	4 1/8"	2"	2 3/4"	3 3/8"	
MIN CONC THICKNESS, T	3 1/4"	3 1/4"	* 6"	5 1/2"	6 3/4"	SEE DIAGRAM BELOW T = 1 1/2" MIN, C = 1/2" MIN			
TORQUE TEST LOAD (LB-FT)	4	30	60	90	150	30	60	90	

* T = 3 1/4" MIN AT TOPSIDE OF CONC O/ STEEL DECK
** STD EMBED = 2 3/4" AT TOPSIDE OF CONC O/ STEEL DECK

"DEWALT" POWER-STUD+ SD2 INSTALLED IN
NORMAL WEIGHT OR LIGHT WEIGHT CONCRETE (f'c = 3000 PSI MIN)
(ICC REPORT ESR 2502)

	GENERAL CONCRETE & TOPSIDE OF CONC O/ STEEL DECK					UNDERSIDE OF CONC O/ STEEL DECK			
ANCHOR DIA		3/8"	1/2"	5/8"	3/4"	3/8"	1/2"	5/8"	3/4"
STD EMBED, Hnom TYP UNO		**2 3/8"	**3 3/4"	4 7/8"	5 3/4"	2 3/8"	2 1/2"	3 5/8"	4 1/2"
MIN CONC THICKNESS, T		* 4"	*5 3/4"	6 1/2"	10"	SEE DIAGRAM BELOW T = 3 1/4" MIN, C = 3/4" MIN			
TORQUE TEST LOAD (LB-FT)		20	40	60	110	25	40	60	110

* T = 2 1/2" MIN AT TOPSIDE OF CONC O/ STEEL DECK
** STD EMBED = 2 1/2" AT TOPSIDE OF CONC O/ STEEL DECK

* UNLESS LARGER OFFSET PERMITTED BY EVALUATION AGENCY REPORT

GENERAL CONC | TOPSIDE OF CONC O/ STEEL DECK | UNDERSIDE OF CONC O/ STEEL DECK

POST INSTALLED ANCHORS

S- 056000_N002A
170127. Q2

THESE NOTES SHALL APPLY TO THE INSTALLATION, INSPECTION, AND TESTING OF EXPANSION, ADHESIVE, AND SCREW ANCHORS. USE SPECIFIC PRODUCTS WHERE INDICATED. IF A SPECIFIC PRODUCT / MANUFACTURER IS NOT NOTED, SELECT ANCHOR FROM THE PROVIDED TABLES BASED ON ANCHOR TYPE, DIAMETER AND BASE MATERIAL. POST-INSTALLED ANCHORS / REINFORCING ARE NOT PERMITTED TO REPLACE CAST-IN ANCHORS/REINFORCING UNLESS SPECIFICALLY NOTED.

INSTALLATION

1. INSTALL PER REQUIREMENTS OF THE EVALUATION AGENCY REPORT & MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS FOR THE SPECIFIC ANCHOR.
2. INSTALLATION OF ADHESIVE ANCHORS INSTALLED IN HORIZONTAL OR UPWARDLY INCLINED ORIENTATIONS RESISTING SUSTAINED TENSION LOADS (AS SPECIFICALLY NOTED ON DETAILS) SHALL BE PERFORMED BY PERSONNEL CERTIFIED BY AN APPLICABLE CERTIFICATION PROGRAM. CERTIFICATION SHALL INCLUDE A WRITTEN TEST AND PERFORMANCE TEST IN ACCORDANCE WITH THE ACI/CRSI ADHESIVE ANCHOR INSTALLER CERTIFICATION PROGRAM, OR EQUIVALENT. CERTIFICATION PROGRAM SHALL BE SUBMITTED TO STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.
3. ANCHOR INSTALLATION SHALL MEET THE MINIMUM EMBEDMENT, EDGE DISTANCE, SPACING, AND BASE MATERIAL THICKNESS CRITERIA ESTABLISHED BY THE RELEVANT EVALUATION AGENCY REPORT & MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS.
4. ANCHOR INSTALLATION & CURE TEMPERATURES SHALL FOLLOW EVALUATION AGENCY REPORT & MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS.
5. WHEN INSTALLING ANCHORS IN CONCRETE OR MASONRY, DO NOT DAMAGE REINFORCING (REBAR AND/OR PRE/POST TENSIONED STRANDS). LOCATE ALL REINFORCING AT AFFECTED AREAS USING NON-DESTRUCTIVE MEANS PRIOR TO INSTALLING ANCHORS. MAINTAIN A MINIMUM CLEARANCE OF TWO INCHES BETWEEN THE REINFORCEMENT AND THE ANCHOR.

INSPECTION

1. PROVIDE SPECIAL INSPECTION AS REQUIRED BY THE EVALUATION AGENCY REPORT AND ENFORCEMENT AGENCY. WHERE EVALUATION AGENCY REPORT PERMITS EITHER PERIODIC OR CONTINUOUS INSPECTION, USE PERIODIC.
2. ADHESIVE ANCHORS INSTALLED IN HORIZONTAL OR UPWARDLY INCLINED ORIENTATIONS RESISTING SUSTAINED TENSION LOADS (AS SPECIFICALLY NOTED ON DETAILS) SHALL BE CONTINUOUSLY INSPECTED BY AN INSPECTOR SPECIALLY APPROVED FOR THAT PURPOSE BY THE ENFORCEMENT AGENCY.

TESTING

1. TEST ANCHORS IN ACCORDANCE WITH THE EVALUATION AGENCY REPORT AND ENFORCEMENT AGENCY REQUIREMENTS FOR THE SPECIFIC ANCHOR AND IN ACCORDANCE WITH THE FREQUENCIES AND TEST METHODS LISTED BELOW.
2. TESTS SHALL BE PERFORMED IN THE PRESENCE OF THE PROJECT INSPECTOR AND A REPORT OF THE TEST RESULTS SHALL BE SUBMITTED TO THE ENFORCEMENT AGENCY AND STRUCTURAL ENGINEER.
3. REACTION LOADS FROM TEST FIXTURE(S) MAY BE APPLIED CLOSE TO THE ANCHOR BEING TESTED, PROVIDED THE ANCHOR IS NOT RESTRAINED BY THE FIXTURE(S) FROM WITHDRAWING.
4. TEST METHOD SHALL BE AS NOTED FOR SPECIFIC ANCHOR TYPES AND THE FOLLOWING CRITERIA APPLY FOR THE ACCEPTANCE OF INSTALLED ANCHORS:
   - HYDRAULIC RAM METHOD (TENSION TESTING):
     THE ANCHOR SHALL MAINTAIN THE TEST LOAD FOR 15 SECONDS AND SHALL HAVE NO OBSERVABLE MOVEMENT AT THE APPLICABLE TEST LOAD. A PRACTICAL WAY TO DETERMINE OBSERVABLE MOVEMENT IS THAT THE WASHER UNDER THE NUT BECOMES LOOSE.
   - TORQUE WRENCH METHOD (TORQUE TESTING):
     - THE APPLICABLE TEST TORQUE MUST BE REACHED WITHIN THE FOLLOWING LIMITS:
     - ONE-HALF (1/2) TURN OF THE NUT, TYP UNO.
     - ONE-QUARTER (1/4) TURN OF THE NUT FOR THE 3/8" SLEEVE ANCHOR ONLY.
     - ONE-QUARTER (1/4) TURN OF THE SCREW AFTER INITIAL SEATING OF THE SCREW HEAD FOR SCREW ANCHORS.
5. TESTING FREQUENCIES SHALL BE AS INDICATED IN THE TABLE BELOW. WHEN MULTIPLE ANCHORS ARE USED IN A SINGLE GROUP OR CONNECTION, THE PERCENT OF ANCHORS TESTED AT EACH LOCATION SHALL BE AS INDICATED BELOW.
6. IF ANY ANCHOR FAILS TESTING, ALL ANCHORS OF THE SAME CATEGORY NOT PREVIOUSLY TESTED SHALL BE TESTED UNTIL 10 CONSECUTIVE ANCHORS PASS, THEN THE INITIAL TESTING FREQUENCY SHALL BE RESUMED.

TESTING FREQUENCY

APPLICATION	PERCENT OF ALL ANCHORS
SILL PLATE BOLTING AND REBAR AT SLAB ON GRADE, UNO	5 PERCENT
STRUCTURAL EXCLUDING SILL PLATE BOLTING	50 PERCENT
NON-STRUCTURAL INCLUDING EQUIPMENT ANCHORAGE	25 PERCENT

POWER ACTUATED FASTENERS

S- 056000_N001A
190225. Q2

1. POWER ACTUATED FASTENERS SHALL BE "HILTI" X-U (ICC ESR 2269), "SIMPSON" PDPA (ICC ESR 2138), OR "DEWALT" POWER DRIVEN FASTENERS (ICC ESR 2024), TYP UNO.
2. INSTALLATION OF FASTENERS SHALL BE IN ACCORDANCE WITH THE EVALUATION AGENCY REPORT. INSTALL FASTENERS WITH SUFFICIENT EDGE DISTANCE AND SPACING TO ACHIEVE FULL CAPACITY, UNO.
3. FASTENERS TO CONCRETE OR MASONRY SHALL HAVE 1" MIN EMBEDMENT (1 1/4" MIN FOR "SIMPSON" PDPA IN MASONRY), TYP UNO.
4. FASTENERS TO STRUCTURAL STEEL SHALL HAVE MIN EMBEDMENT TO STEEL PER MANUFACTURER, TYP UNO.
5. FASTENERS MAY NOT BE USED FOR TENSION LOADS EXCEPT FOR THE FOLLOW CONDITIONS:
   - VERTICAL SUSPENSION WIRES FOR ACOUSTICAL TILE OR LAY-IN CEILINGS
   - VERTICAL SUPPORTS OF MECH DUCTS, CONDUITS, ETC WHERE THE SERVICE LOAD ON EACH ANCHOR DOES NOT EXCEED 90 LBS FOR FASTENERS IN CONCRETE OR 250 LBS FOR FASTENERS IN STRUCTURAL STEEL.
   - FASTENERS ARE NOT PERMITTED AT SEISMIC BRACING ATTACHMENTS.
6. WHEN INSTALLING FASTENERS IN PRE/POST-TENSIONED CONCRETE DO NOT DAMAGE STRANDS. LOCATE STRANDS AT AFFECTED AREAS USING NON-DESTRUCTIVE MEANS PRIOR TO INSTALLING FASTENERS. MAINTAIN A MINIMUM CLEARANCE OF 2" BETWEEN THE STRANDS AND THE FASTENERS.

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PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST.
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

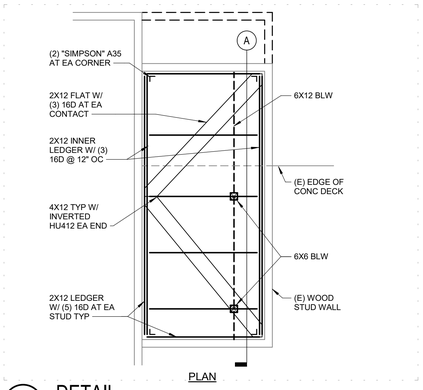
MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

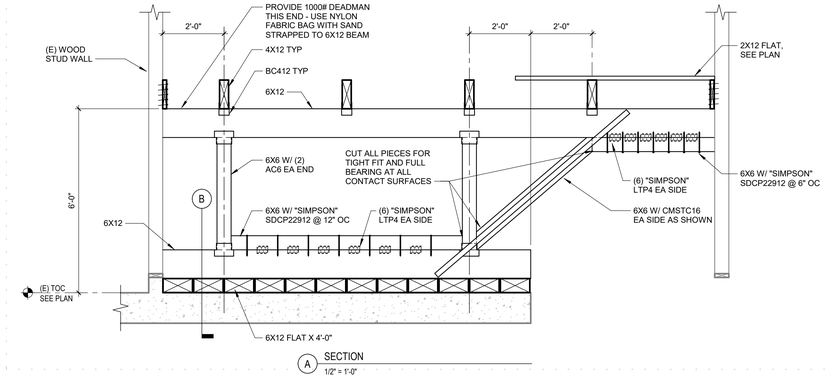
AGENCY

TITLE
TYPICAL NOTES

SHEET
S-013

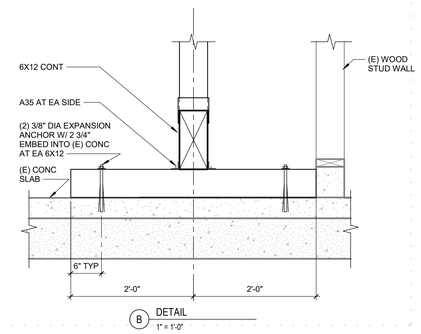


PLAN

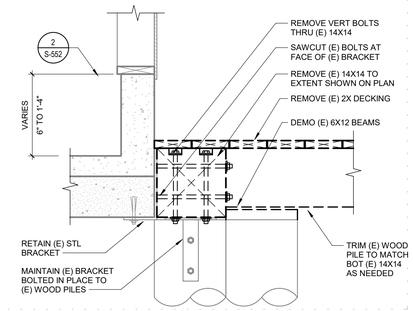


A SECTION
1/2" = 1'-0"

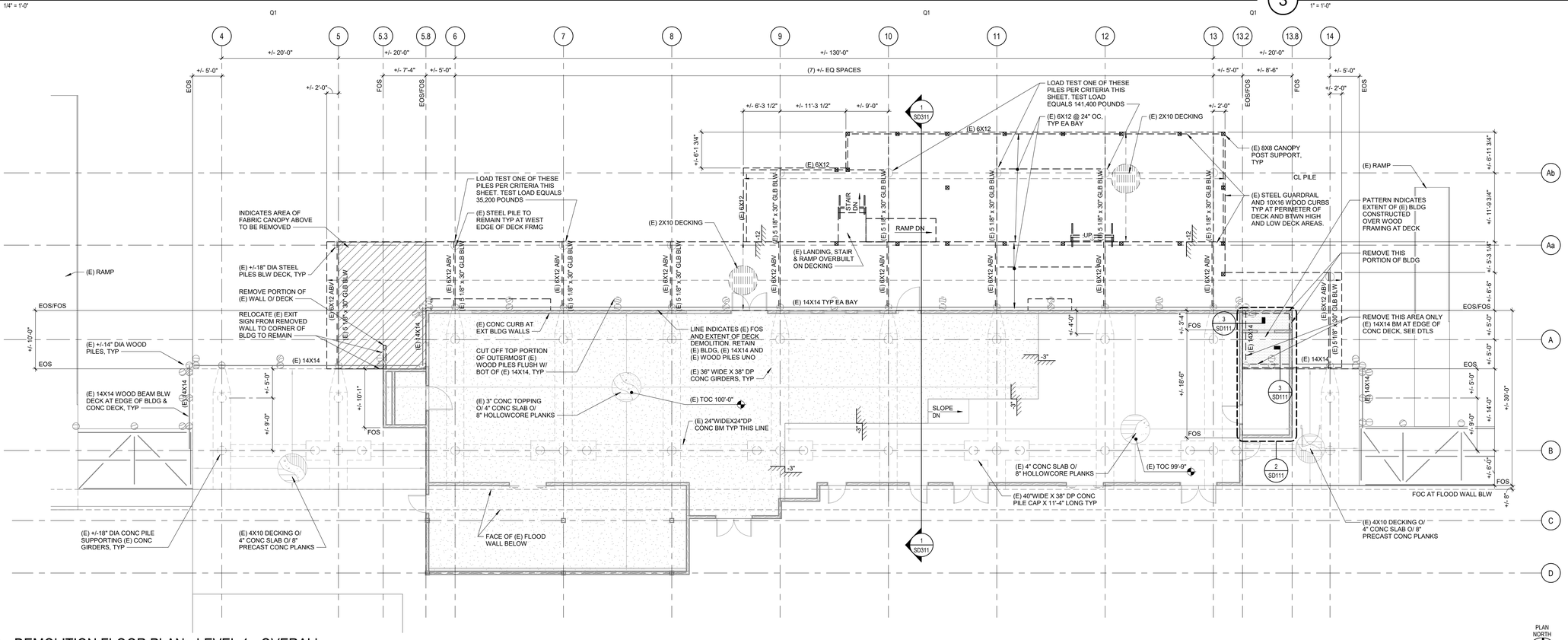
2 DETAIL
1/4" = 1'-0"



B DETAIL
1" = 1'-0"



3 DETAIL
1" = 1'-0"

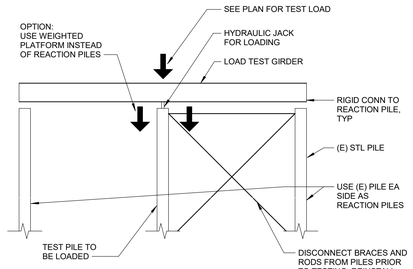


1 DEMOLITION FLOOR PLAN - LEVEL 1 - OVERALL
SCALE 1/8" = 1'-0"

PLAN NORTH

STATIC PILE LOAD TESTING

1. LOAD TESTING SHALL BE PEFORMED BY A CALIFORNIA LICENSED PILE DRIVING CONTRACTOR.
2. PILE DRIVING CONTRACTOR SHALL DESIGN LOAD TESTING APPARATUS, LOADING MEMBERS, SUPPORT FRAMES, CONNECTIONS AND TEST PROCEDURES FOR THE TEST LOADS INDICATED.
3. PILE DRIVING CONTRACTOR SHALL RETAIN THE SERVICES OF A TESTING LAB TO INSPECT AND MONITOR ALL LOADING OPERATIONS AND TO REPORT RESULTS.
4. PILE DRIVING CONTRACTOR SHALL RETAIN THE SERVICES OF A GEOTECHNICAL ENGINEER TO INTERPRET THE TEST RESULTS OBTAINED TO DETERMINE THE ADEQUACY OF THE PILES.
5. PREPARE EXISTING PILE SURFACES AND REINFORCE AS NEEDED TO RECEIVE REACTIONS FROM TEST APPARATUS BEARING SURFACES AND THEIR CONNECTIONS. DO NOT DAMAGE EXISTING PILES. AFTER TESTING COMPLETION REMOVE ALL REINFORCING.
6. LOADING AND TEST PROCEDURES SHALL BE PERFORMED IN COMPLIANCE WITH ASTM D1143. APPLY MEASUREMENT INSTRUMENTATION TO THE EXISTING TEST AND REACTION PILES SO THAT AN ACCURATE MEASUREMENT OF THE TEST PILE DISPLACMENT CAN BE OBTAINED. EACH PILE SHALL HAVE AN INDEPENDENT SECONDARY MEASUREMENT SYSTEM TO ENSURE ACCURACY OF MEASUREMENTS.
7. APPLY LOADS IN INCREMENTS OF 5% OF THE DESIGNATED TEST LOAD PER ASTM D1143 PROCEDURE A-QUICK TEST. HOLD THE INCREMENT OF LOAD AND MEASURE AND RECORD DEFLECTIONS BEFORE PROCEEDING TO THE NEXT INCREMENT OF LOAD.
8. SEE STATIC LOAD TEST CONFIGURATION DIAGRAM THIS SHEET.
9. DURING TESTING IF MORE THAN 1/4" OF UPWARD MOVEMENT IS MEASURED IN EXISTING REACTION PILES, USE OPTIONAL WEIGHTED PLATFORM CONFIGURATION INSTEAD TO PREVENT FURTHER MOVEMENT. LOAD TEST GIRDER SHALL NOT SPAN TO REACTION PILES IF USING WEIGHTED PLATFORM CONFIGURATION.



STATIC LOAD TESTING CONFIGURATION

NOTES

1. REMOVE ALL EXTERIOR WOOD DECKING AND SUPPORTING 6X12S AND GLBS
2. RETAIN ALL 14X14 BEAMS AND WOOD PILES AT PERIMETER OF BLDG AND CONC DECK, UNO.
3. REMOVE ALL CANOPY POSTS
4. REMOVE ALL 10X16 CURB BMS AND GUARDRAILS.
5. SHORE AND RETAIN (E) BLDG WALLS AND ROOF ABOVE, THEN REMOVE DECKING AND FRAMING BLW (E) BLDG AT NORTH END AS INDICATED ON PLAN.
6. RETAIN (E) STEEL PIPE PILES
7. RETAIN CONCRETE DECK AND GIRDERS AND ALL EMBEDS AND PLATES WELDED TO ENDS AT GLB SUPPORTS.

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	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO:	019124.02
CLIENT PROJECT NO:	
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AGENCY

TITLE
DEMO PLAN - FLOOR FRAMING

SHEET
SD111

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY

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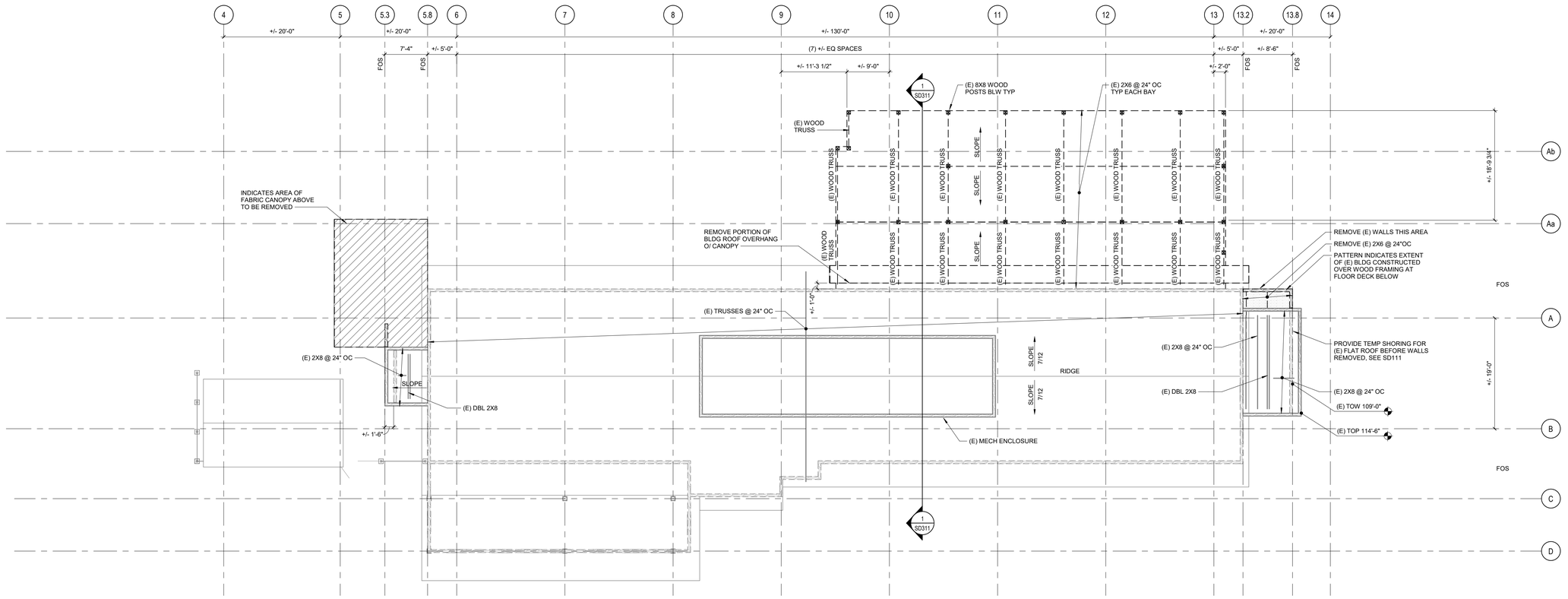

1 DEMOLITION FLOOR PLAN - LEVEL 2 - OVERALL

SCALE 1/8" = 1'-0"

NOTES

1. REMOVE ALL EXTERIOR WOOD CANOPY FRAMING OVER DECK AND SUPPORTING POSTS
2. REMOVE ALL WOOD CANOPY TRUSSES.
3. REMOVE ALL CANOPY POSTS
4. SHORE AND RETAIN (E) BLDG WALLS AND ROOF ABOVE (E) BLDG AT NORTH END.
5. RETAIN (E) TRUSS LEDGERS AT WEST FACE OF BUILDING.

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CONSULTANT

SEAL

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CITY OF SACRAMENTO

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	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

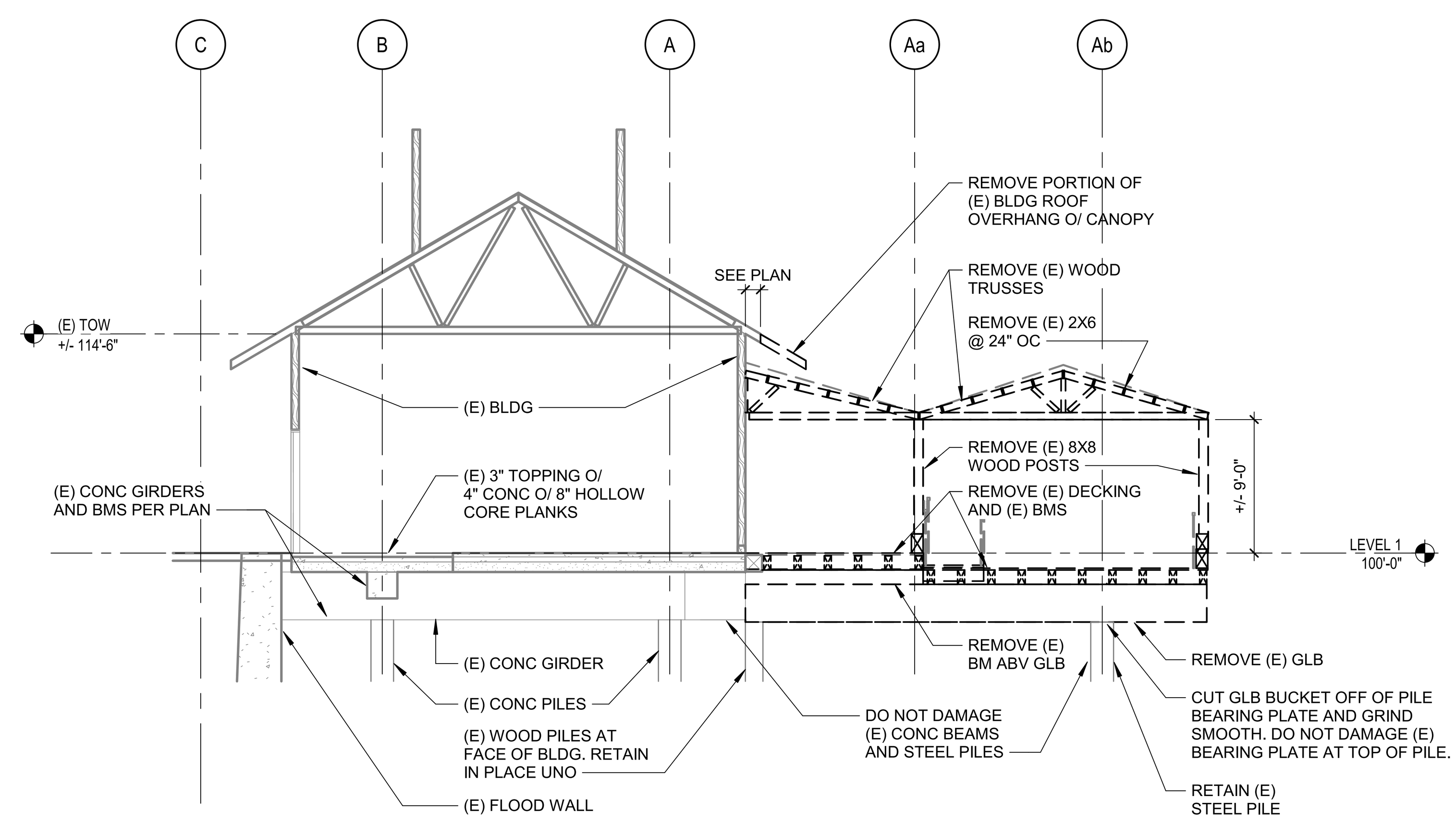
AGENCY

TITLE

DEMO PLAN - ROOF FRAMING

SHEET

SD132



1 SECTION - DEMO - BUILDING
SCALE 1/8" = 1'-0"

NOTES

DEMOLITION FLOOR PLAN NOTES:
1. REMOVE ALL EXTERIOR WOOD DECKING AND SUPPORTING 6X12S AND GLBS
2. RETAIN ALL 14X14 BEAMS AND WOOD PILES AT PERIMETER OF BLDG AND CONC DECK, UNO.
3. REMOVE ALL CANOPY POSTS
4. REMOVE ALL 10X16 CURB BMS AND GUARDRAILS.
5. REMOVE DECKING AND FRAMING BLW (E) BLDG AT NORTH END AS INDICATED ON PLAN. SHORE AND RETAIN (E) BLDG WALLS AND ROOF ABOVE.
6. RETAIN (E) STEEL PIPE PILES
7. RETAIN CONCRETE DECK AND GIRDERS AND ALL EMBEDS AND PLATES WELDED TO ENDS AT GLB SUPPORTS.

DEMOLITION ROOF PLAN NOTES:
1. REMOVE ALL EXTERIOR WOOD CANOPY FRAMING OVER DECK AND SUPPORTING POSTS
2. REMOVE ALL WOOD CANOPY TRUSSES.
3. REMOVE ALL CANOPY POSTS
4. SHORE AND RETAIN (E) BLDG WALLS AND ROOF ABOVE (E) BLDG AT NORTH END.
5. RETAIN (E) TRUSS LEDGERS AT WEST FACE OF BUILDING.

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Sacramento, CA 95818
P 916.558.1900
www.lionakis.com

CONSULTANT

SEAL

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PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST,
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO:	019124.02
CLIENT PROJECT NO:	
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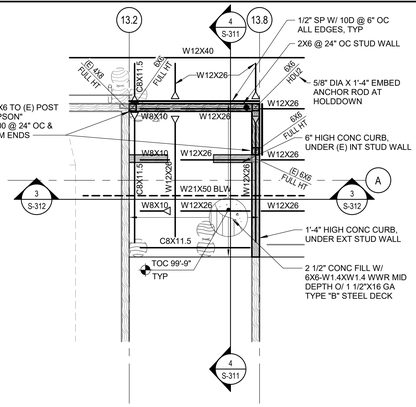
AGENCY

TITLE
DEMO SECTIONS - BUILDING

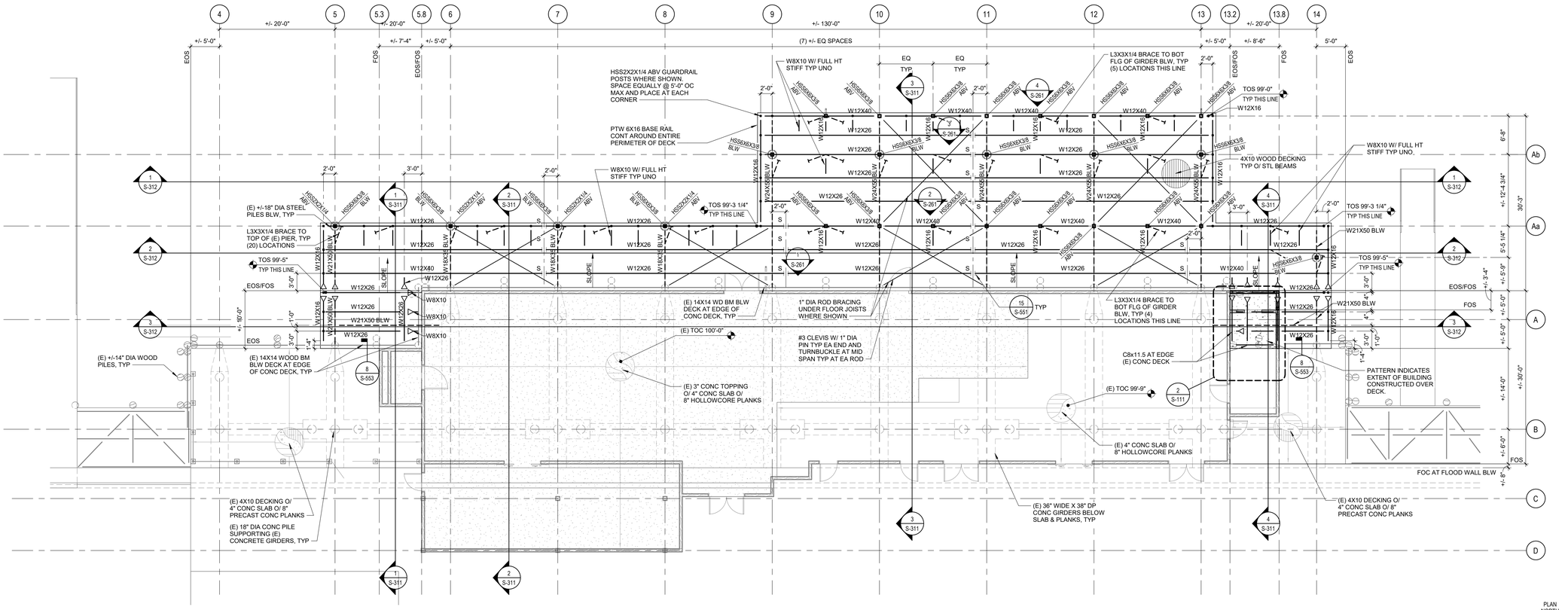
SHEET
SD311



2 ENLARGED PLAN - FLOOR FRAMING

SCALE 1/4" = 1'-0"

PLAN NORTH



1 PLAN - FLOOR FRAMING - LEVEL 1

SCALE 1/8" = 1'-0"

PLAN NORTH

NOTES

1. ALL CONSTRUCTION FOR DECK IS NEW UNLESS IDENTIFIED AS (E) EXISTING.
2. ALL WOOD FRAMING SHALL BE PRESERVATIVE TREATED OR NATURALLY DURABLE WOOD.
3. ALL STEEL FRAMING SHALL BE HOT-DIPPED GALVANIZED.
4. CONNECT STEEL GIRDERS TO (E) CONCRETE GIRDERS.
5. DECK BOARDS AND NAILERS TO BEAMS SHALL BE THE FOLLOWING NATURALLY DURABLE WOOD SPECIES AND GRADES. ALL PIECES SHALL BE HEARTWOOD.
   - REDWOOD NO. 1 PER REDWOOD INSPECTION SERVICE
   - WESTERN CEDAR NO. 1 PER WEST COAST LUMBER INSPECTION BUREAU
   - ALASKA CEDAR NO. 1 PER WEST COAST LUMBER INSPECTION BUREAU

   ALTERNATIVELY AT THE DISCRETION OF THE CITY THE FOLLOWING PRESERVATIVE TREATED WOOD WITHOUT USING EXCISING SHALL BE USED.
   - DOUGLAS FIR-LARCH NO. 1 PER WEST COAST LUMBER INSPECTION BUREAU
6. ATTACH DECK BOARDS TO EACH SUPPORT W/ (3) "SIMPSON" SDWS27600SS 0.275" DIA TYPE 316 STAINLESS STEEL SCREWS.
7. LAYOUT DECK BOARDS WITH (3) SPANS MINIMUM OVER (3) SUPPORTS. CANTILEVER BOARDS ONLY WHERE SPECIFICALLY DETAILED AND EACH SHALL HAVE A BACK SPAN OVER (3) SUPPORTS MINIMUM. SINGLE SPAN DECK BOARDS OVER (2) SUPPORTS ARE NOT PERMITTED. USE CONTINUOUS ONE-PIECE MULTIPLE-SPAN DECK BOARDS FULL WIDTH WHERE POSSIBLE. PROVIDE MIN (1) CONTINUOUS BOARD BETWEEN SPLICES ON SAME SUPPORTING BEAM. PROVIDE MIN (1) BEAM SPACE BETWEEN SPLICES IN ADJACENT BOARDS. LOCATE BOARD SPLICES AT THE CENTER LINE OF SUPPORTS AND CUT FOR SQUARE BUTT. LAYOUT W/ 1/8" GAP BTWN ADJ BOARD EDGES AND ENDS.
8. PROVIDE BIRD DETERRENT SYSTEM AT EXPOSED HORIZONTAL BEAM SURFACES BELOW DECK.

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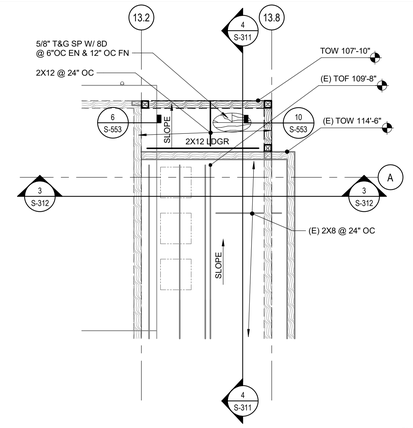
TITLE
PLAN - DECK REPLACEMENT FLOOR FRAMING

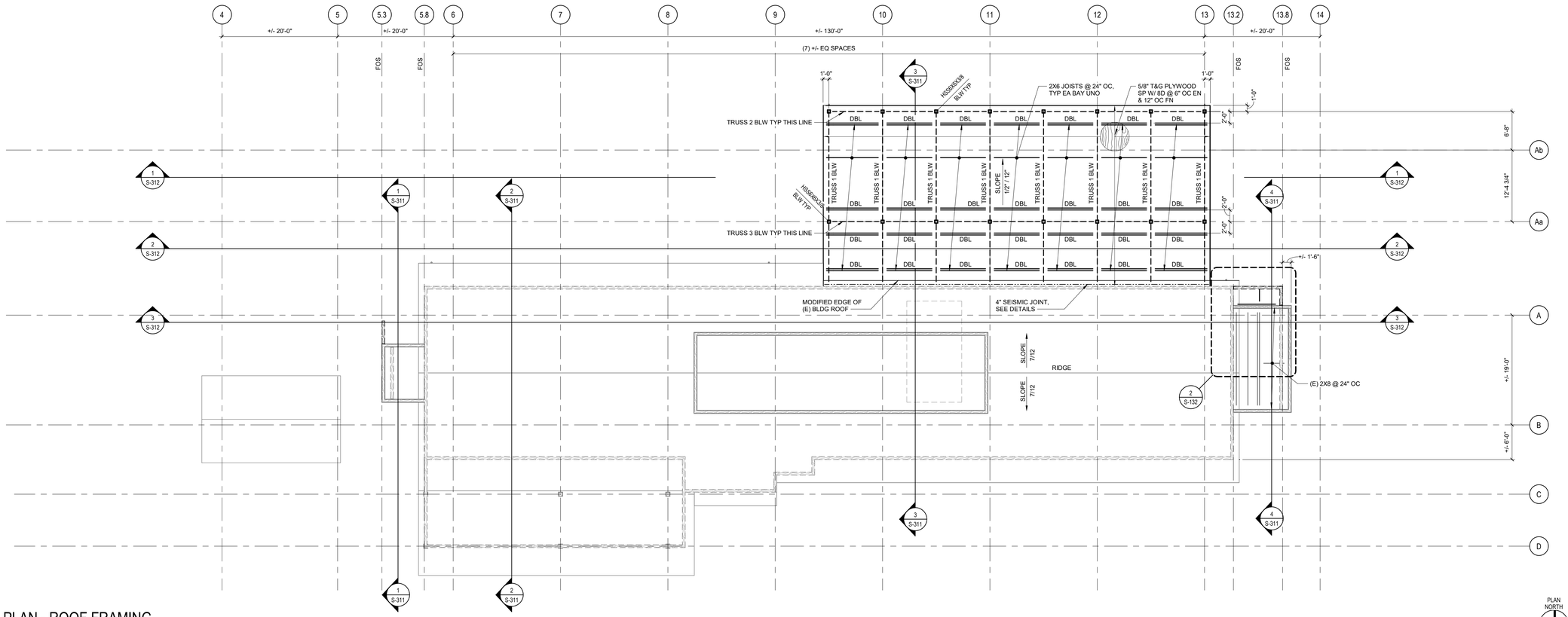
SHEET
S-111



2 ENLARGED PLAN - ROOF FRAMING

SCALE 1/4" = 1'-0"

PLAN NORTH



1 PLAN - ROOF FRAMING

SCALE 1/8" = 1'-0"

NOTES

1. TRUSSES SHALL BE PREFABRICATED PLATED TYPE WITH MINIMUM MEMBER SIZES OF 4X6.
2. TRUSSES SHALL BEAR ON STEEL PLATE FABRICATED BUCKETS ON TOP OF HSS COLUMNS.
3. SHORE AND RETAIN (E) BUILDING WALLS AND ROOF ABOVE (E) BUILDING AT NORTH END.
4. RETAIN (E) TRUSS LEDGERS AT WEST FACE OF BUILDING
5. ALL CANOPY WOOD FRAMING AND TRUSSES SHALL BE PRESSURE TREATED FOR EXTERIOR EXPOSURE.
6. CANOPY SHEATHING SHALL BE MANUFACTURED WITH EXTERIOR GLUES.
7. ALL "SIMPSON" HARDWARE SHALL HAVE G185 COATING WEIGHTS. NAILS, BOLTS, NUTS AND WASHERS INSTALLED IN PRESERVATIVE TREATED WOOD SHALL BE HOT-DIPPED GALVANIZED.
8. ALL STEEL FRAMING SHALL BE HOT-DIPPED GALVANIZED.
9. ALL JOISTS SHALL BE DOUGLAS FIR NUMBER 1 OR BETTER GRADE.

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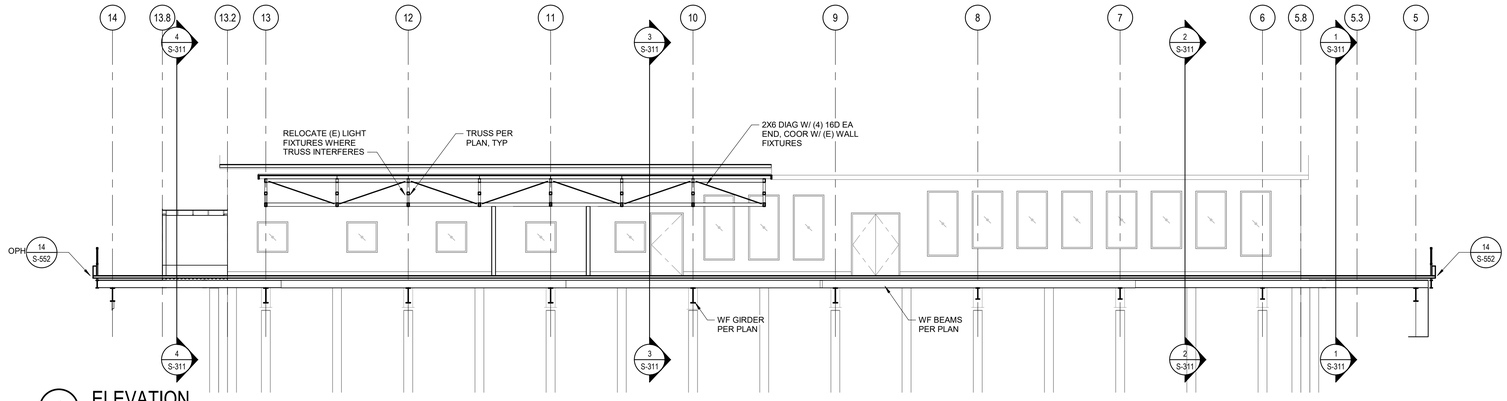
CITY OF SACRAMENTO

TITLE

PLAN - CANOPY REPLACEMENT ROOF FRAMING

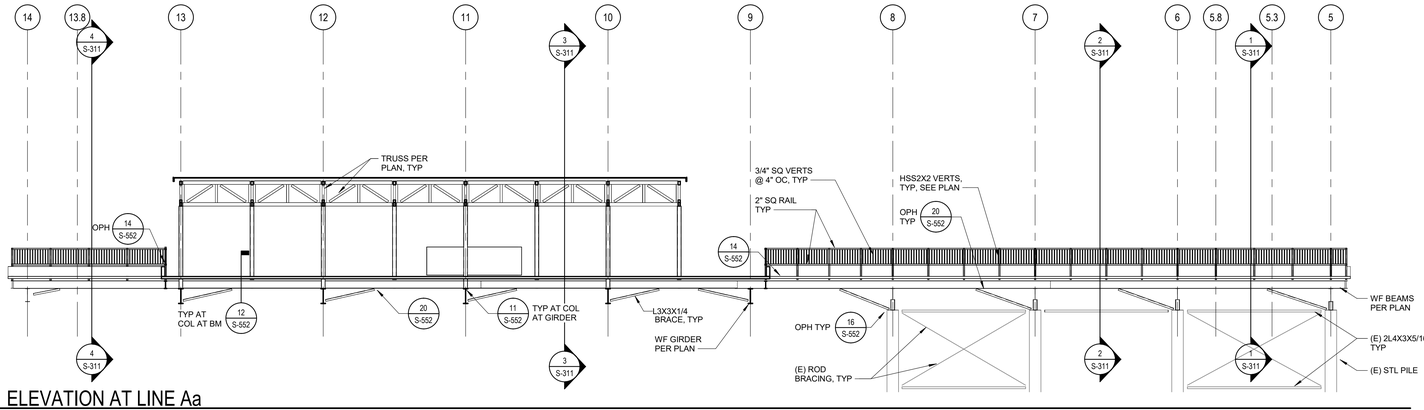
SHEET

S-132



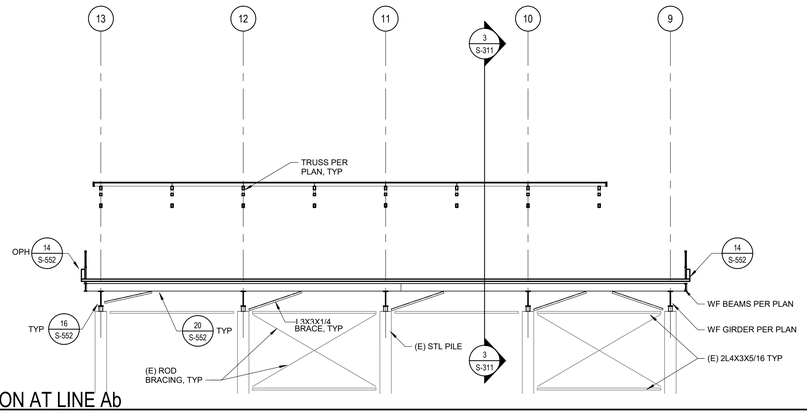
1 ELEVATION

SCALE 1/8" = 1'-0"



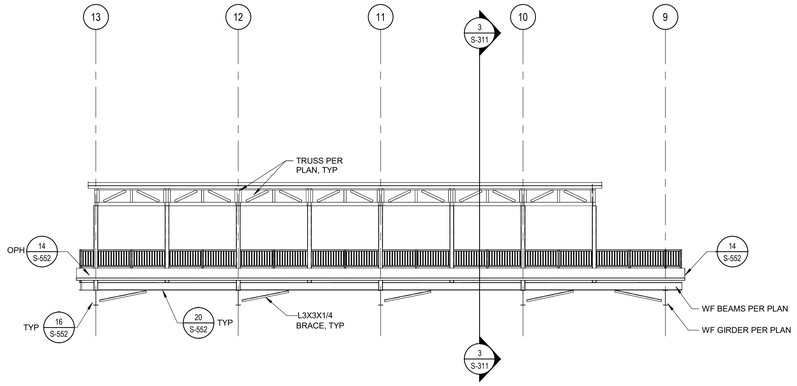
2 ELEVATION AT LINE Aa

SCALE 1/8" = 1'-0"



3 ELEVATION AT LINE Ab

SCALE 1/8" = 1'-0"



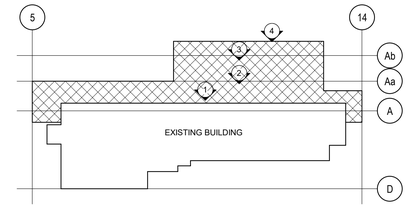
4 ELEVATION

SCALE 1/8" = 1'-0"

NOTES

1. SEE MAIN PLANS FOR ADDITIONAL NOTES, SCHEDULES, & LEGENDS.
2. SEE MAIN PLANS FOR ADDITIONAL INFORMATION NOT SHOWN ON ELEVATIONS.

KEY PLAN



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AGENCY

TITLE

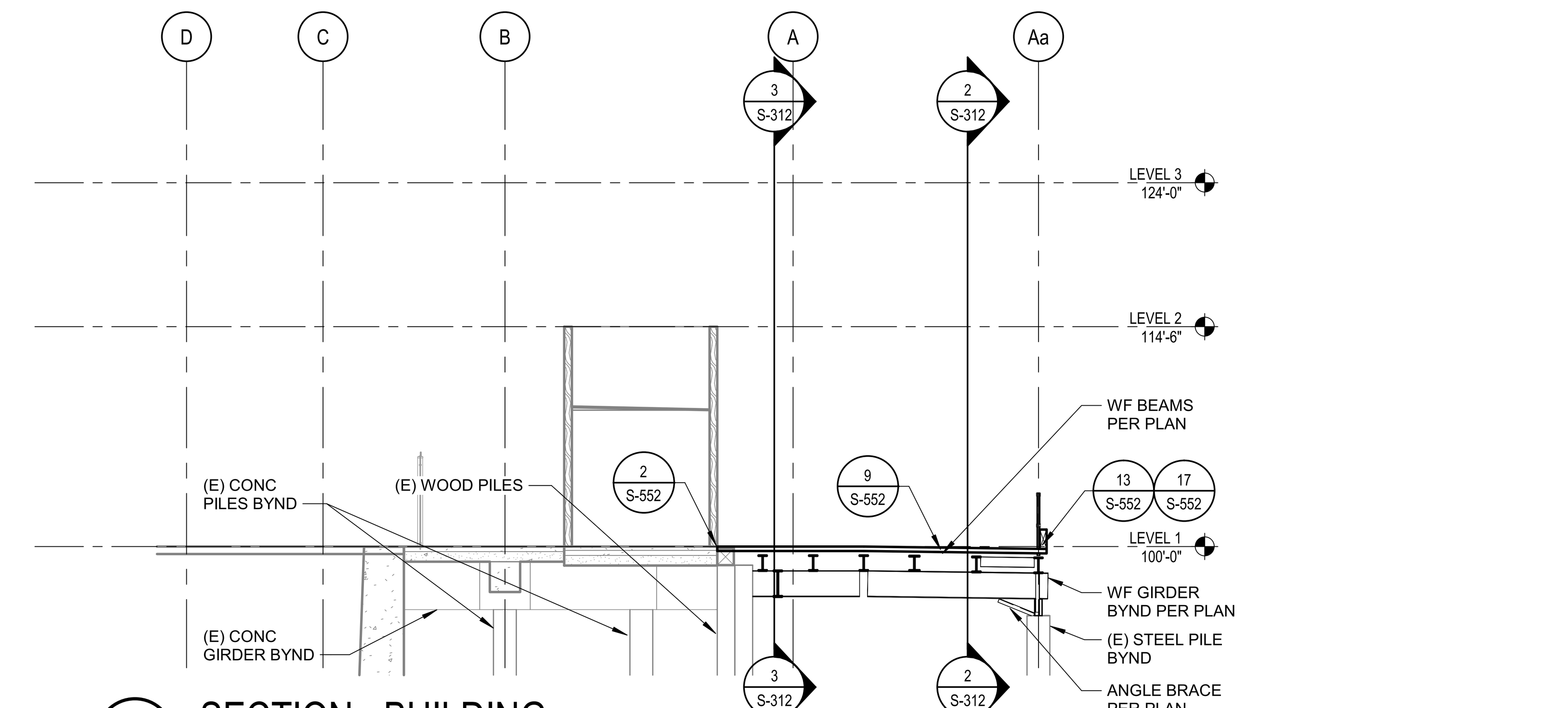
ELEVATIONS - WOOD FRAMING

SHEET

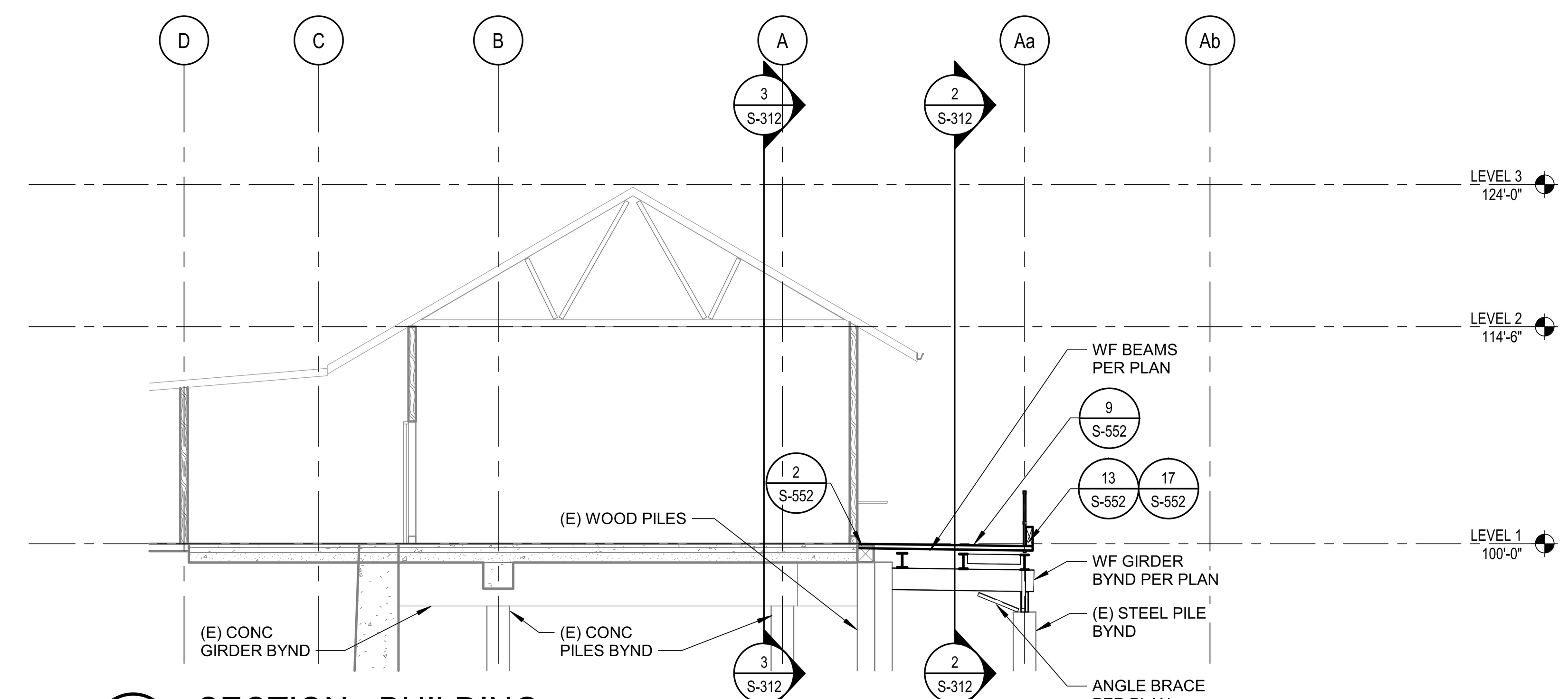
S-261

NOTES

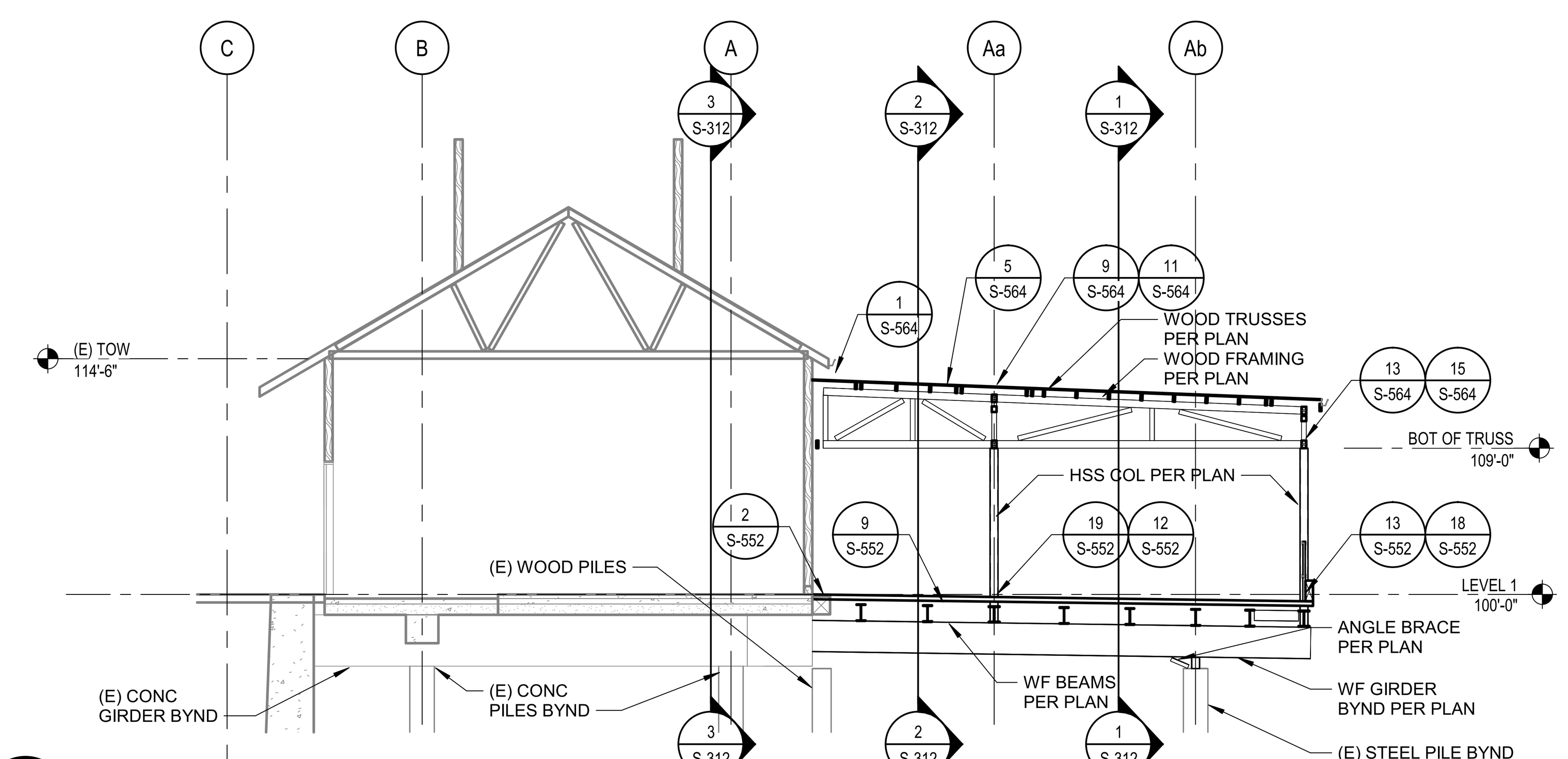
1. SEE MAIN PLANS FOR ADDITIONAL NOTES, SCHEDULES, & LEGENDS.
2. SEE MAIN PLANS FOR ADDITIONAL INFORMATION NOT SHOWN ON SECTIONS.



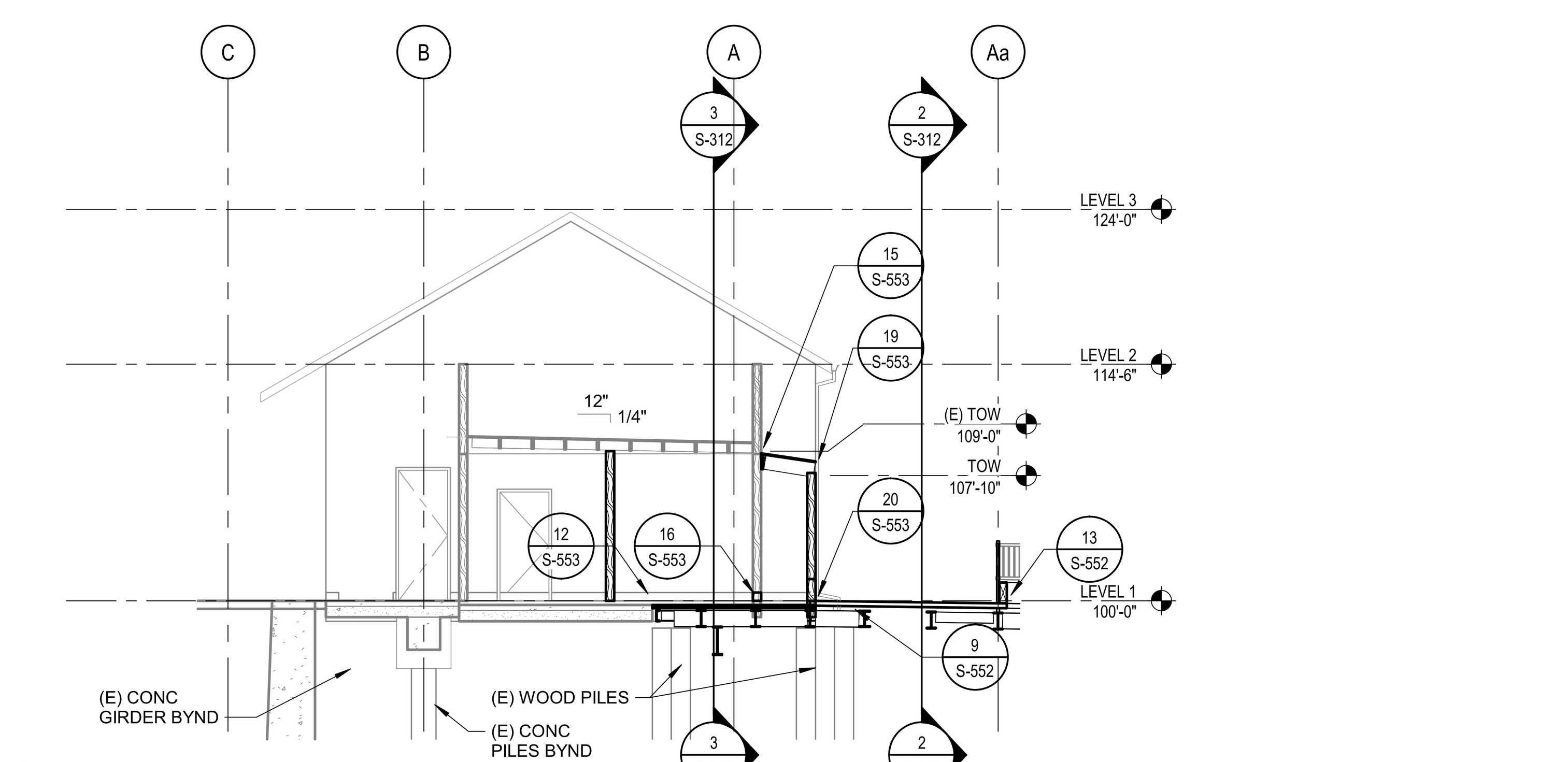
1 SECTION - BUILDING
SCALE 1/8" = 1'-0"



2 SECTION - BUILDING
SCALE 1/8" = 1'-0"

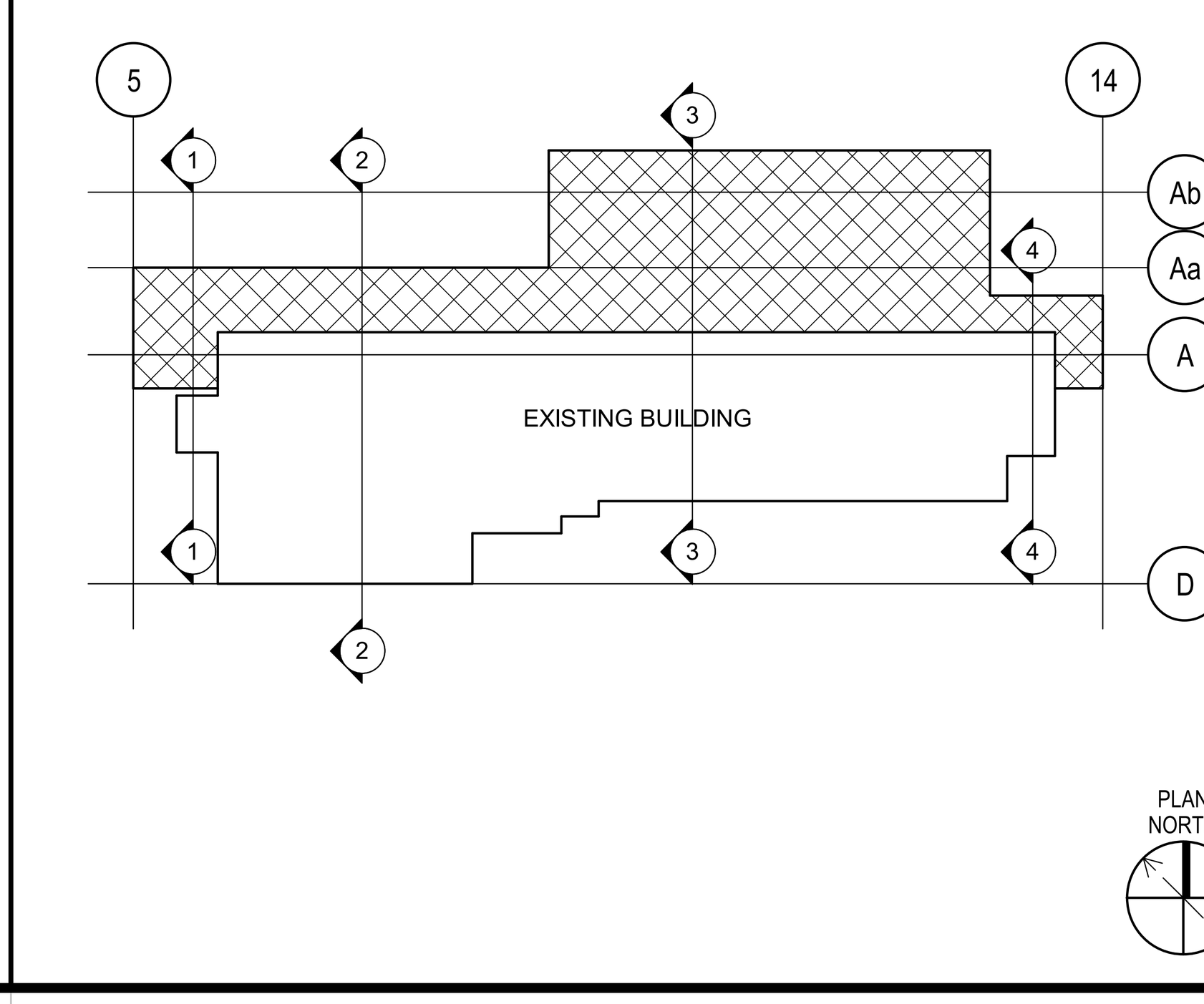


3 SECTION - BUILDING
SCALE 1/8" = 1'-0"



4 SECTION - BUILDING
SCALE 1/8" = 1'-0"

KEY PLAN



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AGENCY

TITLE
SECTIONS - BUILDING

SHEET
S-311

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY

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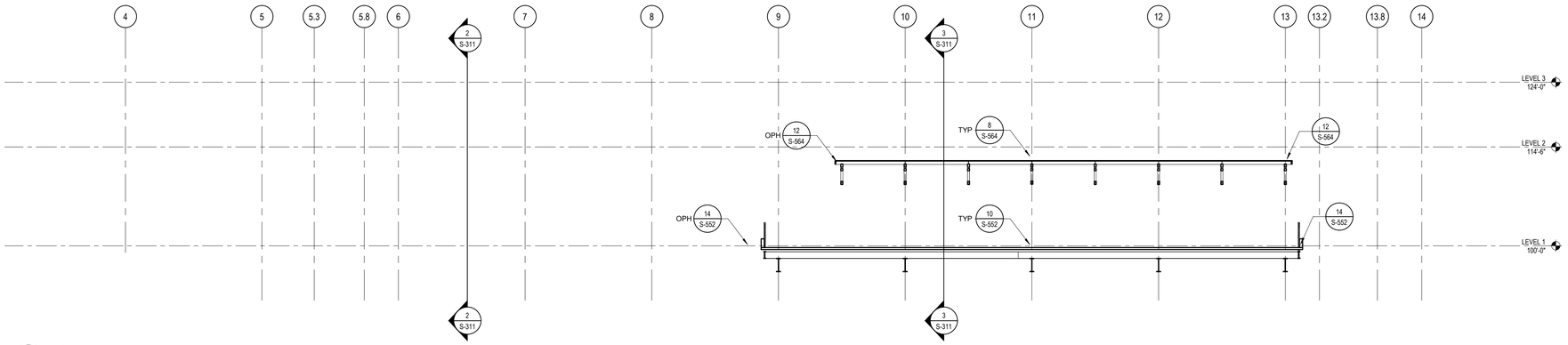
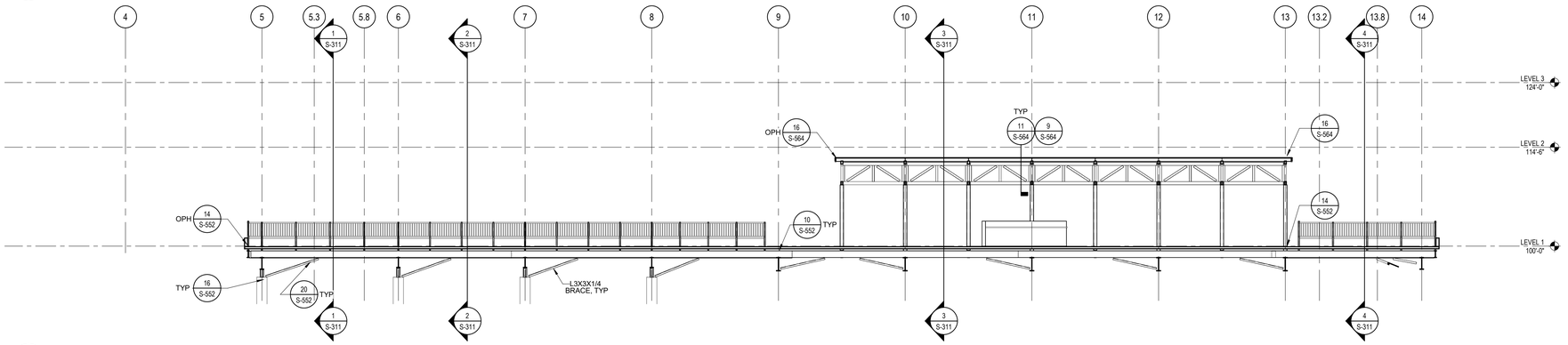
2/25/2025 4:34:11 PM



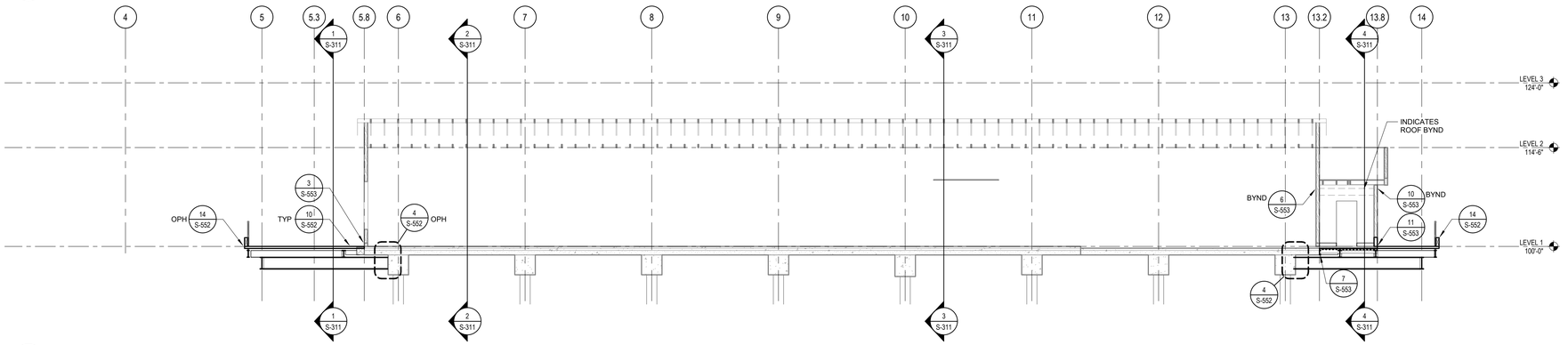
1 SECTION - BUILDING

SCALE 1/8" = 1'-0"



2 SECTION - BUILDING

SCALE 1/8" = 1'-0"



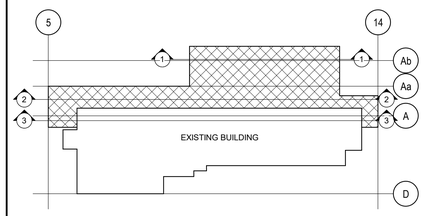
3 SECTION - BUILDING

SCALE 1/8" = 1'-0"

NOTES

1. SEE MAIN PLANS FOR ADDITIONAL NOTES, SCHEDULES, & LEGENDS.
2. SEE MAIN PLANS FOR ADDITIONAL INFORMATION NOT SHOWN ON SECTIONS.

KEY PLAN



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TITLE

SECTIONS - BUILDING

SHEET

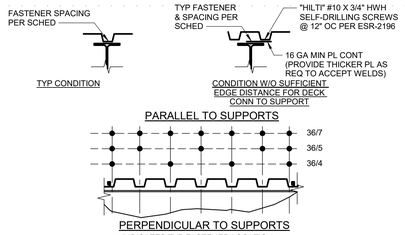
S-312

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY

STEEL DECK PROPERTIES							
TYPE	GA	Ip+ (in⁴/ft)	Ip- (in⁴/ft)	Sp+ (in³/ft)	Sp- (in³/ft)	Fy MIN (KSI)	EVAL REPORT
B (ASC)	20	0.197	0.237	0.228	0.236	50	IAPMO ER-0161
	18	0.287	0.313	0.311	0.329	50	
	16	0.377	0.383	0.397	0.404	50	
B (VERCO)	20	0.213	0.231	0.230	0.237	40	IAPMO ER-2018
	18	0.300	0.306	0.314	0.331	40	
	16	0.381	0.381	0.399	0.410	40	

1 TYP COMPOSITE DECK PROPERTIES

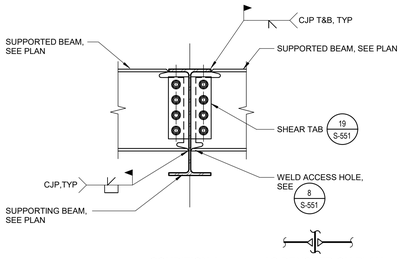
SCALE: NTS — R:_053100_T050B 170828. Q1



ATTACHMENT ZONE	TYP FASTENER	FASTENER PATTERN	SIDE SEAM CONN	PARALLEL CONN SPACING
ZONE 1 (TYP UNO)	HILTI X-ENP-19 L15 PINS INSTALLED PER ESR-3903	36/7/4: (36/7 AT PANEL ENDS, 36/4 AT INTERMEDIATE)	BUTTON PUNCH @ 24" OC PER ESR-3903	6" OC

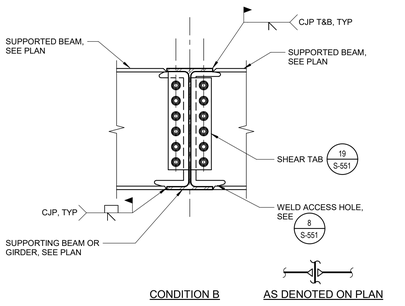
2 TYP 1 1/2" TYPE 'B' COMPOSITE STEEL DECK ATTACHMENT

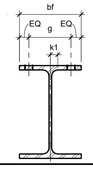
SCALE: NTS — R:_053100_T021A 200304. Q2



4 TYP BEAM TO BEAM MOMENT

1" = 1'-0" — S:_051200_T077A 140127. Q1



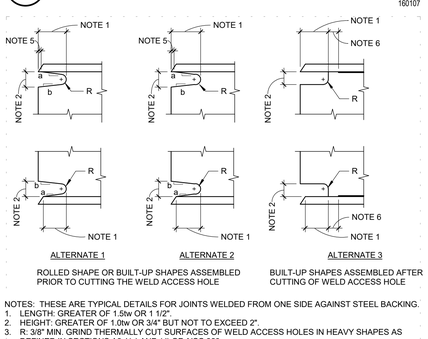


TYP BOLT GAGE FOR W SHAPES		
NOMINAL FLANGE WIDTH bf (IN)	STANDARD GAGE g (IN)	MAX BOLT DIA (IN)
4 ≤ bf < 5	2 1/4	1/2
5 ≤ bf < 6	2 3/4	5/8
6 ≤ bf < 7	3 1/2	3/4
7 ≤ bf < 8	4 1/2	7/8
8 ≤ bf < 12	5 1/2	1
12 ≤ bf < 16	7 1/2	1 1/8
16 ≤ bf < 20	8 1/2	1 1/4

NOTES:
1. SEE AISC FOR BEAM FLANGE WIDTHS bf, k1, AND BOLT ENTERING AND TIGHTENING CLEARANCES.
2. NOTIFY STRUCTURAL ENGINEER WHERE BOLT GAGE NOTED CONFLICTS WITH OTHER ELEMENTS OF CONNECTION.
3. MAXIMUM BOLT DIAM NOTED IS BASED UPON LESSER OF MIN EDGE DISTANCE PER AISC TABLE J3.4 EQUAL TO (MIN bf - g)/2 AND BOLT/WASHER DIAM CLEARANCE EQUAL TO g/2 - MAX k1.

5 TYP BOLT GAGE AT WF BEAMS

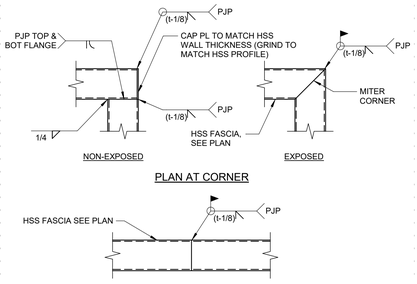
SCALE: NTS — S:_051200_T005A 140127



NOTES:
1. "t" SHALL BE THE LESSER OF THE HSS BEAM/COLUMN WALL THICKNESS OR 5/16", TYP UNO
2. GRIND SMOOTH ALL ARCHITECTURALLY EXPOSED WELDED CONNECTIONS
3. REMOVE ERECTION TABS THAT MAY BE REQUIRED
4. IF BEAM IS WIDER THAN COLUMN, CAP END OF BEAM SIM TO COLUMN CAP PLATE

6 TYP EXPOSED HSS BM TO HSS COL

1" = 1'-0" — S:_051200_T043A 140127



NOTES:
1. SEE STRUCTURAL STEEL NOTES FOR CRITERIA WHERE CONNECTIONS ARE EXPOSED AND VISIBLE TO THE PUBLIC AND BUILDING OCCUPANTS (OTHER THAN MAINTENANCE AREAS).
2. "t" IS THE HSS WALL THICKNESS

7 TYP HSS CORNER & SPLICE

1" = 1'-0" — S:_051200_T045A 160107

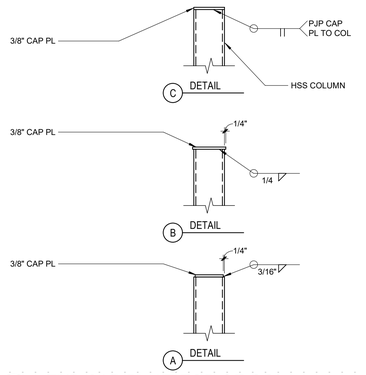
ROLLED SHAPE OR BUILT-UP SHAPES ASSEMBLED PRIOR TO CUTTING THE WELD ACCESS HOLE

BUILT-UP SHAPES ASSEMBLED AFTER CUTTING OF WELD ACCESS HOLE

NOTES: THESE ARE TYPICAL DETAILS FOR JOINTS WELDED FROM ONE SIDE AGAINST STEEL BACKING.
1. LENGTH: GREATER OF 1.5tw OR 1 1/2".
2. HEIGHT: GREATER OF 1.0tw OR 3/4" BUT NOT TO EXCEED 2".
3. R: 3/8" MIN. GRIND THERMALLY CUT SURFACES OF WELD ACCESS HOLES IN HEAVY SHAPES AS DEFINED IN SECTIONS A3.1(c) AND (d) OF AISC 360.
4. SLOPE a FORMS A TRANSITION FROM THE WEB TO THE FLANGE. SLOPE b MAY BE HORIZONTAL.
5. THE BOTTOM OF THE TOP FLANGE IS TO BE CONTOURED TO PERMIT THE TIGHT FIT OF BACKING BARS WHERE THEY ARE TO BE USED.
6. THE WEB-TO-FLANGE WELD OF BUILT-UP MEMBERS IS TO BE HELD BACK A DISTANCE OF AT LEAST THE WELD SIZE FROM THE EDGE OF THE ACCESS HOLE.

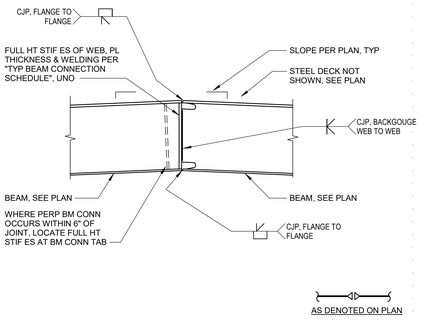
8 TYP WELD ACCESS HOLE

SCALE: NTS — S:_051200_T015A 180723. Q1



9 TYP CAP PL AT TOP OF COL

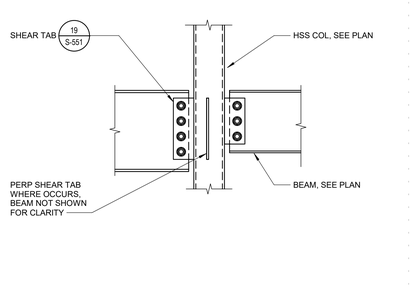
1" = 1'-0" — S:_051200_T0094 180723



NOTES:
1. FLANGE WELDS SHALL MAINTAIN THE FULL FLANGE AREA. USE RUN-OFF TABS, REMOVE & GRIND SMOOTH.
2. SEE TYPICAL DETAILS FOR ACCESS HOLE GEOMETRY

11 TYP WF OR CHANNEL BENT BEAM

1" = 1'-0" — S:_051200_T003A 140127



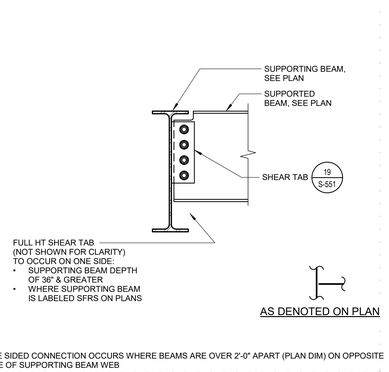
10 TYP HSS COL OVER OR UNDER WF BEAM

1" = 1'-0" — S:_051200_T009A 140127

NOTE: FOR CONNECTIONS AT SFRS BEAMS, SEE

12 TYP WF BEAM TO HSS COL AT CONT COL

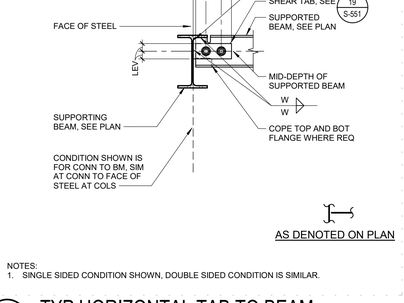
1" = 1'-0" — S:_051200_T0092 180723



NOTES:
1. ONE SIDED CONNECTION OCCURS WHERE BEAMS ARE OVER 2'-0" APART (PLAN DIM) ON OPPOSITE SIDE OF SUPPORTING BEAM WEB

13 TYP ONE SIDED BEAM TO BEAM

SCALE: NTS — S:_051200_T086 180723



14 TYP TWO SIDED BEAM TO BEAM

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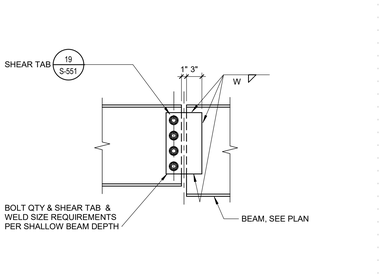


15 TYP BEAM SPLICE

SCALE: NTS — S:_051200_T088 191030

NOTES:
1. SINGLE SIDED CONDITION SHOWN, DOUBLE SIDED CONDITION IS SIMILAR.

16 TYP HORIZONTAL TAB TO BEAM

SCALE: NTS — S:_051200_T011A 180723. Q1

TYP BEAM CONNECTION SCHEDULE			
NOMINAL BEAM OR CHANNEL DEPTH	HIGH STRENGTH BOLTS (QUANTITY) DIA, GROUP	SINGLE ROW OF BOLTS	
		WELD SIZE W	SHEAR TAB THICKNESS T
4, 5, 6, 7	(2) 3/4" HORIZ, A	3/16"	1/4"
8, 9, 10	(2) 3/4", A	3/16"	1/4"
12, 13, 14	(3) 3/4", A	3/16"	1/4"
15, 16, 18	(4) 7/8", A	1/4"	3/8"
20, 21	(5) 7/8", A	1/4"	3/8"
24	(6) 7/8", A	1/4"	3/8"
27	(7) 7/8", A	5/16"	1/2"
30	(8) 7/8", A	5/16"	1/2"
33	(9) 1", B	5/16"	1/2"
36	(10) 1", B	5/16"	1/2"
40	(11) 1", B	5/16"	1/2"
44	(12) 1", B	5/16"	1/2"

NOTES:
1. USE SUPPORTED BEAM DEPTH WITH SCHEDULE. CONNECTION INFORMATION TO BE BASED ON SUPPORTED BEAM DEPTH.
2. ALL BOLTS SHALL BE HIGH STRENGTH BOLT TYPE N WITH THREADS INCLUDED IN THE SHEAR PLANE.
3. GROUP A BOLTS SHALL BE ASTM F3125 GRADE A325 OR F1825.
4. GROUP B BOLTS SHALL BE ASTM F3125 GRADE A490 OR F2280.
5. GROUP C BOLTS SHALL BE ASTM F3043 OR ASTM F311.
6. FOR BEAMS LESS THAN 8" DEEP, SEE DETAIL 16/S-551

17 TYP BEAM CONNECTION SCHEDULE

SCALE: NTS — S:_051200_T084 180723. Q1

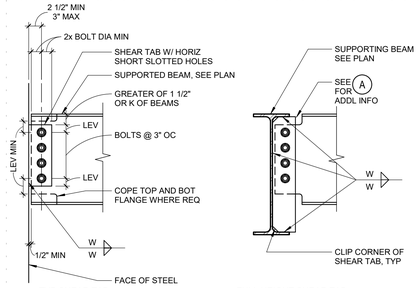
HOLE DIMENSIONS AT STEEL TO STEEL CONNECTIONS				
BOLT DIA, D	STANDARD (DIA)	OVERSIZED (DIA)	SHORT SLOT (WIDTH X LENGTH)	LONG SLOT (WIDTH X LENGTH)
1/2"	9/16"	5/8"	9/16"X11/16"	9/16"X1 1/4"
5/8"	11/16"	13/16"	11/16"X7/8"	11/16"X1 9/16"
3/4"	13/16"	15/16"	13/16"X1"	13/16"X1 7/8"
7/8"	15/16"	1 1/16"	15/16"X1 1/8"	15/16"X2 3/16"
1"	1 1/8"	1 1/4"	1 1/8"X1 5/16"	1 1/8"X2 1/2"
1 1/8" & GREATER	D + 1/8"	D + 5/16"	(D + 1/8")x(D + 3/8")	(D + 1/8")x(2.5 x D)

HOLE DIMENSIONS AT STEEL TO CONCRETE / MASONRY CONNECTIONS			
BOLT DIA	ANCHOR ROD HOLE DIA	BOLT DIA	ANCHOR ROD HOLE DIA
1/2"	15/16"	1 1/4"	2 1/16"
5/8"	1 1/16"	1 1/2"	2 5/16"
3/4"	1 5/16"	1 3/4"	2 3/4"
7/8"	1 9/16"	2"	3 1/4"
1"	1 13/16"	2 1/2"	3 3/4"

PLATE WASHER SCHEDULE (WITH STANDARD HOLE AT CENTER)			
BOLT DIA	STEEL PLATE SIZE	BOLT DIA	STEEL PLATE SIZE
1/2"	3/16"X1 1/2" SQ	1 1/4"	1/2"X3 1/2" SQ
5/8"	1 /4"X1 3/4" SQ	1 1/2"	1/2"X4" SQ
3/4"	1 /4"X2" SQ	1 3/4"	5/8"X4 1/2" SQ
7/8"	5/16"X2 1/2" SQ	2"	3/4"X5" SQ
1"	3/8"X3" SQ	2 1/2"	7/8"X6" SQ

18 TYP BOLT HOLE & PLATE WASHER SCHEDULE

SCALE: NTS — S:_051200_T100 180723. Q1



NOTES:
1. SHEAR TABS SHALL BE CONDITION (A) TYP, UNO.
2. FOR BOLT SIZE & QUANTITY, SHEAR TAB THICKNESS "T" AND WELD SIZE "W" SEE USING NOMINAL DEPTH OF SUPPORTED BEAM. 17/S-551
3. FOR K DIMENSION SEE AISC.
4. ALL BOLTS SHALL BE IN HORIZONTAL SHORT SLOTTED HOLES AT TAB AND BEAM, TYP UNO.
5. LEV = 1 1/4" MIN AT 3/4" DIA BOLTS, 1 1/2" MIN AT 7/8" DIA BOLTS, AND 1 3/4" MIN AT 1" DIA BOLTS.

19 TYP SHEAR TAB

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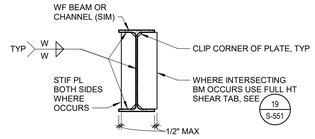

TYP STIF PL SCHEDULE		
NOMINAL BEAM OR CHANNEL DEPTH	WELD SIZE W	STIF PL THICKNESS T
4, 5, 6, 7	3/16"	1/4"
8, 9, 10	3/16"	1/4"
12, 13, 14	3/16"	1/4"
15, 16, 18	1/4"	3/8"
20, 21, 24	1/4"	3/8"
27, 30, 33	5/16"	1/2"
36, 40, 44	5/16"	1/2"

20 TYP STIFFENER PLATE

SCALE: NTS — S:_051200_T090 180723

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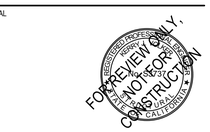

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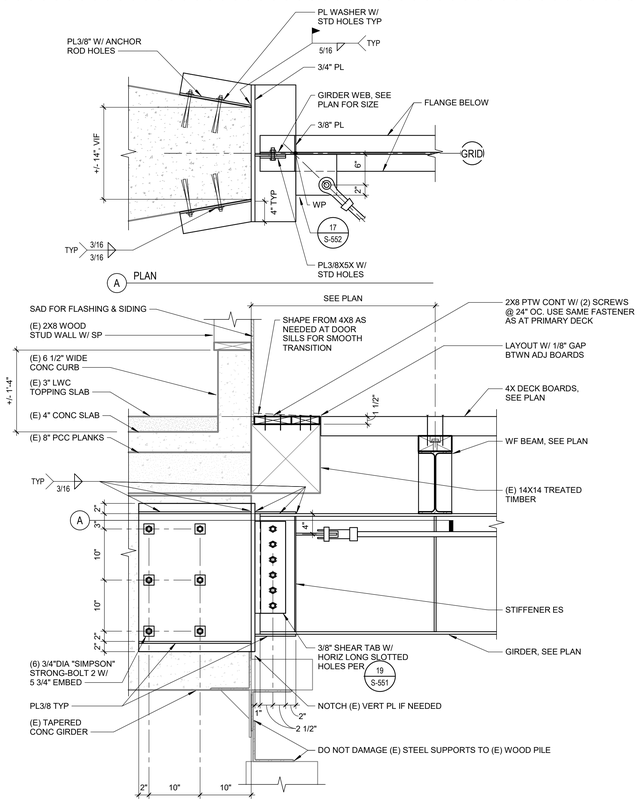
AGENCY

TITLE
DETAILS - TYPICAL STRUCTURAL STEEL BEAMS

SHEET
S-551



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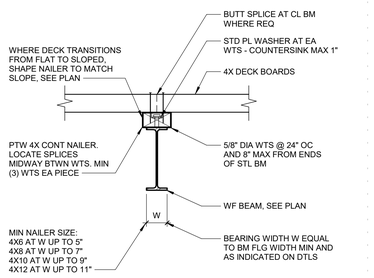

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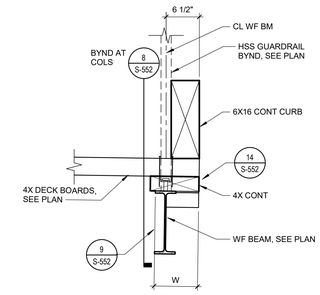

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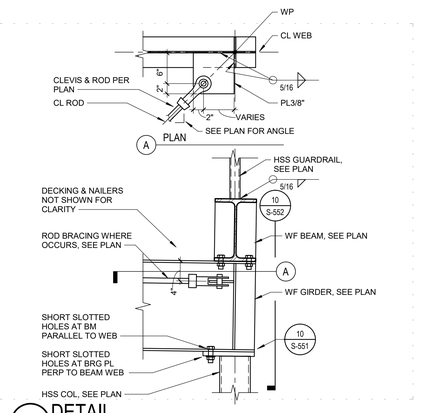

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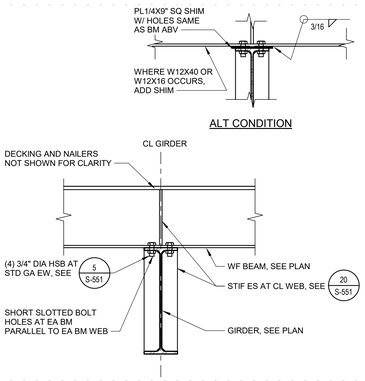

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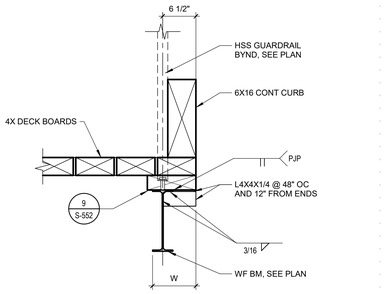

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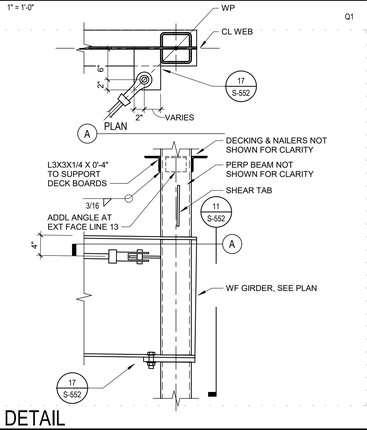

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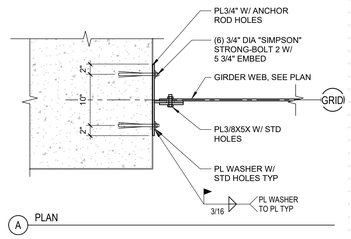

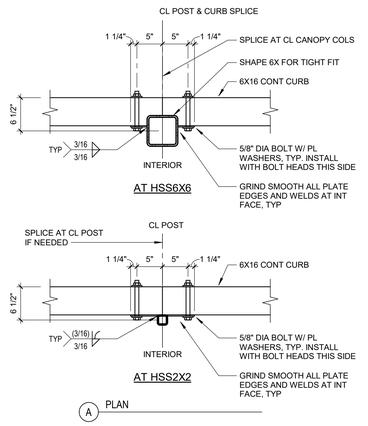

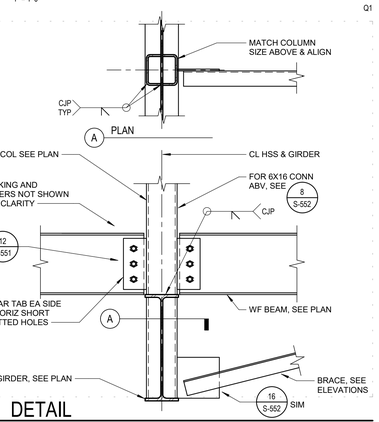

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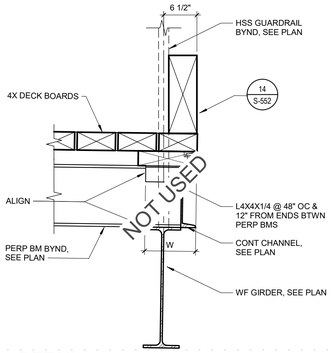

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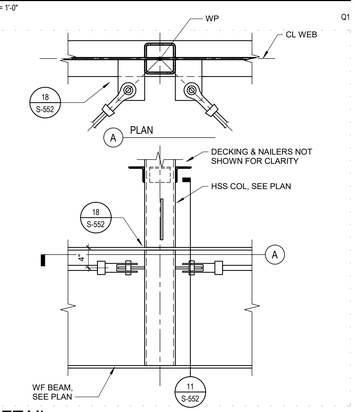

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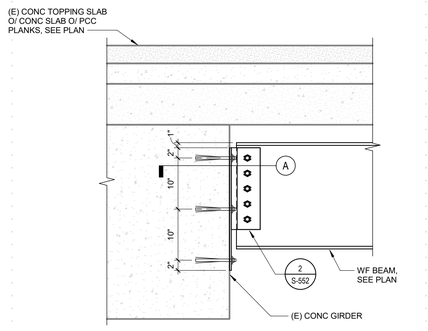

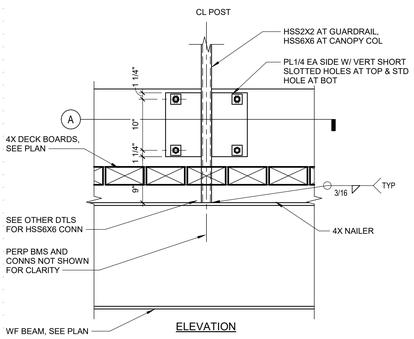

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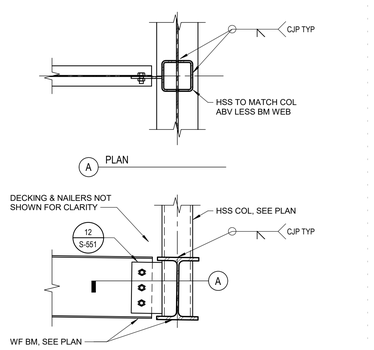

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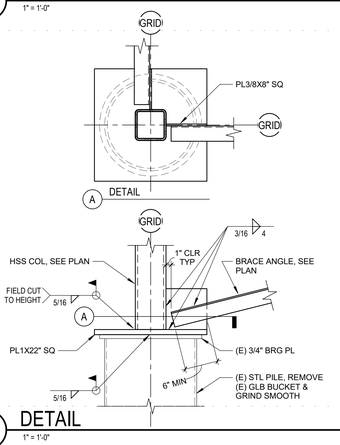

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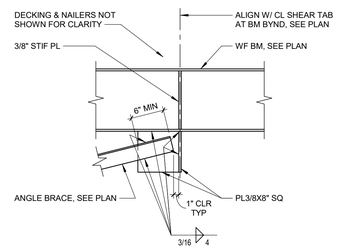

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DETAILS - STRUCTURAL STEEL

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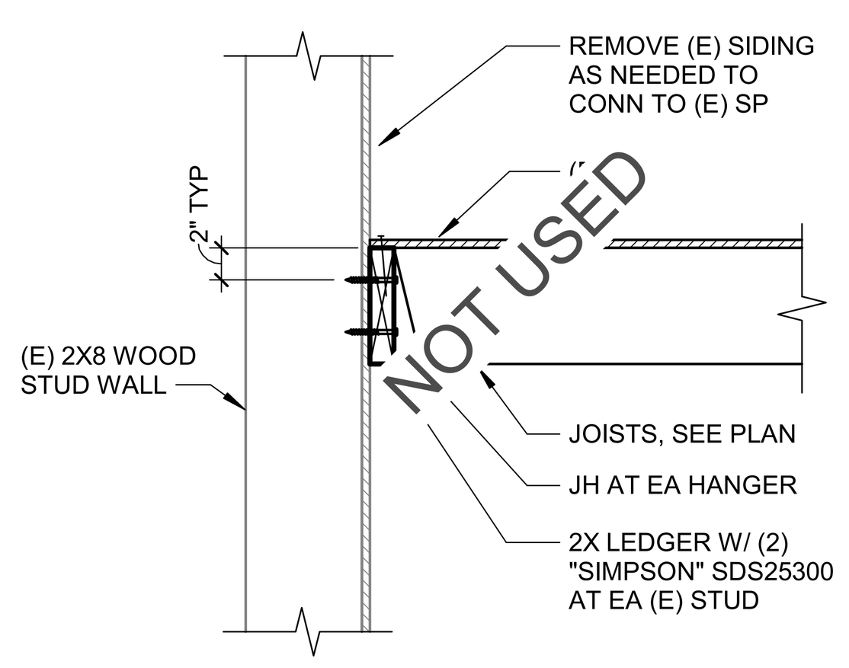

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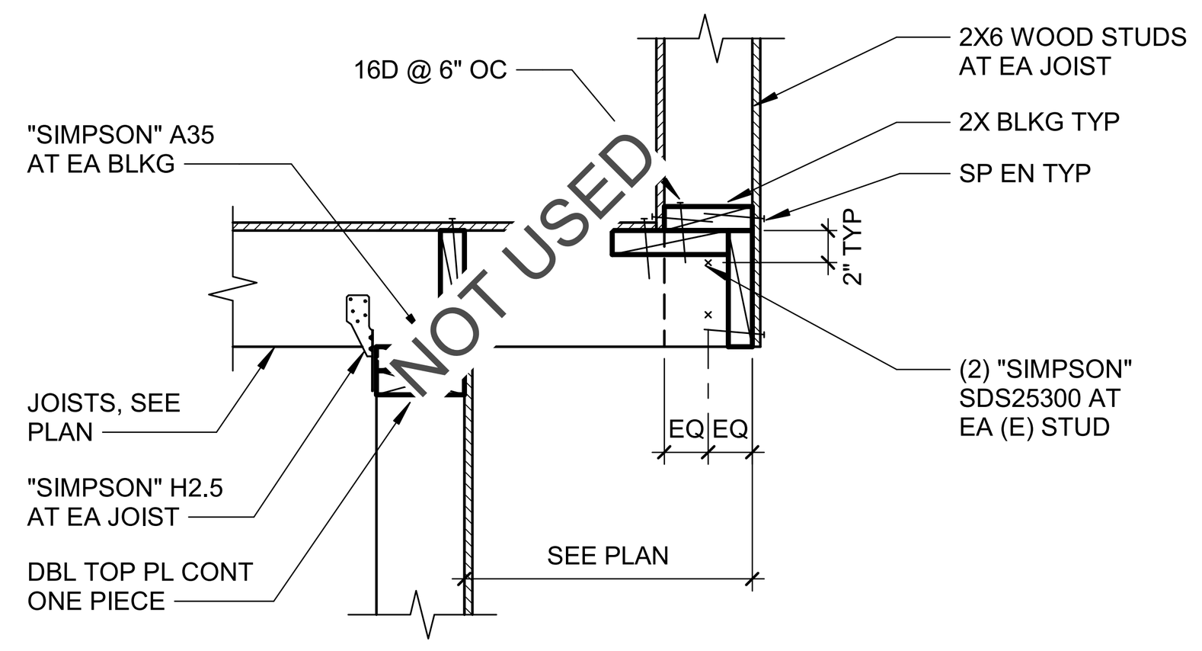

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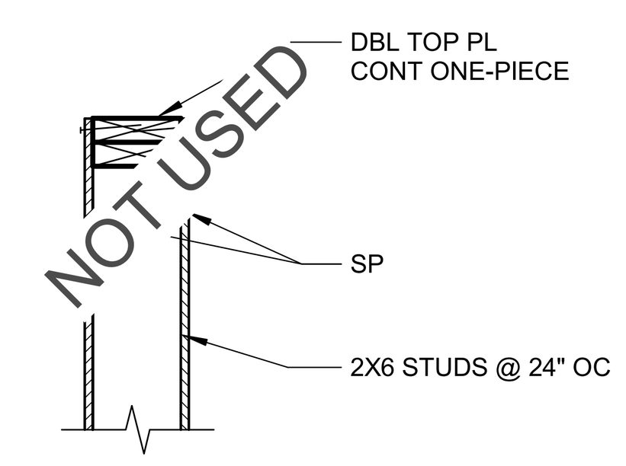

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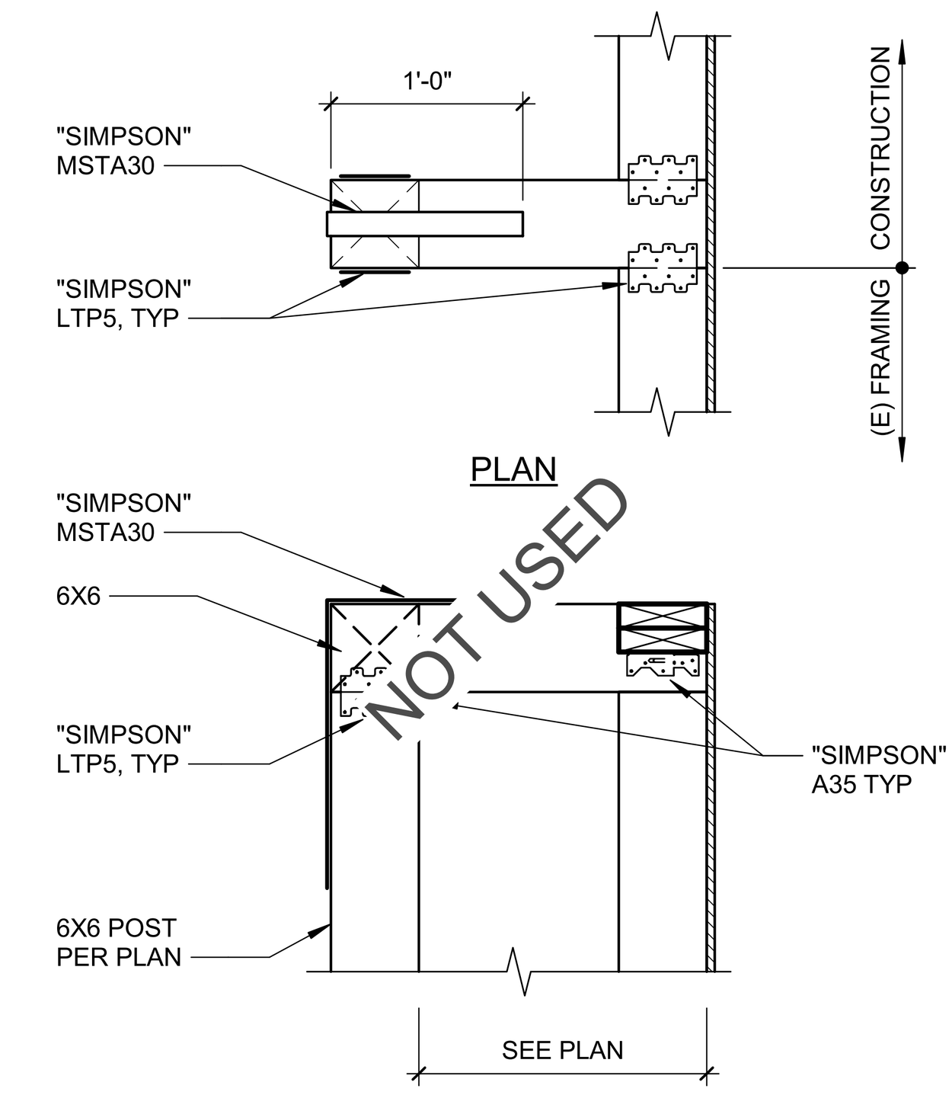

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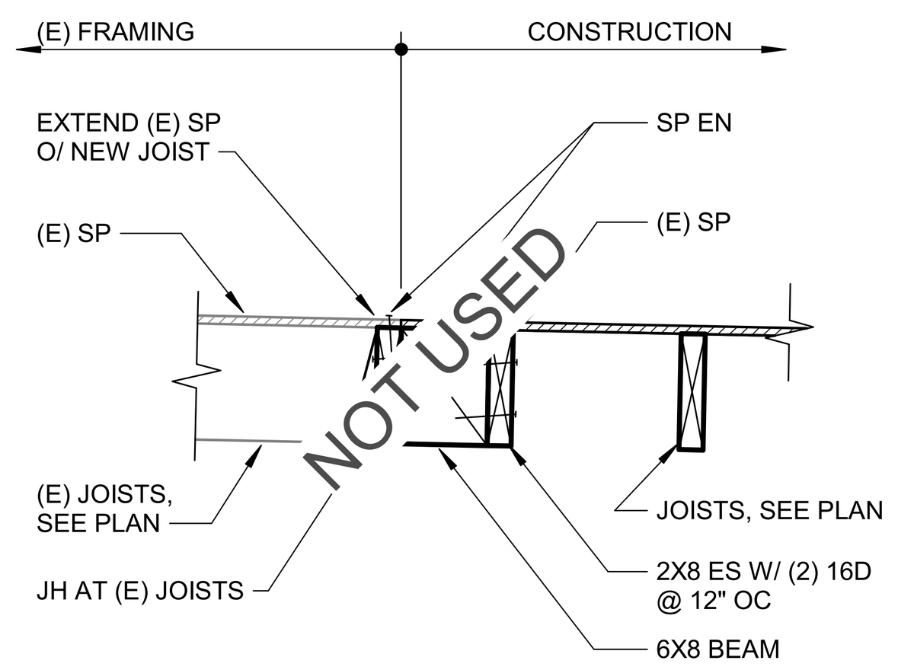

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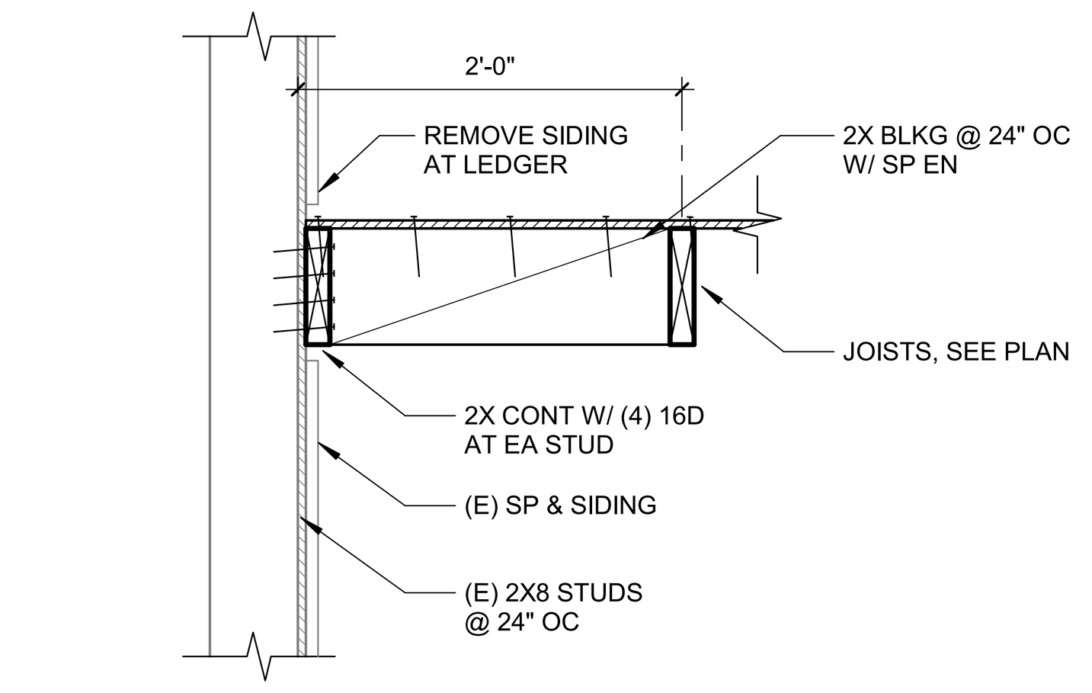

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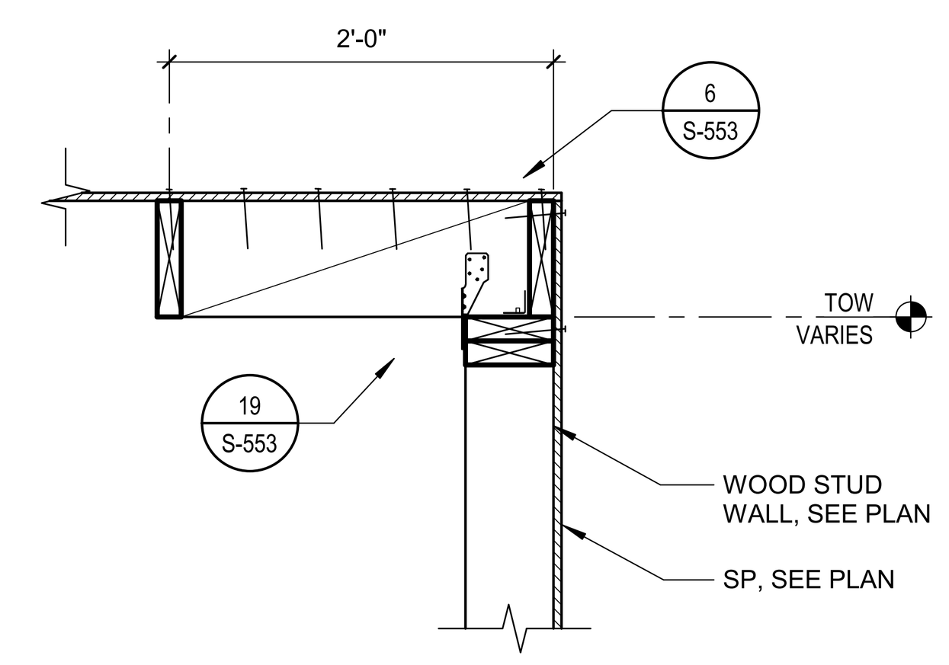

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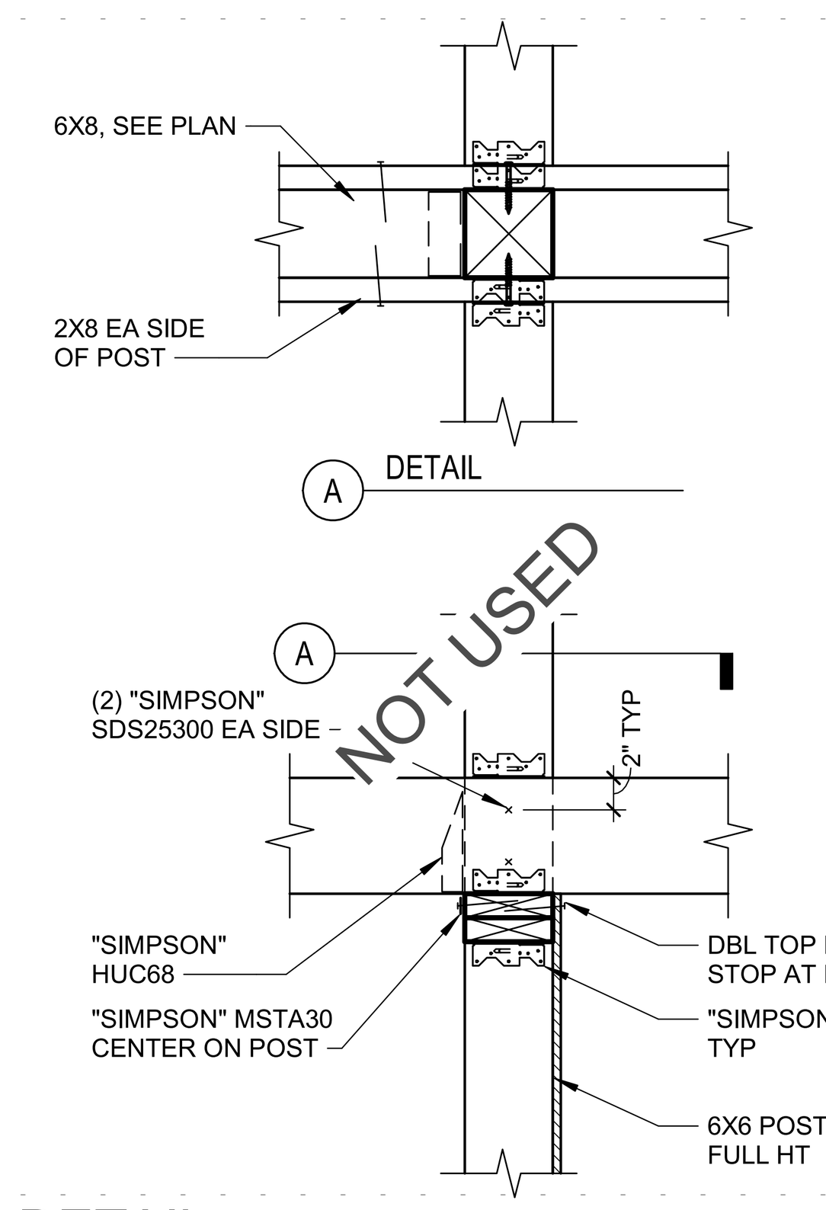

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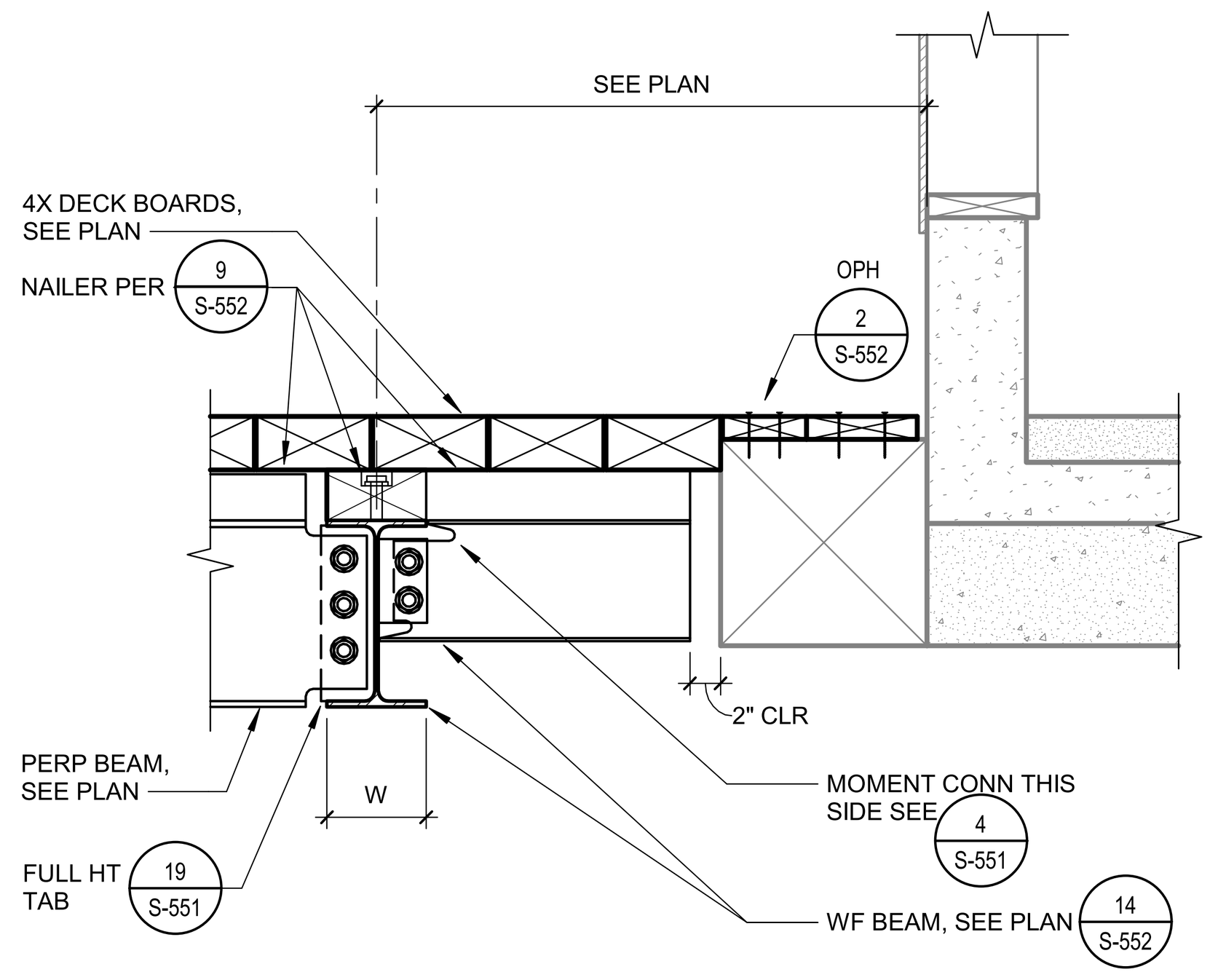

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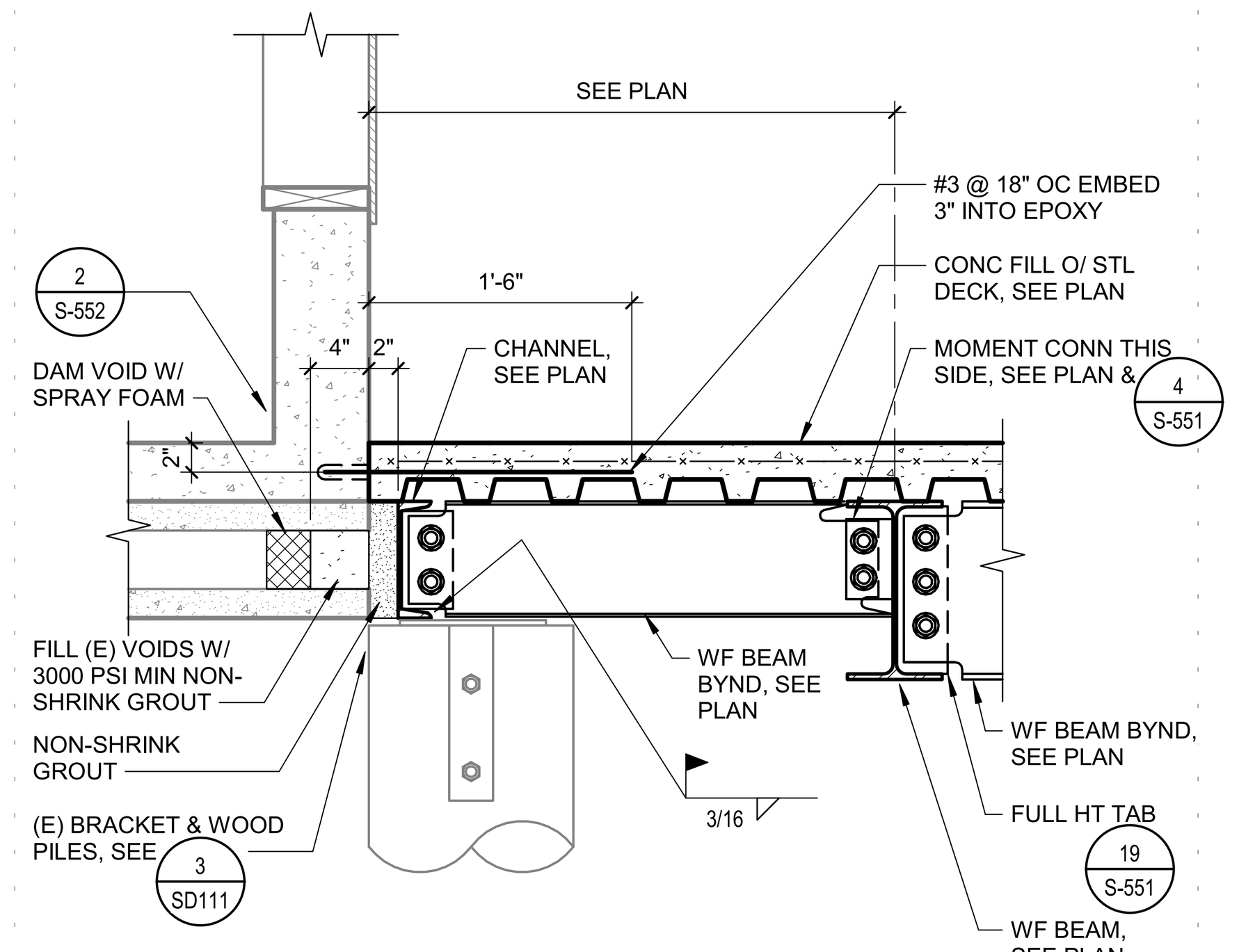

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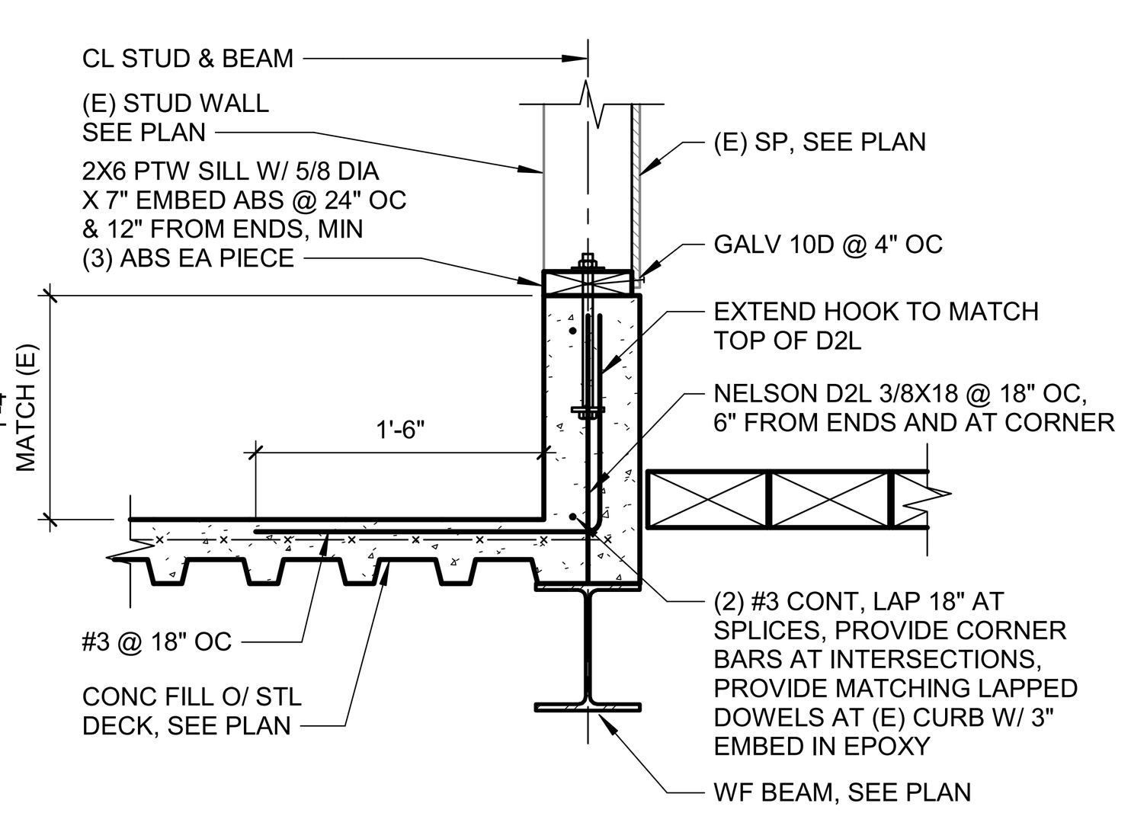

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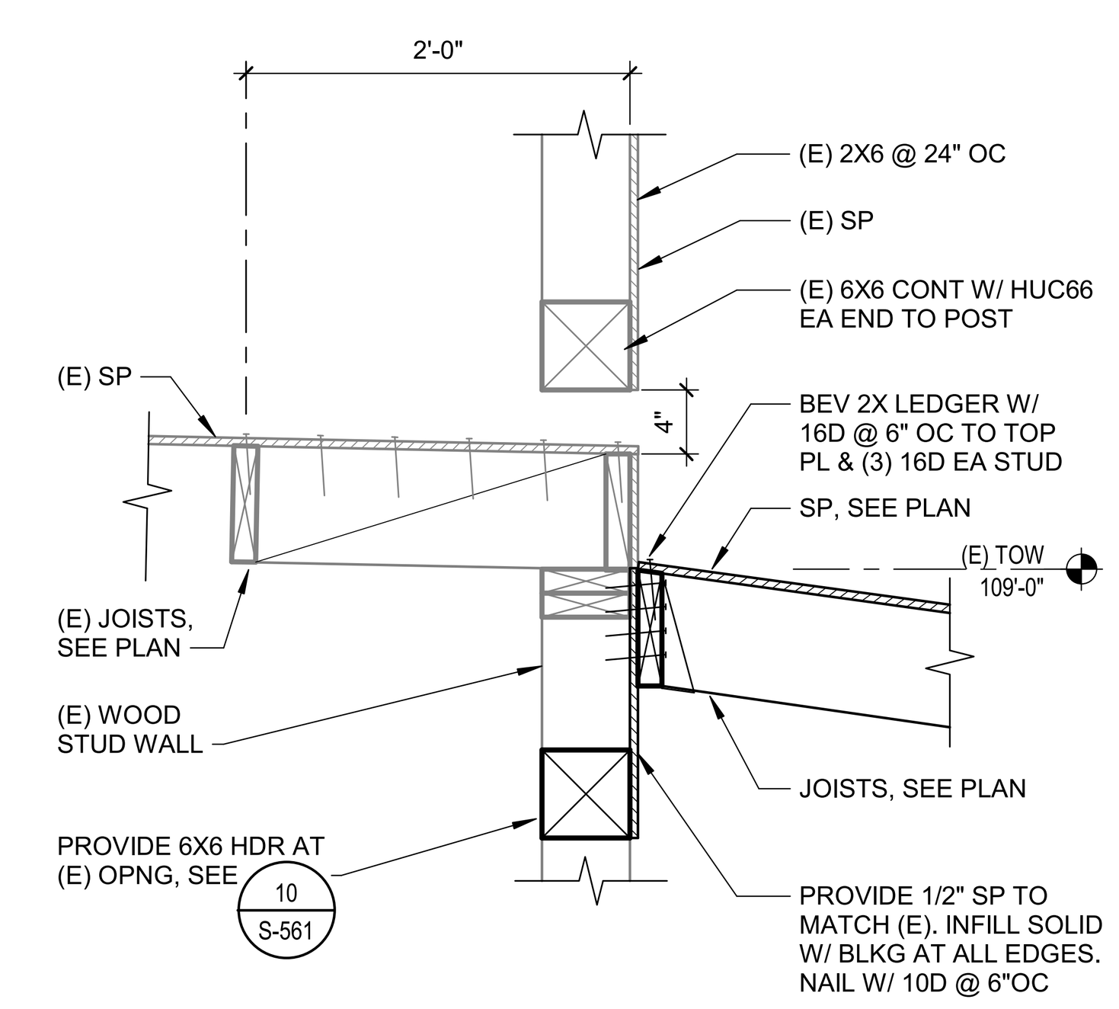

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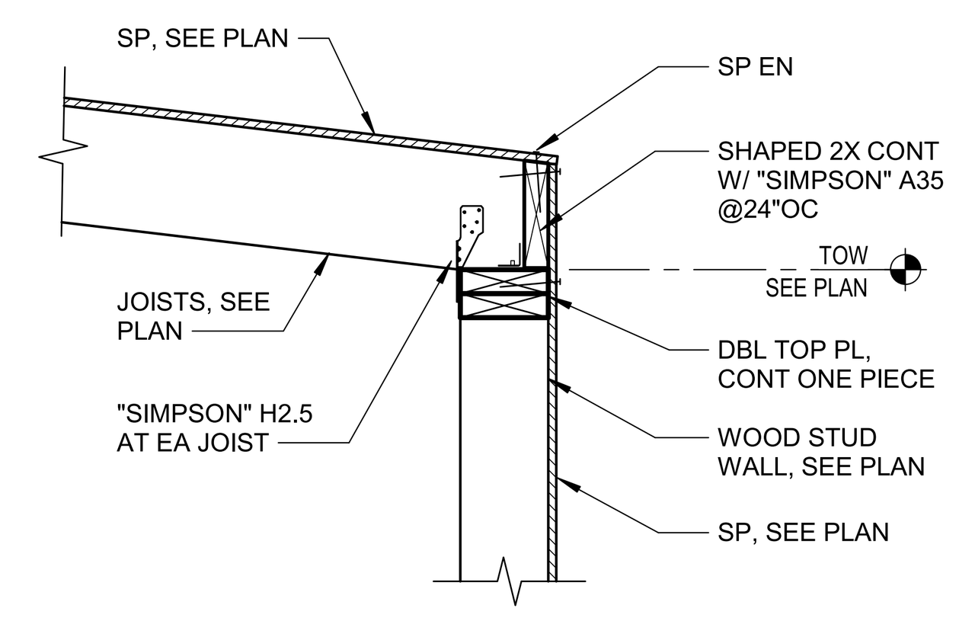

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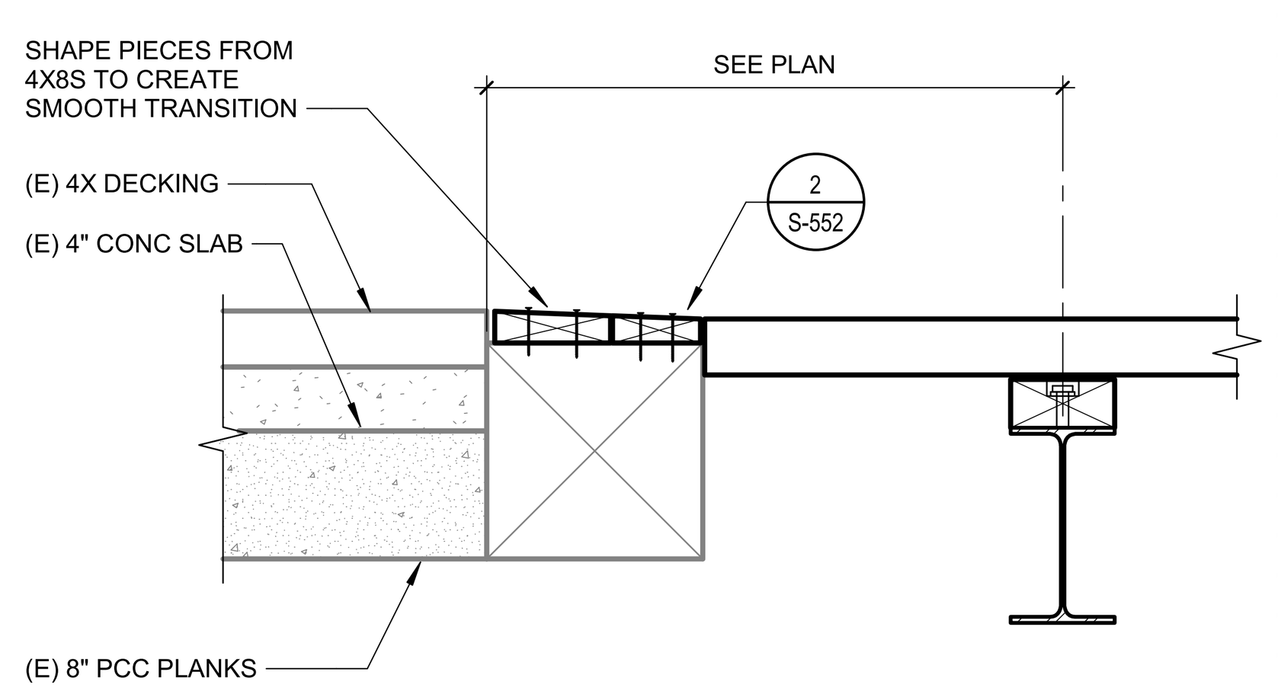

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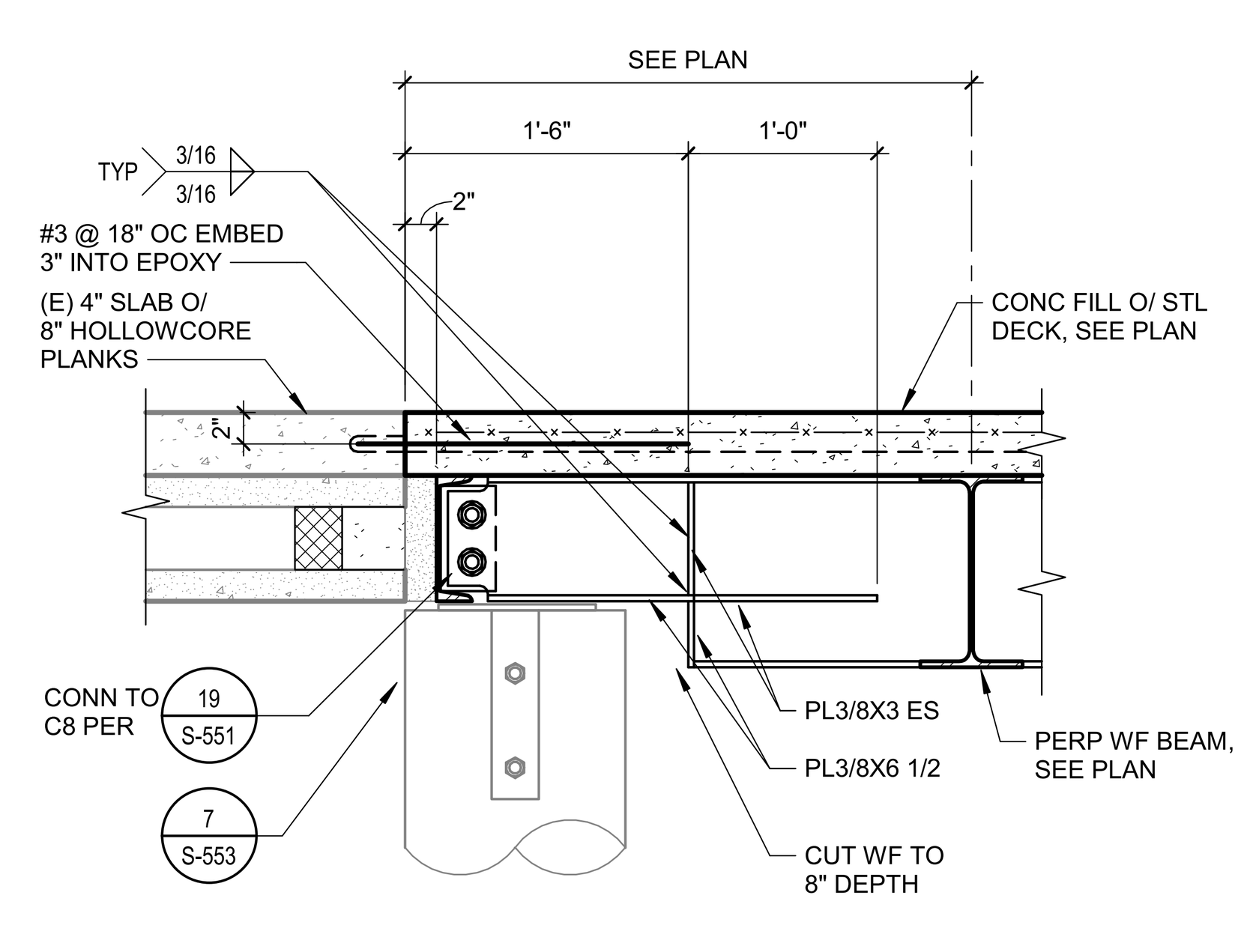

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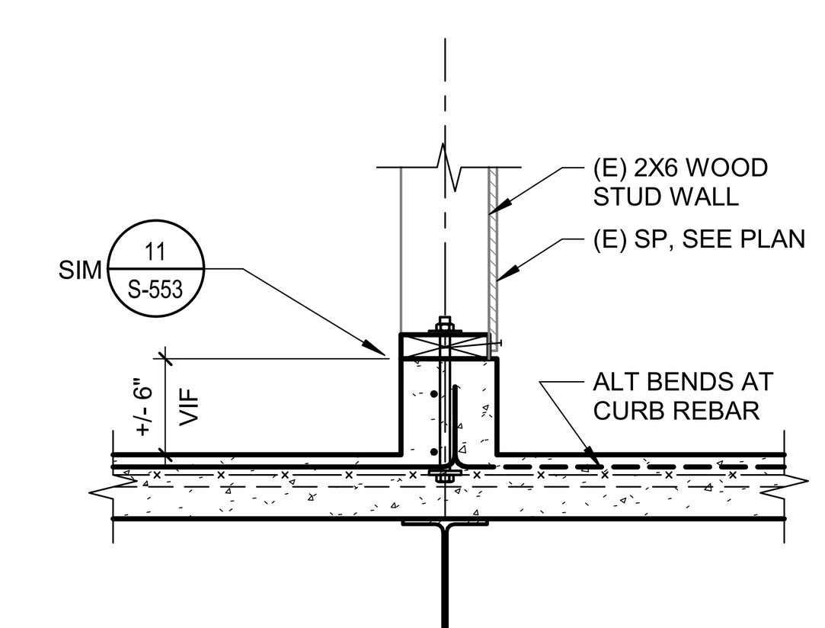

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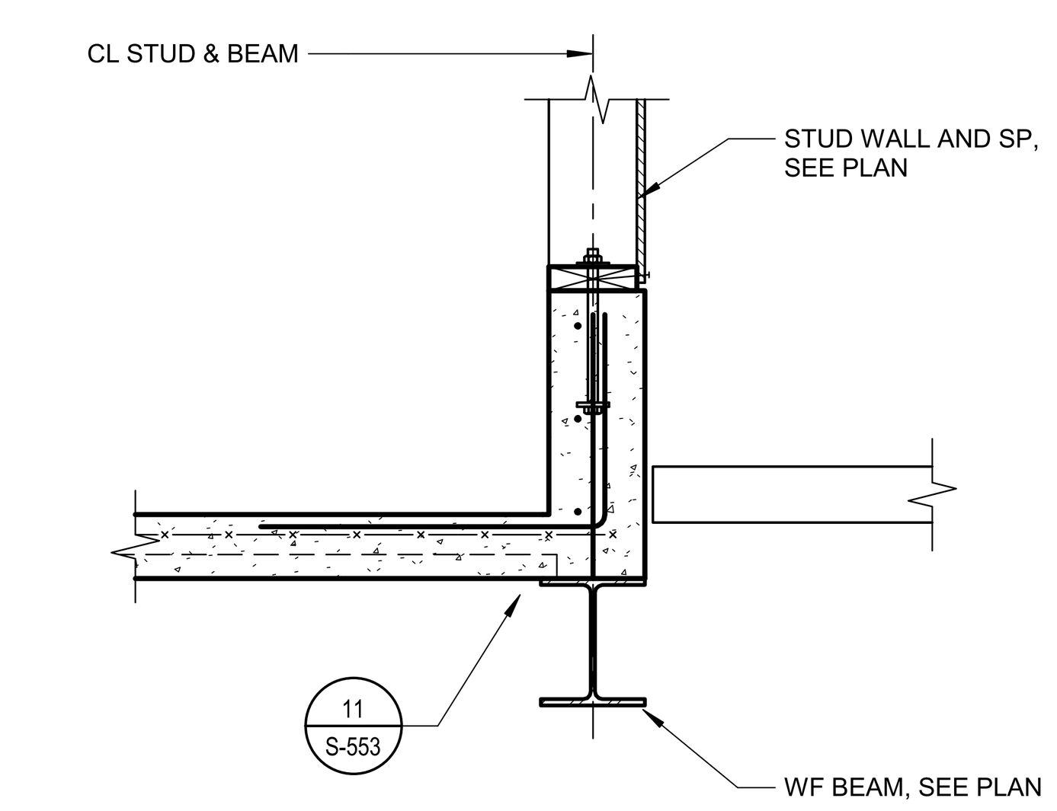

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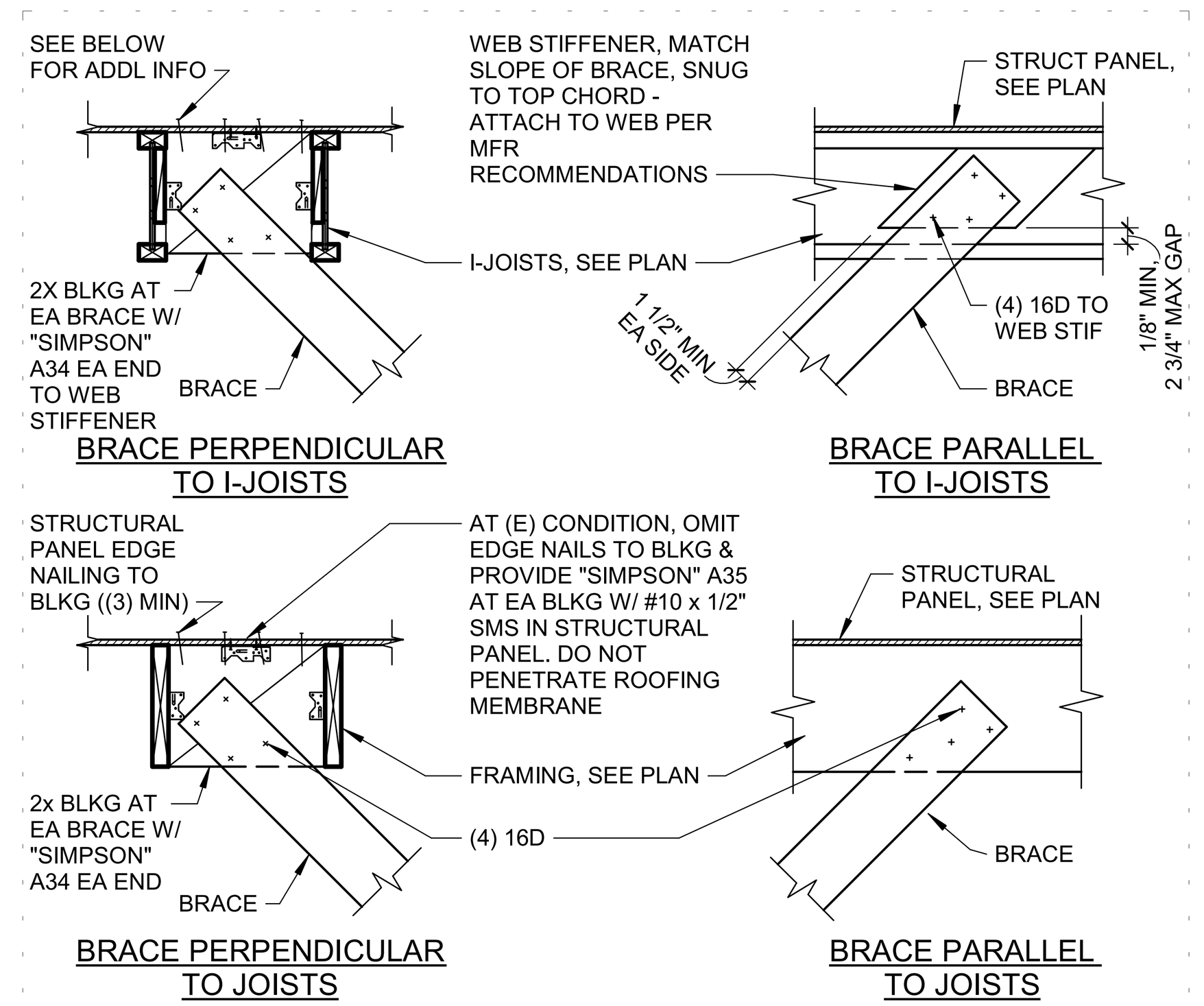

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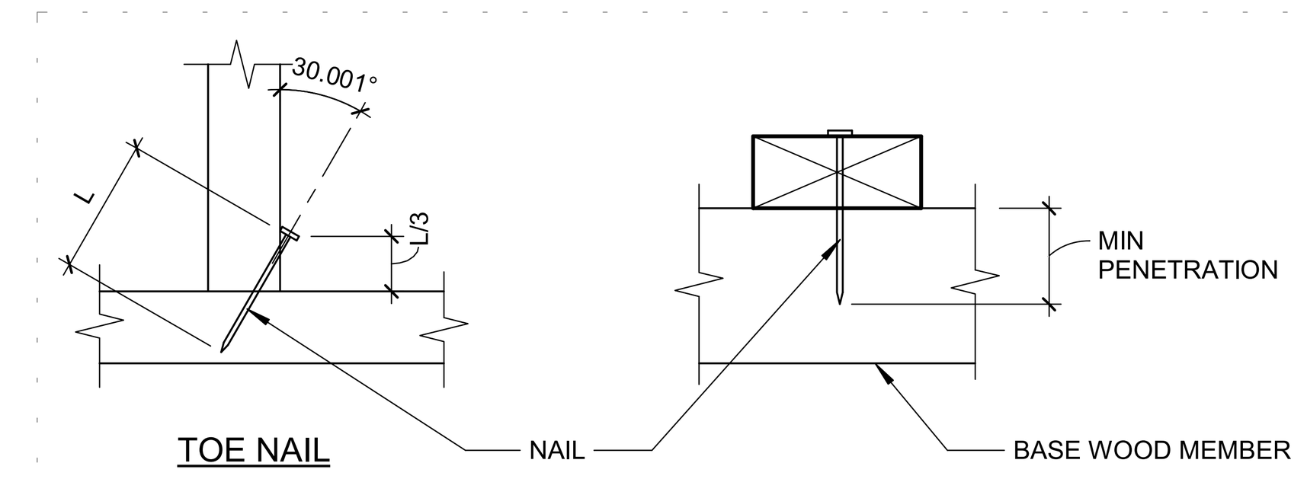
180508. Q2

17 TYP NAIL INSTALLATION

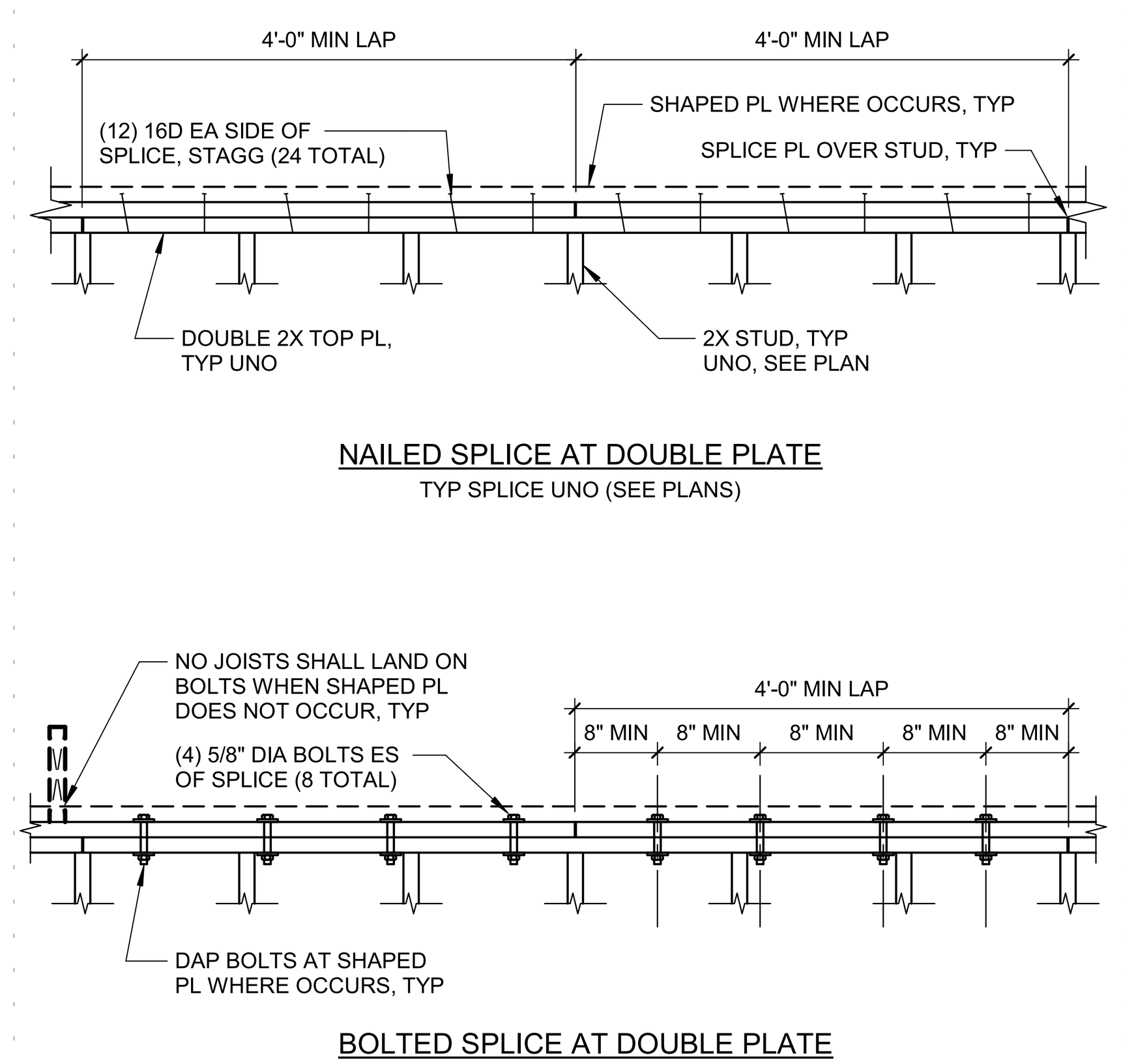


NAIL SCHEDULE						
NAIL PENNY WEIGHT	SHANK DIA (IN)	LENGTH (IN)	MAXIMUM PREDRILL BIT DIA. (IN)	MINIMUM PENETRATION (IN)	MINIMUM SPACING (IN)	MINIMUM EDGE DISTANCE
8d COMMON	0.131	2 1/2	3/32	1 5/8	1 5/8	13/16
10d COMMON	0.148	3	7/64	1 7/8	1 7/8	15/16
16d COMMON	0.162	3 1/2	1/8	2	2	1
20d BOX	0.148	4	7/64	1 7/8	1 7/8	15/16
30d BOX	0.148	4 1/2	7/64	1 7/8	1 7/8	15/16
40d BOX	0.162	5	1/8	2	2	1

NOTES:
1. NAIL LENGTHS DENOTED ARE FOR STANDARD NAILS. SHORTER NAILS W/ EQUIVALENT DIA WILL BE PERMITTED IF MINIMUM PENETRATION INTO BASE WOOD MEMBER IS MAINTAINED.
2. PREDRILL TO PREVENT SPLITTING

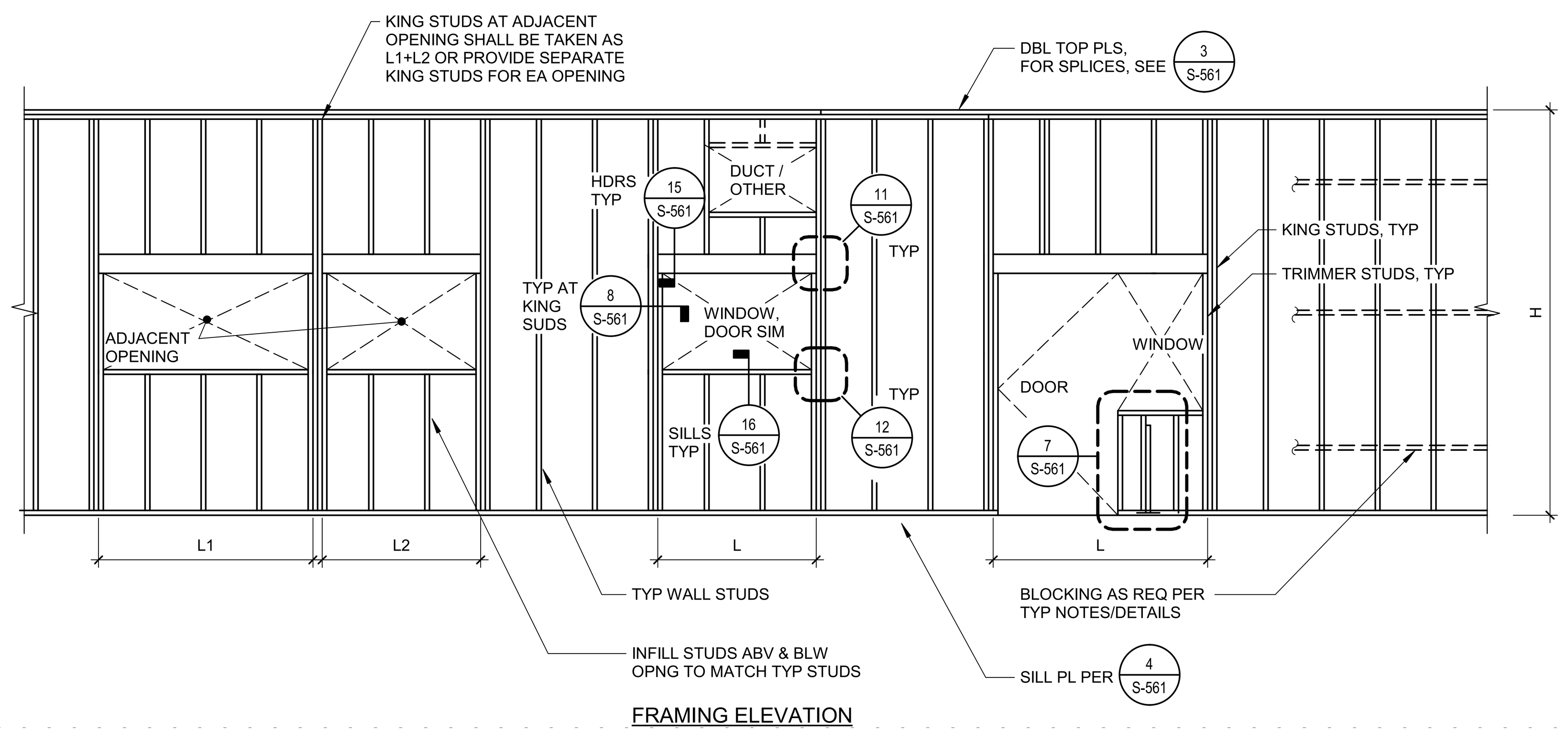
SCALE: NTS
S-_061010_T005A
140127. Q2

3 TYP TOP PLATE SPLICES



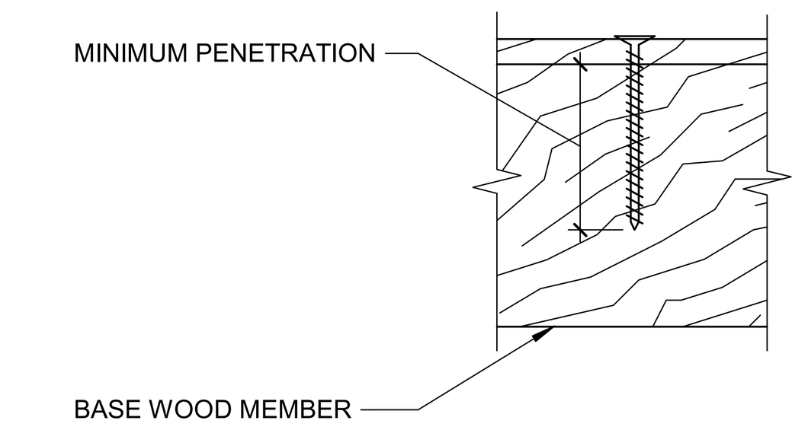
SCALE: NTS
S-_061010_T038A
190227. Q2

10 TYP STRUCT WOOD STUD WALL



SCALE: NTS
S-_061000_T011A
180723. Q2

18 TYP WOOD SCREW INSTALLATION

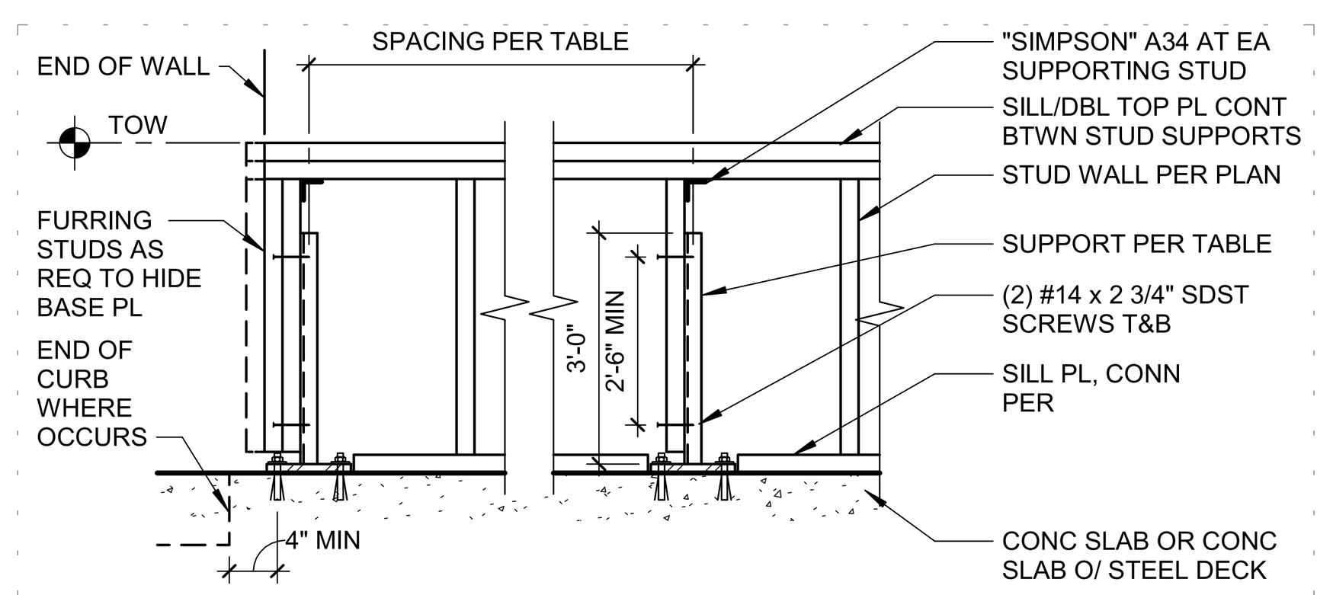


WOOD SCREW SCHEDULE			
SCREW SIZE	SCREW DIAMETER	MAXIMUM PREDRILL BIT DIA (IN)	MINIMUM PENETRATION UNO
#8	0.164	3/32"	1 1/4"
#10	0.190	7/64"	1 1/2"
#12	0.216	1/8"	1 3/4"
#14	0.242	5/32"	2"

NOTES:
1. PREDRILL ALL SCREW HOLES W/ COUNTERSINK BIT.
2. ALL SCREWS TO HAVE FLAT HEAD FOR WOOD TO WOOD CONNECTIONS AND PAN HEAD FOR SP TO WOOD OR METAL TO WOOD CONNECTIONS.
3. ALL SCREWS TO HAVE ROLLED THREADS.
4. WAX SHALL BE USED ON THE WOOD SCREWS OR IN THE LEAD HOLES TO FACILITATE INSERTION AND PREVENT DAMAGE TO THE WOOD SCREW.
5. THE THREADED PORTION OF THE WOOD SCREW SHALL BE INSERTED IN ITS LEAD HOLE BY TURNING WITH A WRENCH, NOT BY DRIVING WITH A HAMMER.

SCALE: NTS
S-_061010_T006A
140127. Q2

7 TYP PARTIAL HEIGHT STRUCT WALL SUPPORT



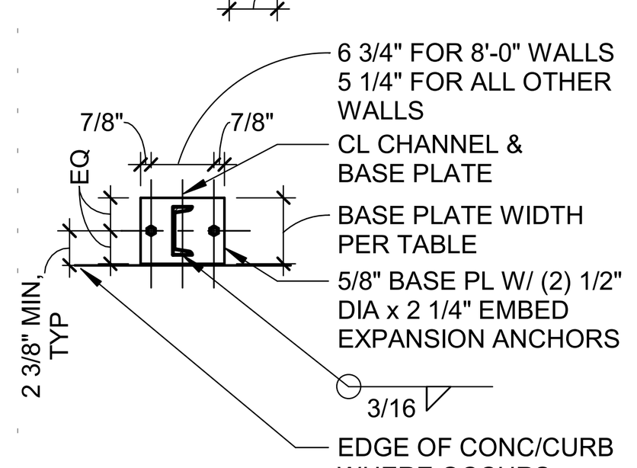
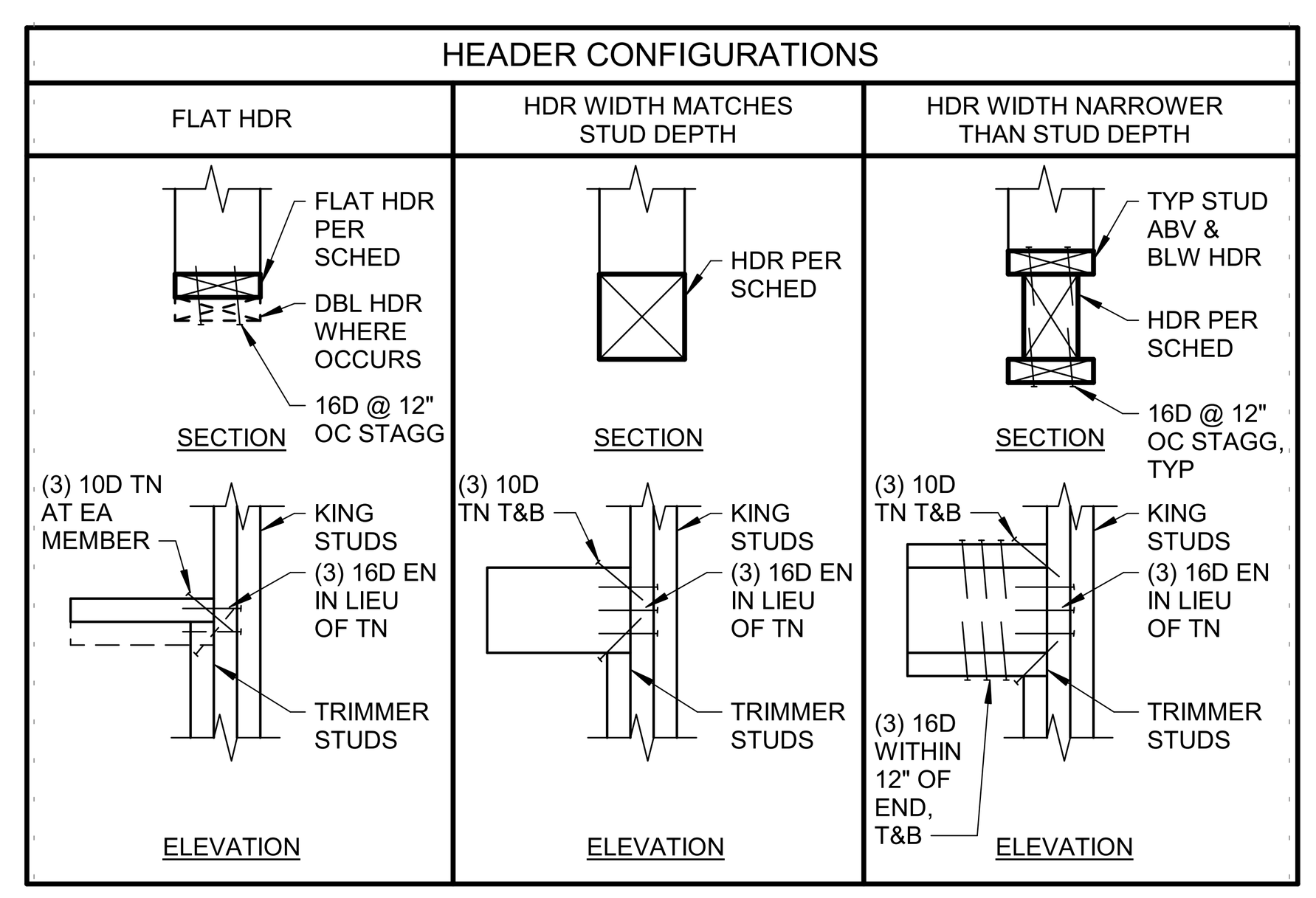


TABLE FOR MAXIMUM SPACING OF SUPPORTS					
STUD WALL	SUPPORT SIZE	BASE PL WIDTH	MAX WALL HEIGHT		
			4'-0"	5'-0"	6'-0"
2x6	C4x4.5	5 1/2"	10'-8"	6'-8"	4'-0"
2x8	C4x4.5	7"	-	9'-4"	6'-8"

NOTES:
1. EXPANSION ANCHORS MUST BE INSTALLED WITH SPECIAL INSPECTION. DO NOT USE THIS DETAIL FOR WALLS USED AS GUARDRAILS OR WALLS WITH GRAB BARS.

SCALE: NTS
S-_061000_T013A
180723. Q1

11 TYP WOOD HEADER CONN TO KING STUDS



SCALE: NTS
S-_061000_T003A
180723. Q2

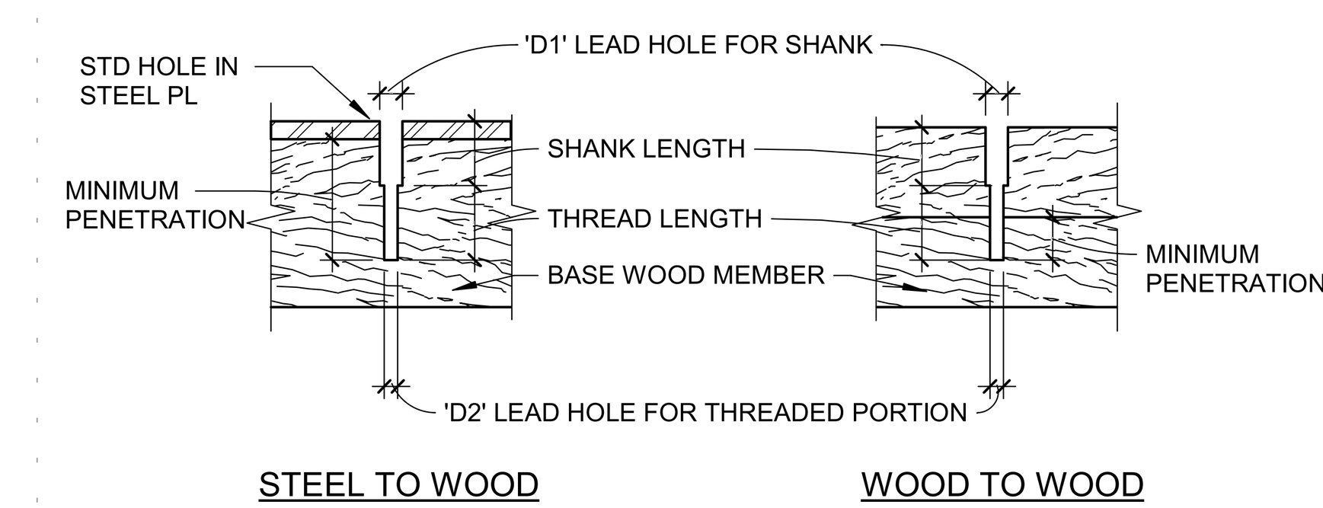
15 TYP STRUCT WOOD HEADERS

HEADER SCHEDULE				
OPNG WIDTH, L	4' MAX	8' MAX	10' MAX	OVER 10'
HDR TYPE	HS1	HS2	HS3	SEE PLANS
MIN HDR SIZE	4X8 OR 6X6	6X10	6X12	

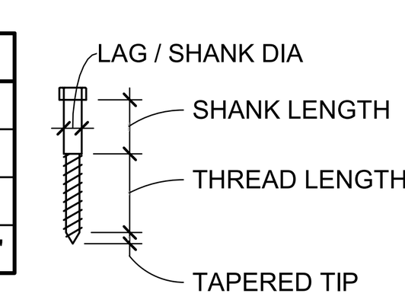
NOTES:
1. HEADER TYPE TO BE SELECTED BASED ON WALL CONFIGURATION AND OPENING WIDTH UNLESS A SPECIFIC HDR TYPE IS NOTED ON OTHER DETAILS.
2. HEADER SIZE IS A MINIMUM AND MAY BE INCREASED TO MATCH WALL STUD WIDTH AS NEEDED.

SCALE: NTS
S-_061000_T004A
180723. Q2

19 TYP LAG SCREW INSTALLATION



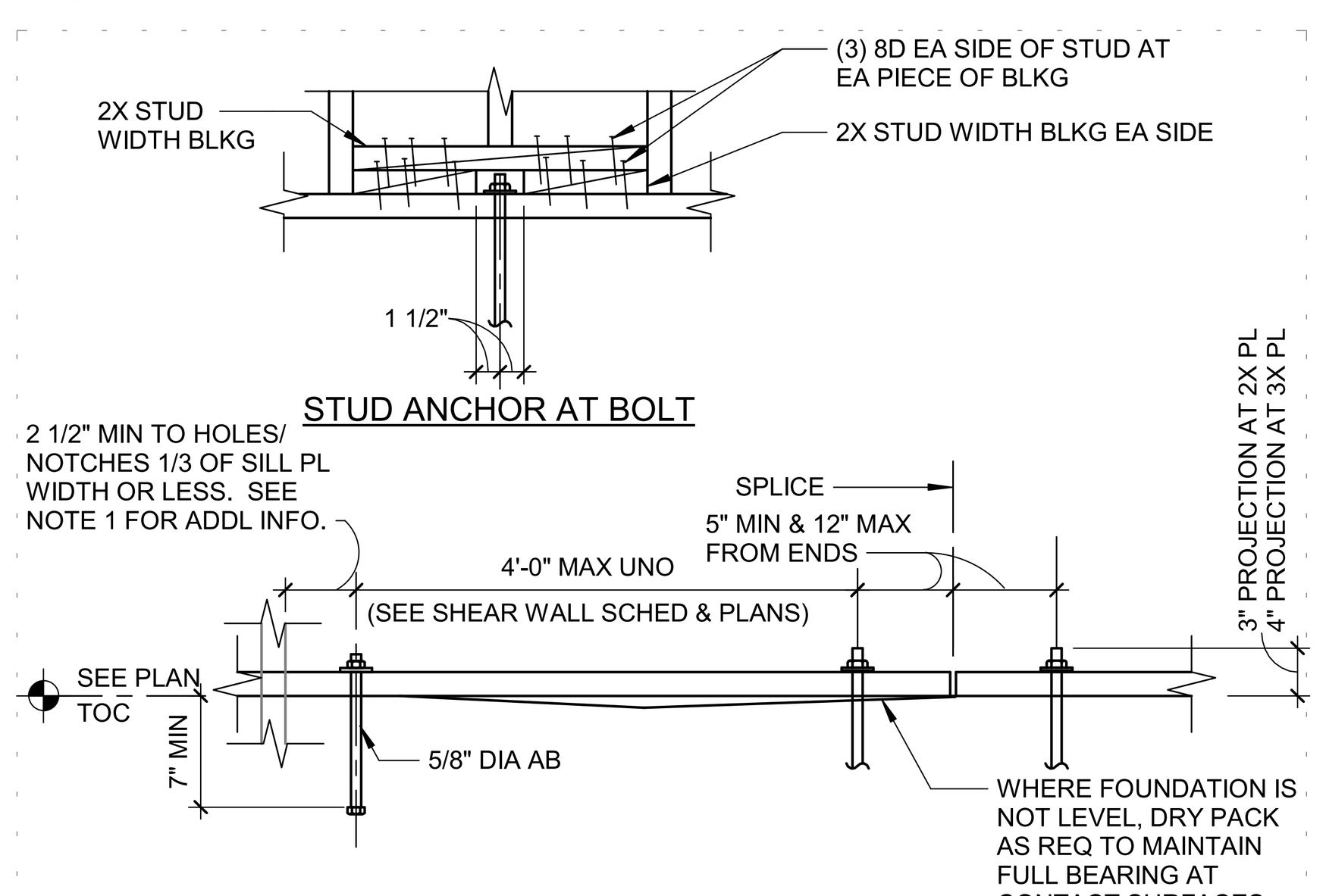
LAG SCREW SCHEDULE							
LAG / SHANK DIA	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"
'D1' HOLE SIZE	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"
'D2' HOLE SIZE	1/8"	1/4"	1/4"	3/8"	1/2"	1/2"	5/8"
MIN PENETRATION	2 1/2"	3 3/4"	4 3/4"	6"	7 1/4"	8 1/2"	9 1/2"



NOTES:
1. THE THREADED PORTION OF THE LAG SCREW SHALL BE INSERTED IN ITS LEAD HOLE BY TURNING WITH A WRENCH, NOT BY DRIVING WITH A HAMMER.
2. WAX SHALL BE USED ON THE LAG SCREW OR IN THE LEAD HOLE TO FACILITATE INSERTION AND PREVENT DAMAGE TO THE LAG SCREW.
3. MINIMUM PENETRATION DOES NOT INCLUDE THE LENGTH OF THE TAPERED TIP.

SCALE: NTS
S-_061010_T004A
160711. Q2

4 TYP AB AT WOOD SILL PLATE

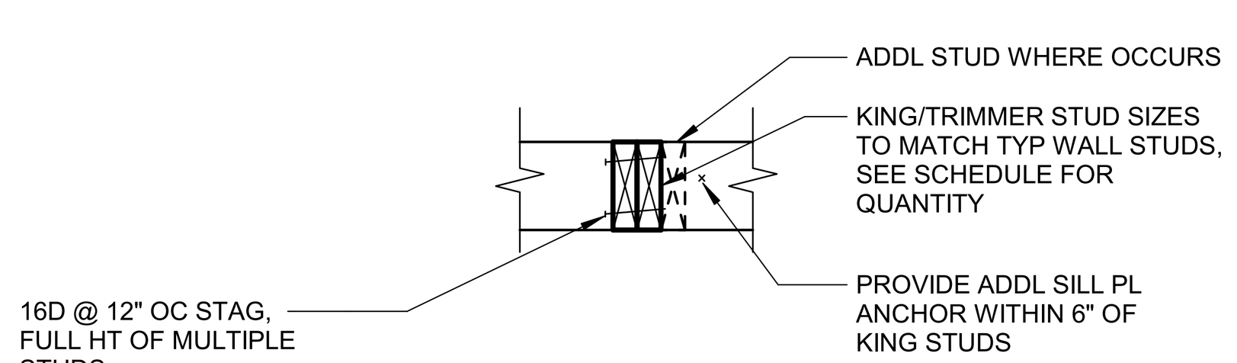


NOTES:
1. PLATES BORED, CUT OR NOTCHED MORE THAN 1/3 OF WIDTH SHALL HAVE ADDL BOLTS EACH SIDE OF BORE, CUT OR NOTCH (AS FOR SPLICES)
2. TWO BOLTS MIN FOR EACH PIECE OF SILL
3. OUTSIDE DIA OF THREADS MUST EQUAL BOLT SHANK DIA
4. HOLD DOWN BOLTS DO NOT REPLACE ANCHOR BOLTS
5. CENTER ALL AB'S ON CENTERLINE OF SILL UNO.
6. SILL PLATE ANCHOR BOLTS MAY BE REPLACED W/ 5/8" DIA "SIMPSON" TITEN HD W/ 4 3/4" MIN NOMINAL EMBED (1 3/4" MIN CONC EDGE DISTANCE AND 6" MIN CONC END DISTANCE).

SCALE: NTS
S-_061010_T035A
200716

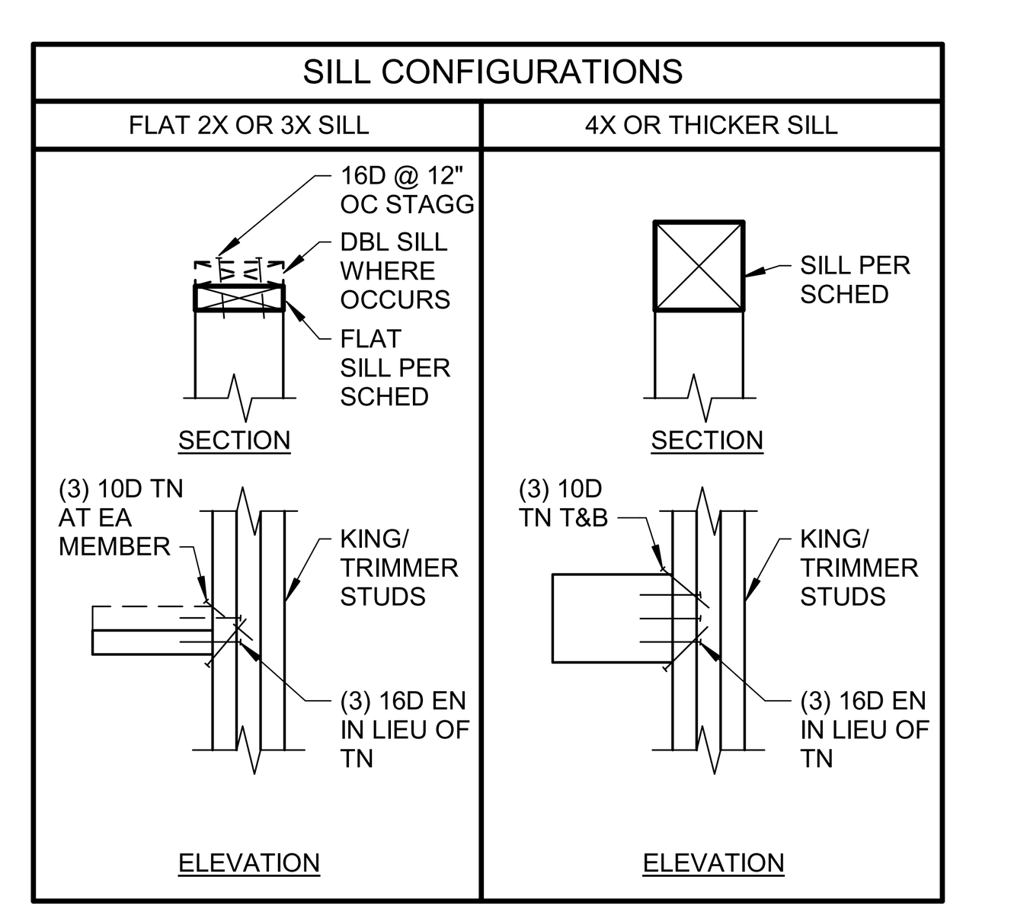
8 TYP WOOD KING/TRIMMER STUDS

QUANTITY OF KING/TRIMMER STUDS EA SIDE OF OPNG					
WALL CONFIG		INTERIOR WALL		EXTERIOR WALL	
		H = 14'-0" OR LESS	H = 20'-0" OR LESS	H = 14'-0" OR LESS	H = 20'-0" OR LESS
OPENING WIDTH, L	4' MAX	(2) KING (1) TRIMMER	(2) KING (1) TRIMMER	(3) KING (1) TRIMMER	(3) KING (2) TRIMMER
	8' MAX	(2) KING (1) TRIMMER	(3) KING (1) TRIMMER	(3) KING (2) TRIMMER	SEE PLAN
	10' MAX	(2) KING (2) TRIMMER	(3) KING (2) TRIMMER	(3) KING (2) TRIMMER	SEE PLAN



SCALE: NTS
S-_061000_T014A
180723. Q2

12 TYP WOOD SILL CONN TO KING STUDS



SCALE: NTS
S-_061000_T005A
180723. Q2

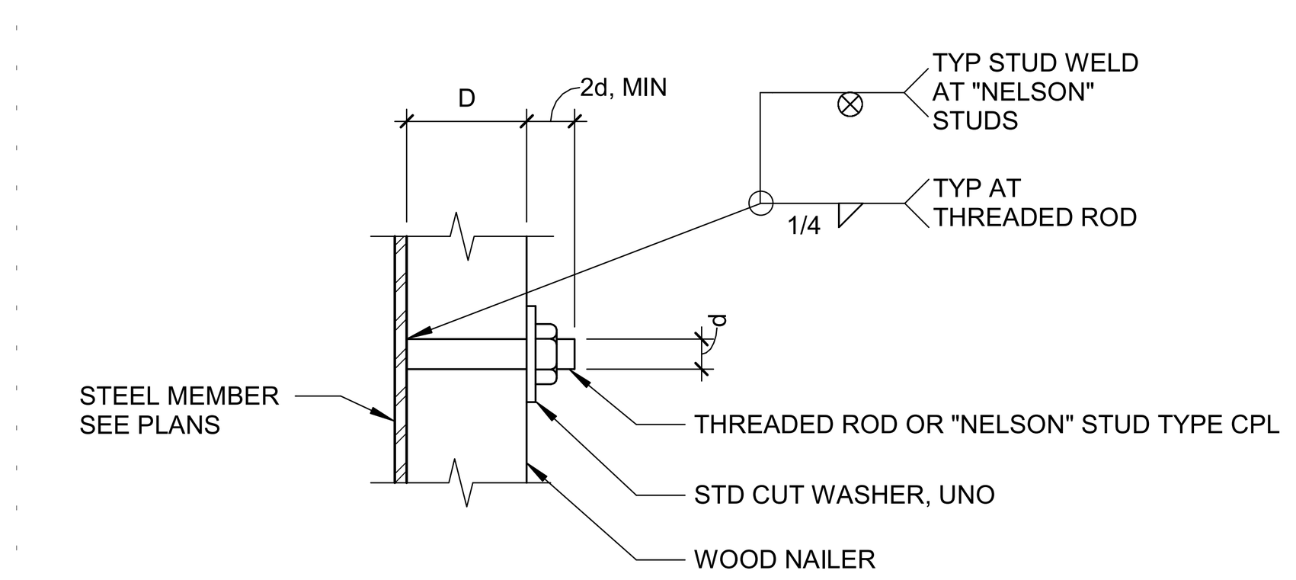
16 TYP STRUCT WOOD SILLS

SILL SCHEDULE				
OPNG WIDTH	4' MAX	6' MAX	12' MAX	OVER 10'
SILL TYPE	SS1	SS2	SS3	SEE PLANS
MIN SILL SIZE	(1) 2X	(2) 2X	(3) 2X	

NOTES:
1. SILL TYPE TO BE SELECTED BASED ON OPENING WIDTH UNLESS A SPECIFIC SILL TYPE IS NOTED ON OTHER DETAILS.
2. 2X MATERIAL SHALL MATCH TYP WALL STUDS.

SCALE: NTS
S-_061000_T006A
180723. Q2

20 TYP WELDED THREADED STUD (WTS)



NOTES:
1. DO NOT COUNTERSINK BOLT TYP UNO
2. D = WOOD NAILER THICKNESS, SEE PLANS
3. d = BOLT DIAMETER (SEE PLANS & DETAILS)

SCALE: NTS
S-_061010_T039A
140127. Q2

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PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST,
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	12/22/2023	50% CONSTRUCTION DOCUMENTS
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT
LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
DETAILS - TYPICAL WOOD FRAMING

SHEET
S-561

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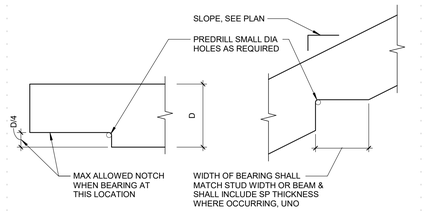
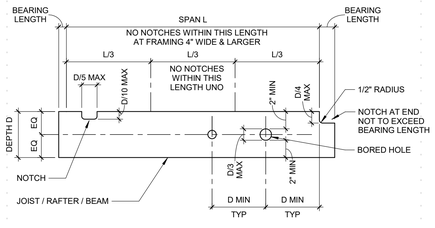


FLAT CONDITION SLOPED CONDITION

NOTES:
1. OVERCUTTING IS NOT PERMITTED. ALL CUTS SHALL INTERSECT DRILLED HOLE WHEN USED.
2. BEARING CUTS SHALL OCCUR ONLY WHERE SPECIFICALLY DETAILED ON THE DRAWINGS.
3. CUTS OR DRILLED HOLES SHALL NOT INTERSECT ANY LOOSE KNOTS.

1 TYP BEARING CUT IN JOIST / RAFTER

SCALE: NTS S-_061010_T007A 140127. Q2

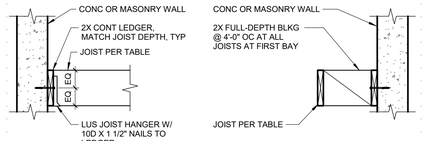


ELEVATION

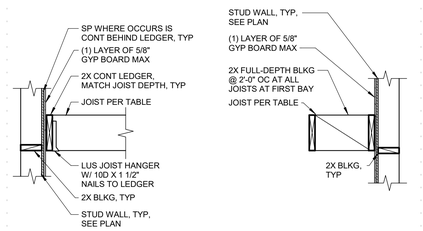
NOTE:
1. PREDRILL SMALL DIA HOLE AT ALL CORNERS OF NOTCHES. ALL CUTS SHALL INTERSECT PREDRILLED HOLE. OVERCUTTING IS NOT PERMITTED.
2. NOTCHES IN THE BOTTOM OF JOISTS ALLOWED ONLY WHERE SPECIFICALLY DETAILED ON THE DRAWINGS.
3. IF JOIST / RAFTER / BEAM CANTILEVERS OR IS CONTINUOUS OVER MORE THAN ONE SPAN, NO NOTCHES ARE PERMITTED.

2 TYP HOLE OR NOTCH IN JOIST / RAFTER / BEAM

SCALE: NTS S-_061010_T008A 160211. Q2



CONCRETE OR MASONRY WALLS



JOISTS PERPENDICULAR TO WALL JOISTS PARALLEL TO WALL

MAX/MUM SPAN	JOIST @ 16" OC	LEDGER NAILING AT EA STUD *	LEDGER BOLTING AT MASONRY OR CONC
8'-9"	2x4	(2) 16D	16" OC
12'-10"	2x6	(2) 16D	16" OC
16'-3"	2x8	(3) 16D	8" OC
19'-10"	2x10	(3) 16D	8" OC

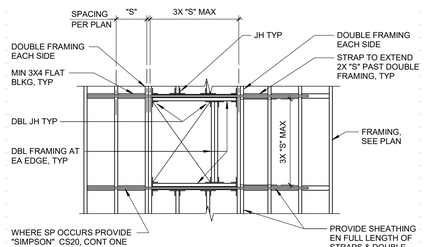
1/4" DIA CONCRETE SCREWS W/ 1 3/4" MIN EMBED @ SPACING INDICATED ALONG LEDGER, TYP

* WHERE GYP BOARD OCCURS BETWEEN LEDGER AND WALL, SUBSTITUTE 16D NAILS WITH 20D.

NOTES:
1. DESIGN CAPACITY: 30 PSF UP OR DOWN (ASD) OR NET WIND UPLIFT = 70 PSF (ULTIMATE), DEFLECTION = L/360 MAX

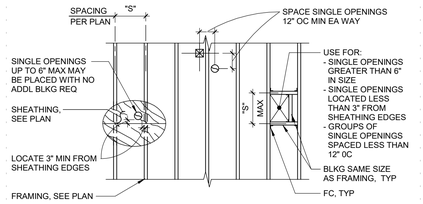
4 TYP STRUCT WOOD EXTERIOR CEILING / SOFFIT FRAMING

SCALE: NTS S-_061000_T002A 180723. Q2



OPENINGS CUTTING (2 MAX) FRAMING MEMBERS

6'-0" MAX SIZE



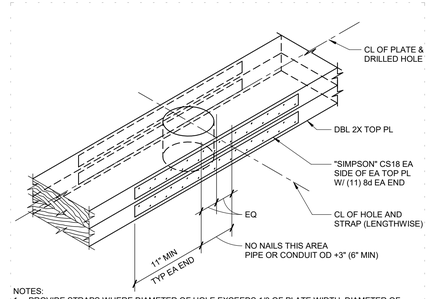
OPENINGS NOT CUTTING A FRAMING MEMBER

2'-0" MAX SIZE

NOTE:
1. SHEATHING REFERS TO GYPSUM BOARD OR SP

8 TYP WOOD ROOF / FLOOR / CEILING FRAMING AT OPENINGS

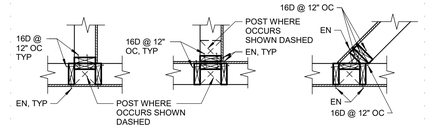
SCALE: NTS S-_061010_T010A 140127. Q2



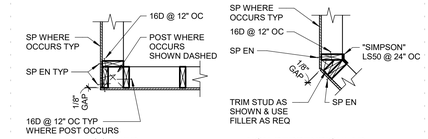
NOTES:
1. PROVIDE STRAPS WHERE DIAMETER OF HOLE EXCEEDS 1/3 OF PLATE WIDTH. DIAMETER OF HOLE SHALL NOT EXCEED 2/3 OF PLATE WIDTH.
2. NO NOTCHES PERMITTED AT TOP PLATES.
3. DO NOT LOCATE HOLES WITHIN 4'-0" EA SIDE OF TOP PLATE SPLICES.
4. IF HOLES OCCUR WITHIN A STUD BAY IN WHICH A JOIST OR TRUSS LANDS, ADD A STUD DIRECTLY BELOW THE JOIST OR TRUSS.

9 TYP PLATE REINFORCING AT PIPE OR CONDUIT

SCALE: NTS S-_061010_T033A 140127. Q2



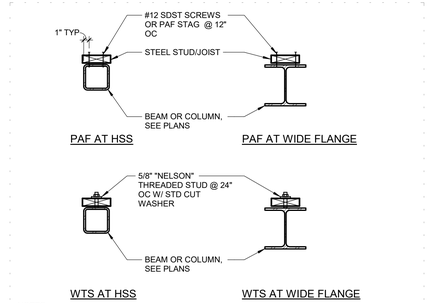
INTERSECTIONS



CORNER NON-PERPENDICULAR CORNER

11 TYP WOOD STUD WALL FRAMING AT CORNERS & INTERSECTION

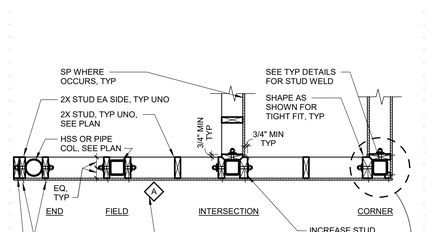
SCALE: NTS S-_061010_T028A 140127. Q2



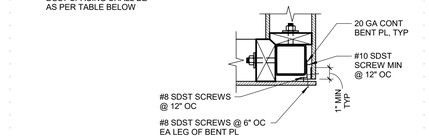
NOTES:
1. USE PAF CONN, TYP UNO
2. SIMILAR AT OTHER STEEL SHAPES

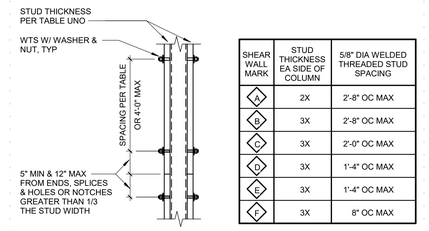
13 TYP WOOD STUD / JOIST CONNECTION TO STRUCTURAL STEEL

SCALE: NTS S-_061000_T007A 180723. Q2



PLAN





ELEVATION

SHEAR WALL MARK	STUD THICKNESS EA SIDE OF COLUMN	5/8" DIA WELDED THREADED STUD SPACING
A	2X	2'-8" OC MAX
B	3X	2'-8" OC MAX
C	3X	2'-0" OC MAX
D	3X	1'-4" OC MAX
E	3X	1'-4" OC MAX
F	3X	8" OC MAX

15 TYP HSS / PIPE COL IN WOOD STUD WALL

SCALE: NTS S-_061010_T025A 200716. Q2

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CLIENT
CITY OF SACRAMENTO

ISSUED

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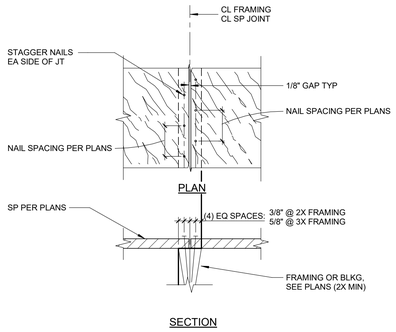
MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
DETAILS - TYPICAL WOOD FRAMING

SHEET
S-562



13 TYP NAILING AT STRUCTURAL PANEL JOINTS

3" = 1'-0"

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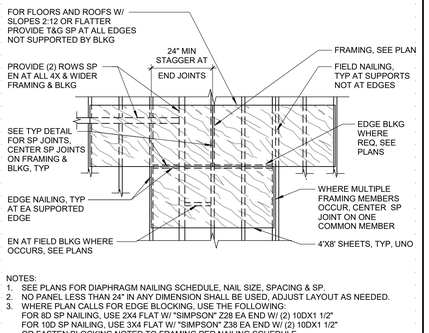
140127. Q2

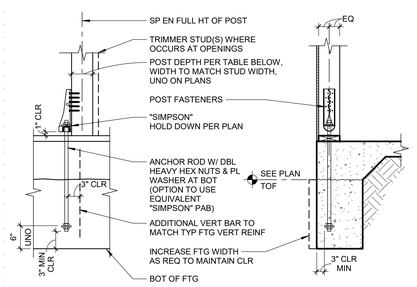


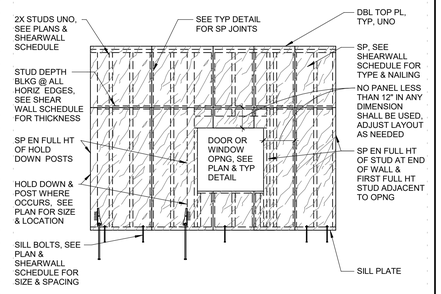
NOTES:
1. SEE PLANS FOR DIAPHRAGM NAILING SCHEDULE, NAIL SIZE, SPACING & SP.
2. NO PANEL LESS THAN 24" IN ANY DIMENSION SHALL BE USED, ADJUST LAYOUT AS NEEDED.
3. WHERE PLAN CALLS FOR EDGE BLOCKING, USE THE FOLLOWING:
   FOR 8D SP NAILING, USE 2X4 FLAT W/ "SIMPSON" Z28 EA END W/ (2) 10DX1 1/2"
   FOR 10D SP NAILING, USE 3X4 FLAT W/ "SIMPSON" Z38 EA END W/ (2) 10DX1 1/2"
   OR FASTEN BLOCKING NOTED TO FRAMING PER NAILING SCHEDULE.

17 TYP STRUCTURAL PANEL LAYOUT - ROOF / FLOOR

1/4" = 1'-0"

S-_061010_T022A
140127. Q2

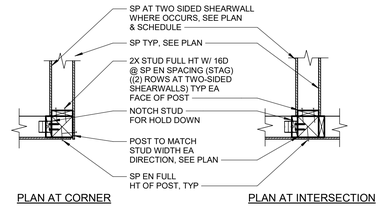




18 TYP SP LAYOUT - SHEAR WALL

1/4" = 1'-0"

S-_061010_T023A
140127. Q2



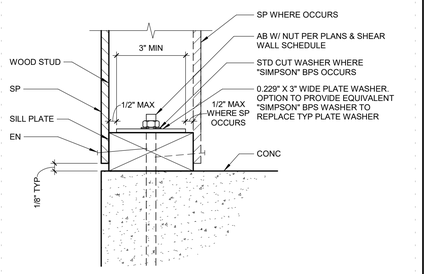
"SIMPSON" DESIGNATION	ANCHOR ROD DIA	PLATE WASHER	POST FASTENERS	POST DEPTH UNO
HDU2	5/8"	1/2" X 1 3/4" SQ	(6) SDS 1/4"X2 1/2"	(2) 2X
HDU4	5/8"	1/2" X 1 3/4" SQ	(10) SDS 1/4"X2 1/2"	(2) 2X
HDU5	5/8"	1/2" X 1 3/4" SQ	(14) SDS 1/4"X2 1/2"	(2) 2X
HDU8	7/8"	1/2" X 2 1/2" SQ	(20) SDS 1/4"X2 1/2"	6X
HDU11	1"	5/8" X 3" X 2 3/4"	(30) SDS 1/4"X2 1/2"	8X
HDU14	1" W/ HEAVY HEX NUT	5/8" X 3" X 2 3/4"	(36) SDS 1/4"X2 1/2"	8X

NOTES:
1. MULTIPLE MEMBERS AT POSTS SHALL BE INTERCONNECTED WITH 16D @ 6" OC MAX, STAGGERED, FULL HEIGHT.
2. WHEN HOLD DOWN & POST ARE INDICATED PER PLAN AT OPENING JAMBS, THE POST SHALL REPLACE THE KING STUDS.

15 TYP HDU HOLDOWN

3/4" = 1'-0"

S-_061010_T017A
200409. Q2



19 TYP SHEAR WALL SILL BOLT

3" = 1'-0"

S-_061010_T056A
190225. Q2

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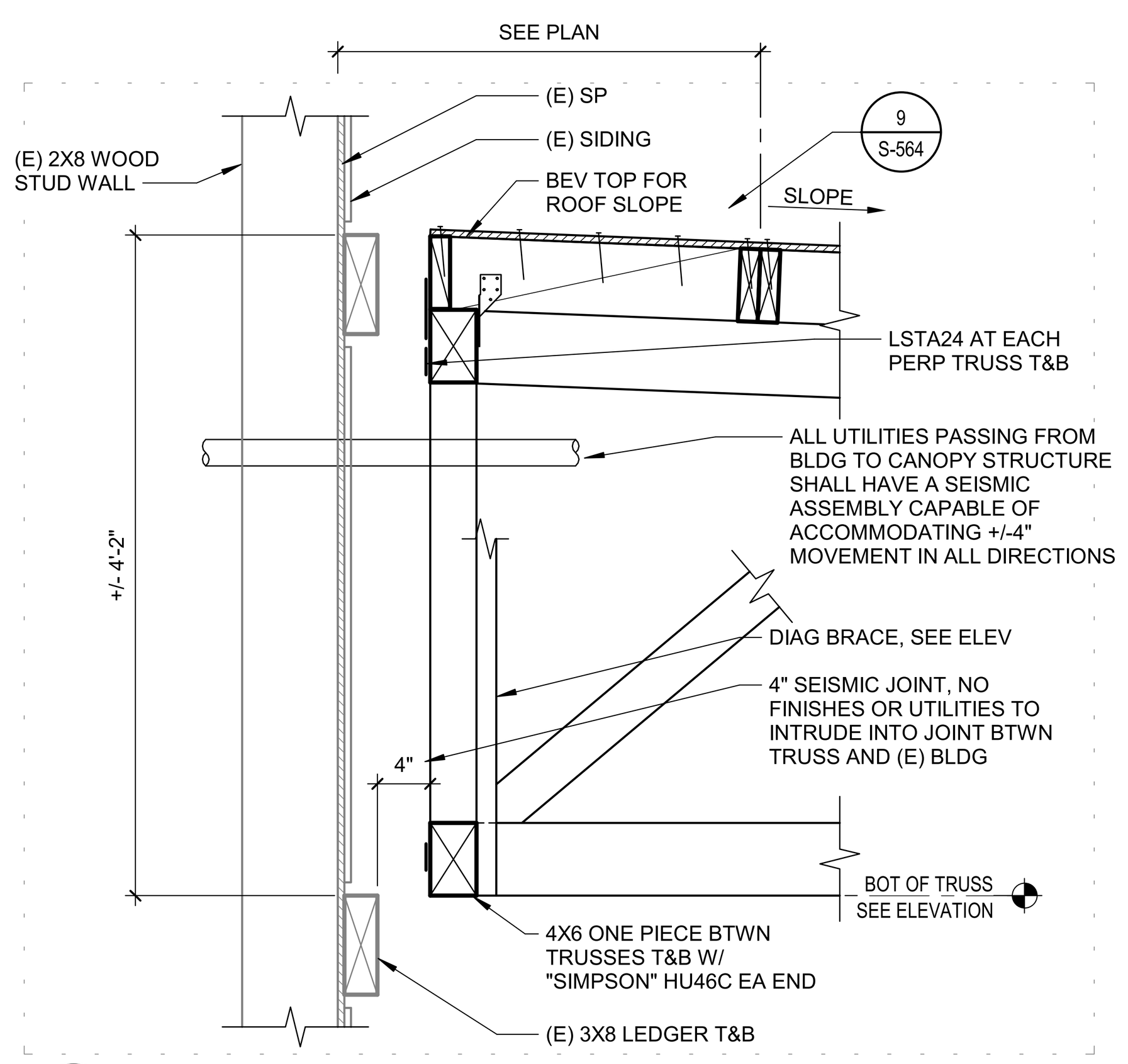
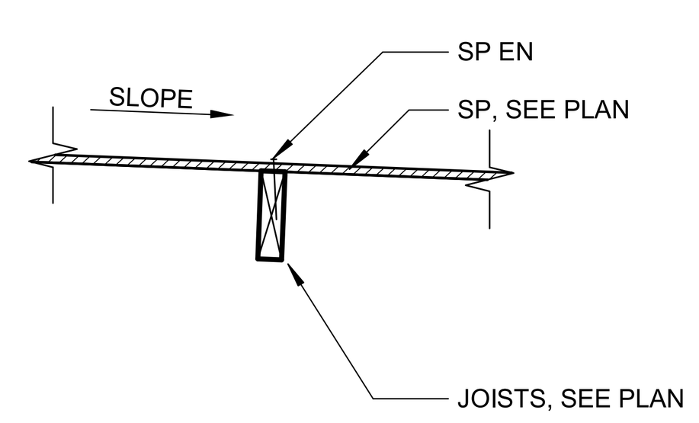
TITLE
DETAILS - TYPICAL WOOD SHEAR WALL FRAMING

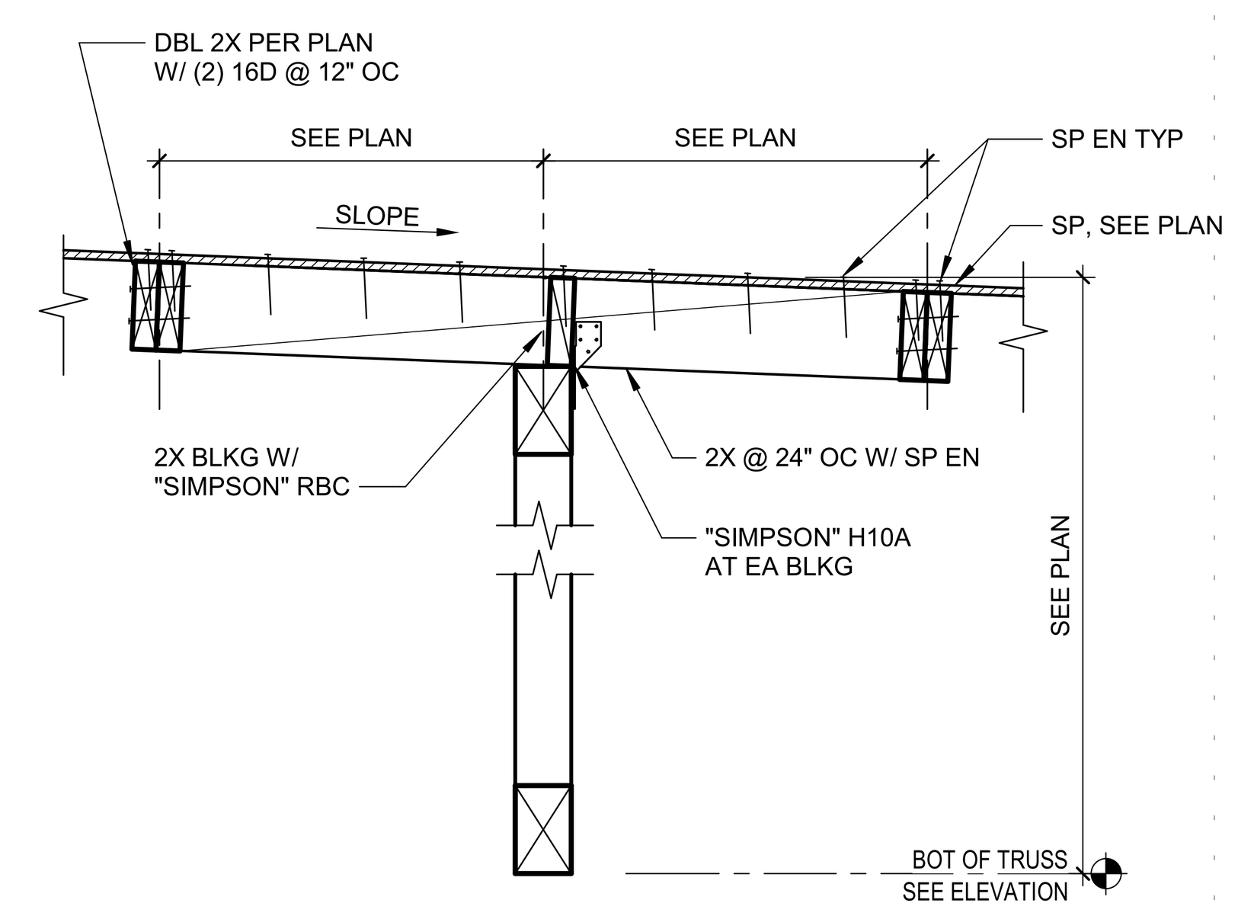
SHEET
S-563



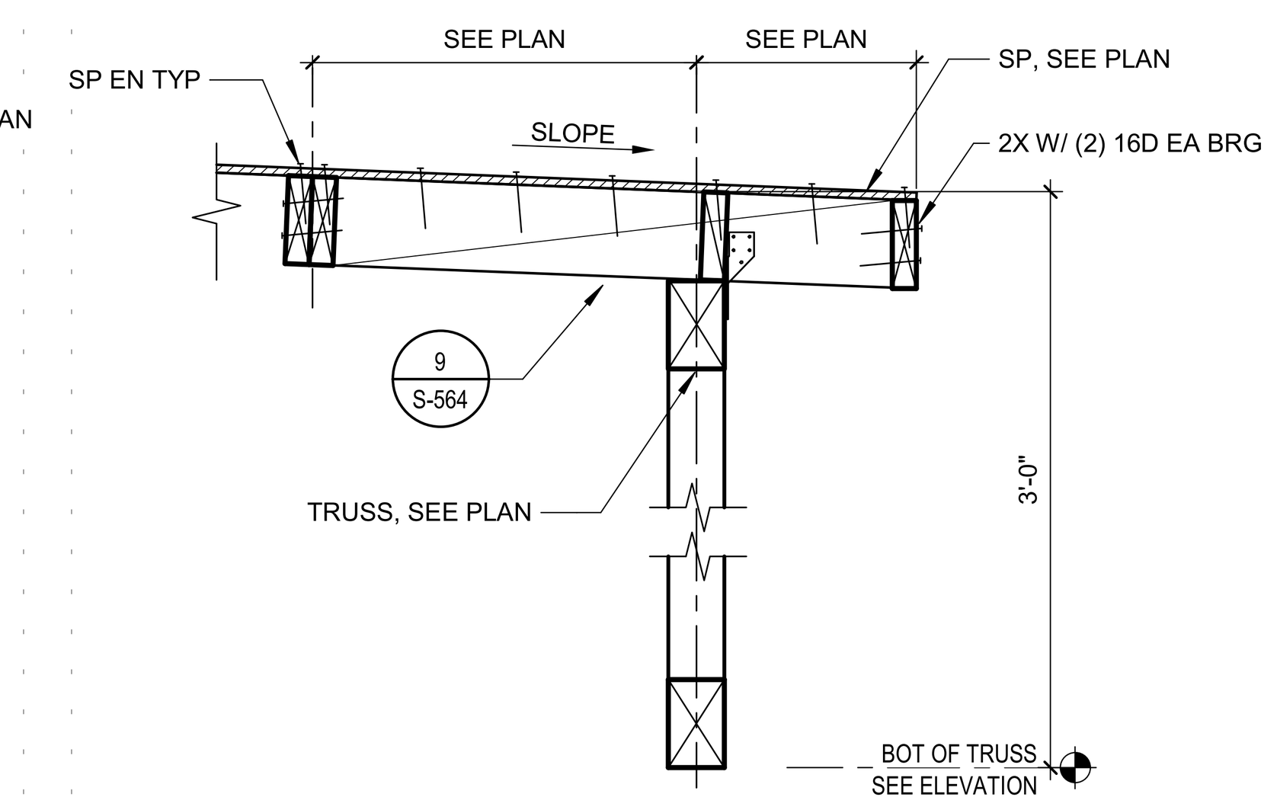
1 DETAIL
1" = 1'-0"



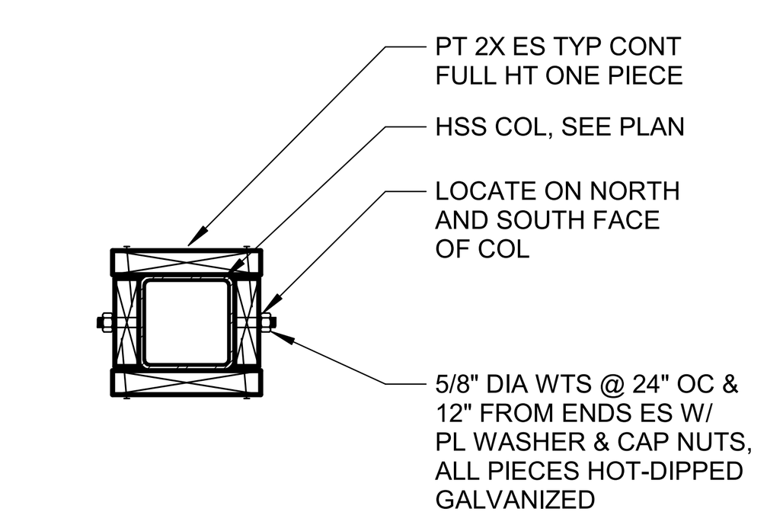
5 DETAIL
1" = 1'-0"



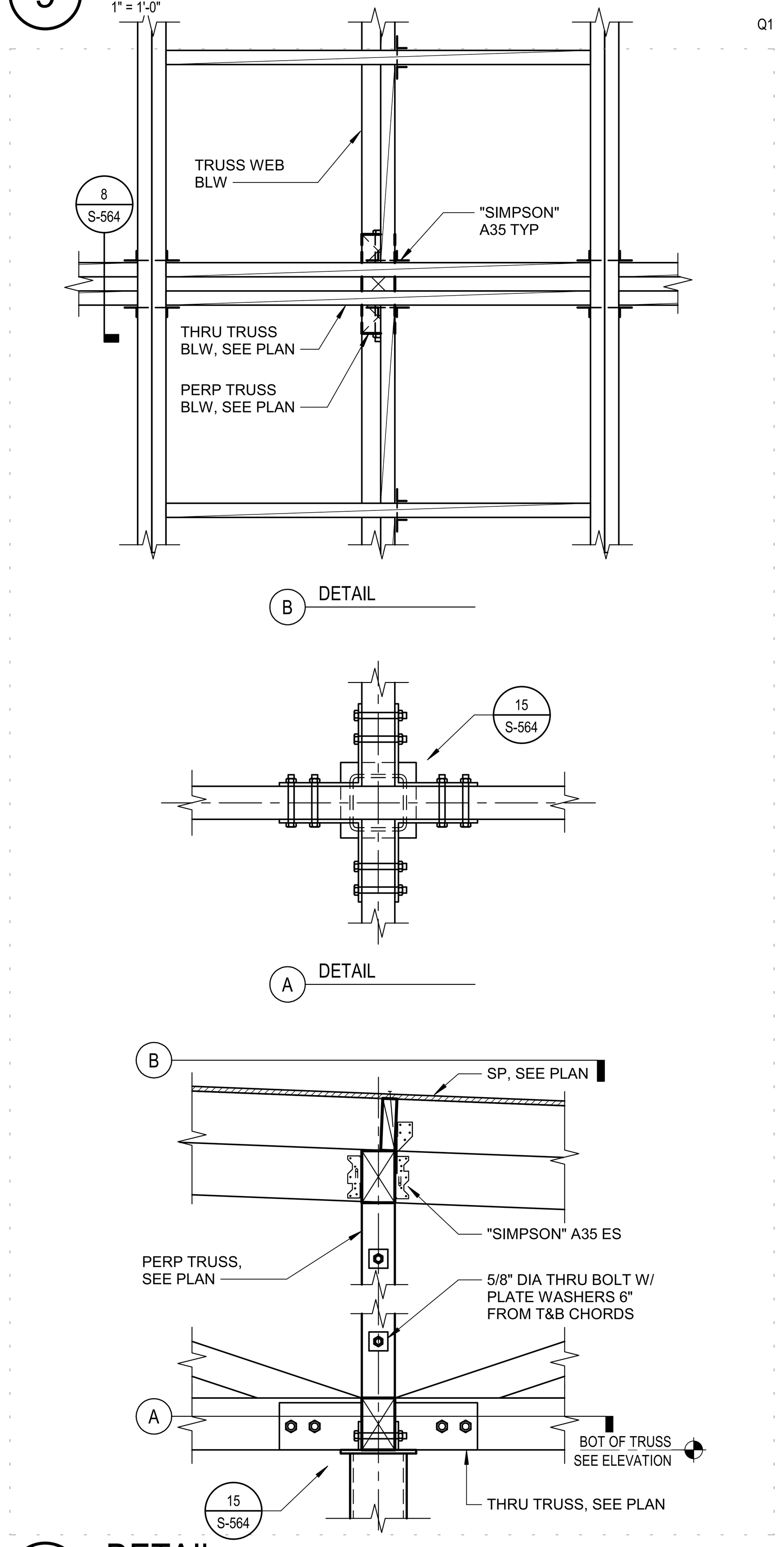
9 DETAIL
1" = 1'-0"



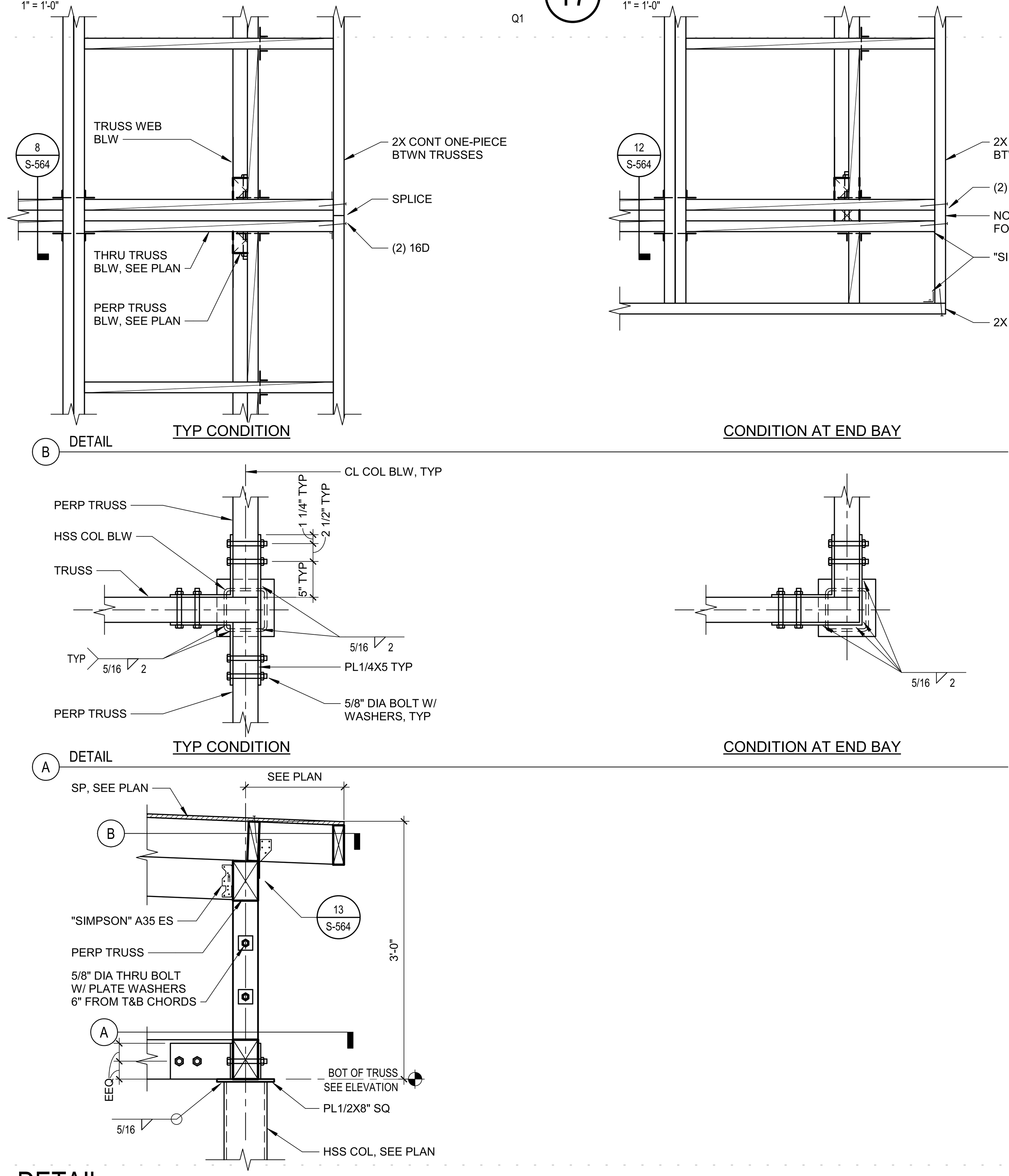
13 DETAIL
1" = 1'-0"



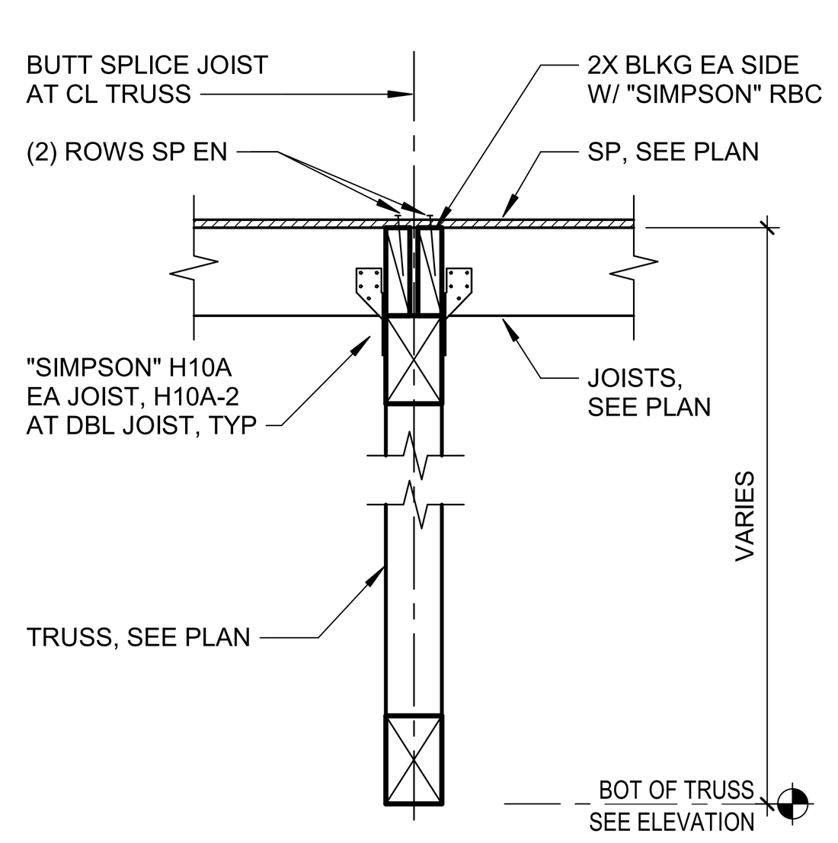
17 DETAIL
1" = 1'-0"



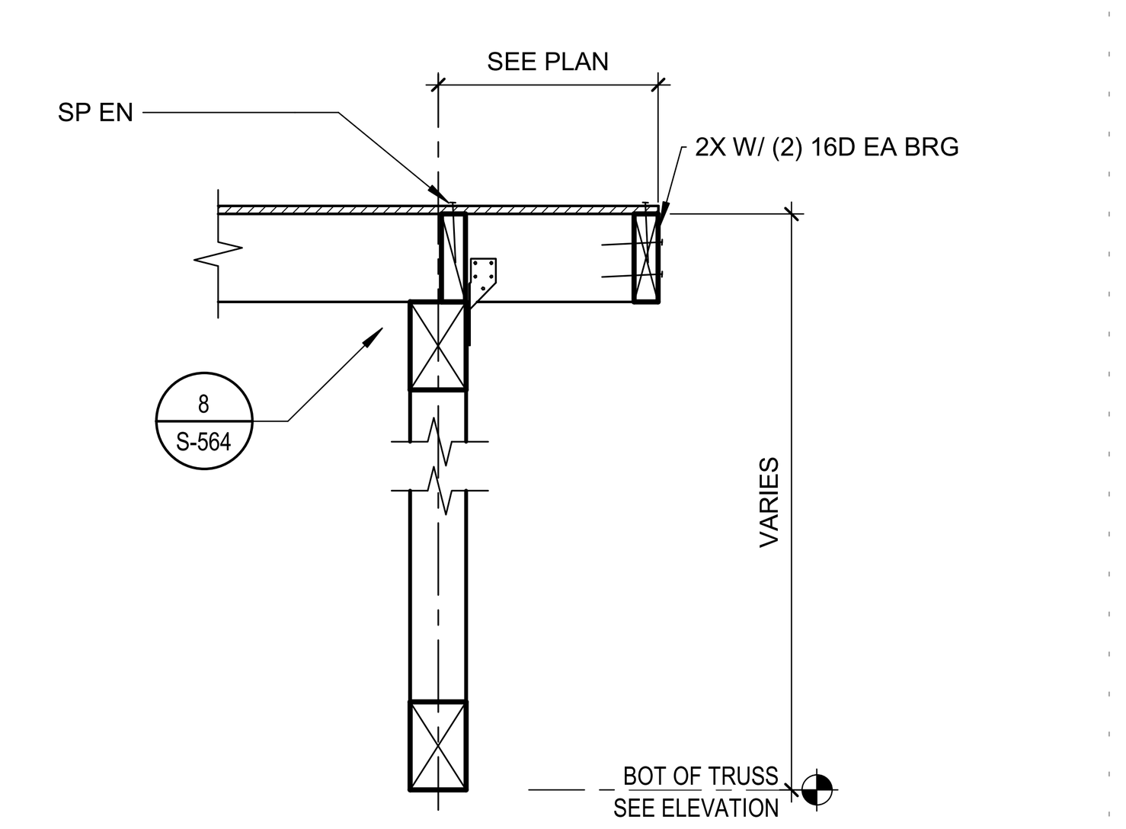
11 DETAIL
1" = 1'-0"



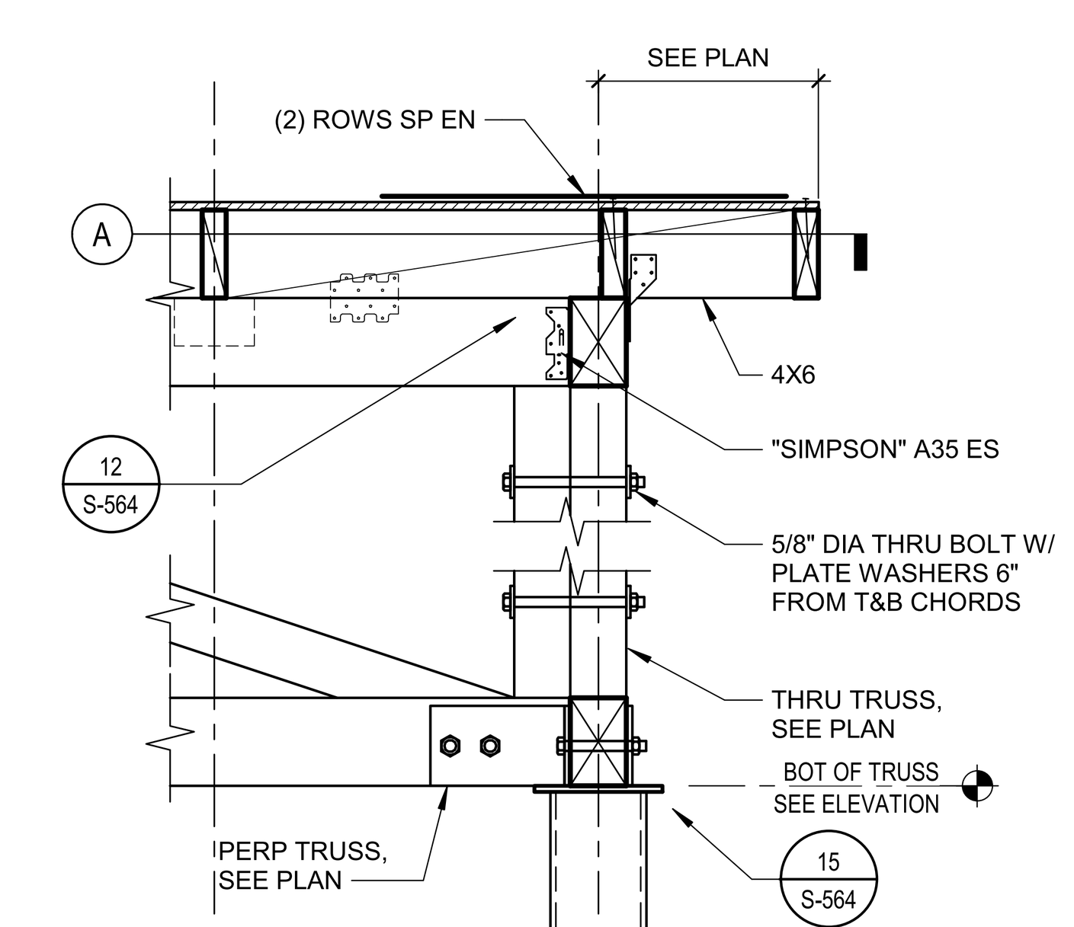
15 DETAIL
1" = 1'-0"

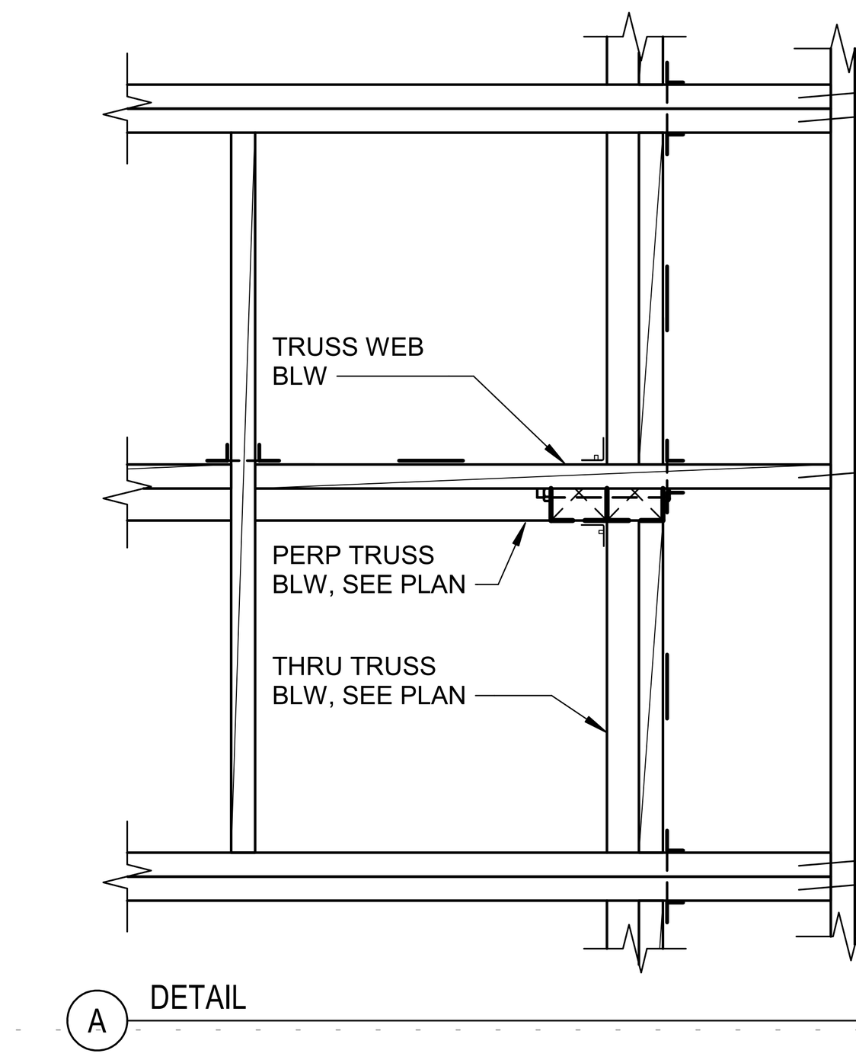


8 DETAIL
1" = 1'-0"



12 DETAIL
1" = 1'-0"





16 DETAIL
1" = 1'-0"

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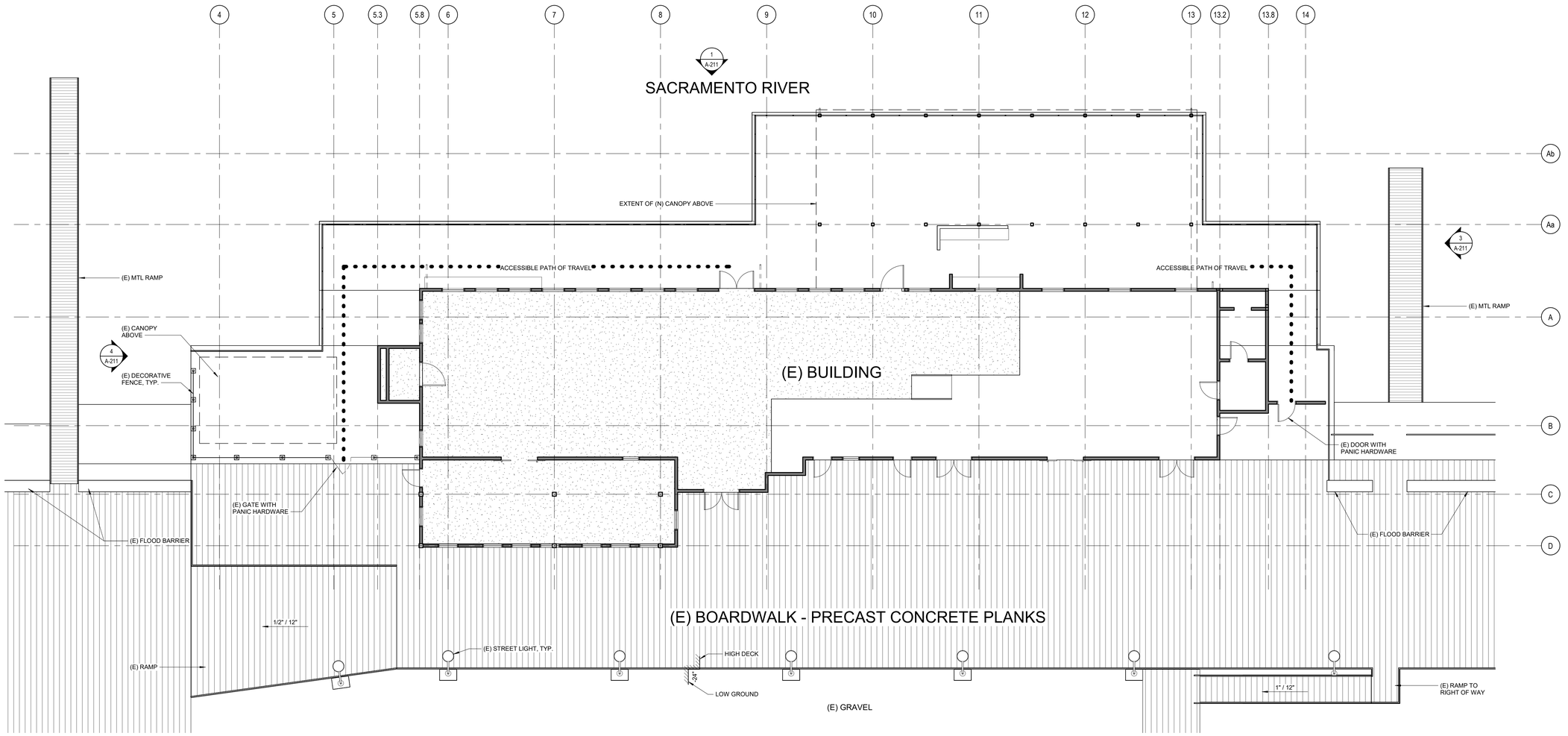
AGENCY

TITLE
DETAILS - TYPICAL WOOD FRAMING

SHEET
S-564



1 SITE PLAN
SCALE 1/8" = 1'-0"

PLAN NORTH

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TITLE
SITE PLAN - OVERALL

SHEET
AS101

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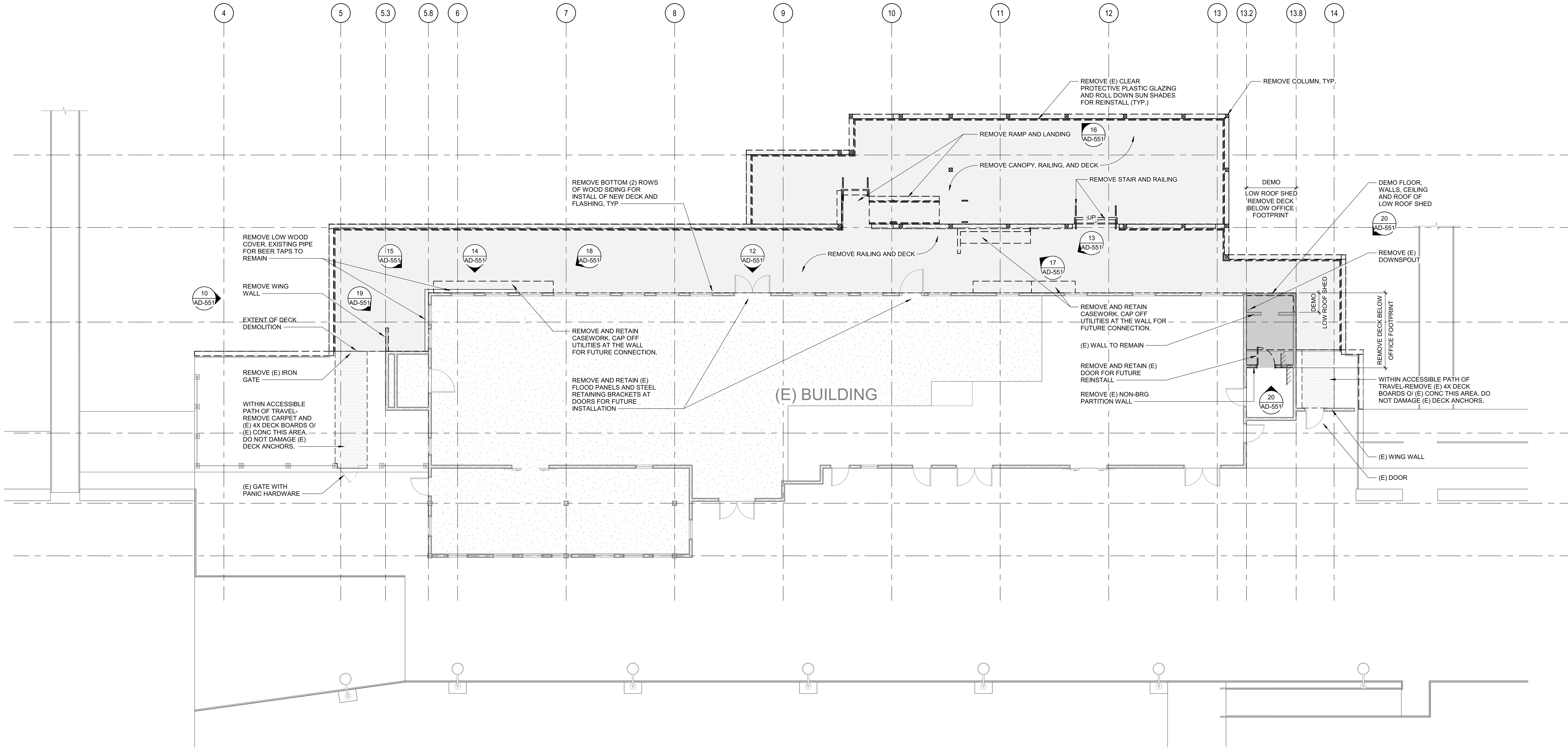

1 DEMOLITION FLOOR PLAN - LEVEL 1

SCALE 1/8" = 1'-0"

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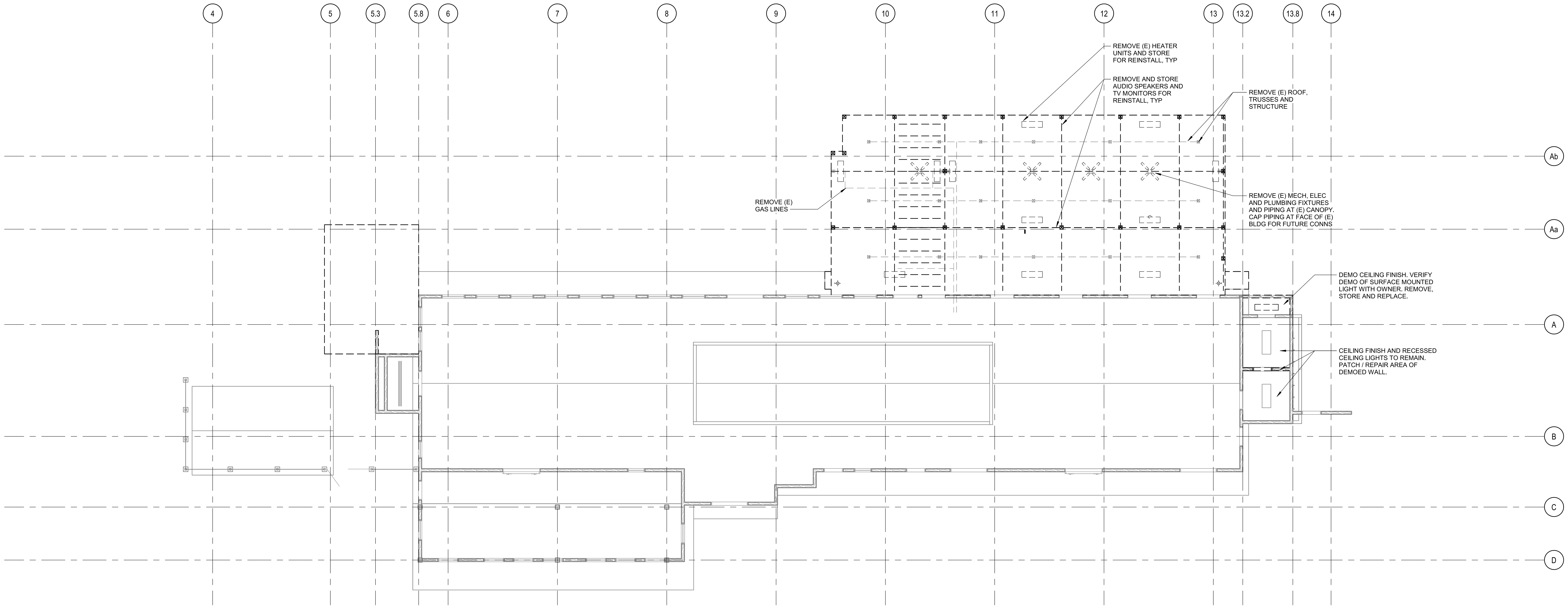
TITLE

DEMOLITION FLOOR PLAN - LEVEL 1

SHEET

AD111

2/25/2025 4:33:51 PM



1 DEMOLITION CEILING PLAN - LEVEL 1 - OVERALL

SCALE 1/8" = 1'-0"

PLAN NORTH

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DEMOLITION CEILING PLAN - LEVEL 1

SHEET

AD121

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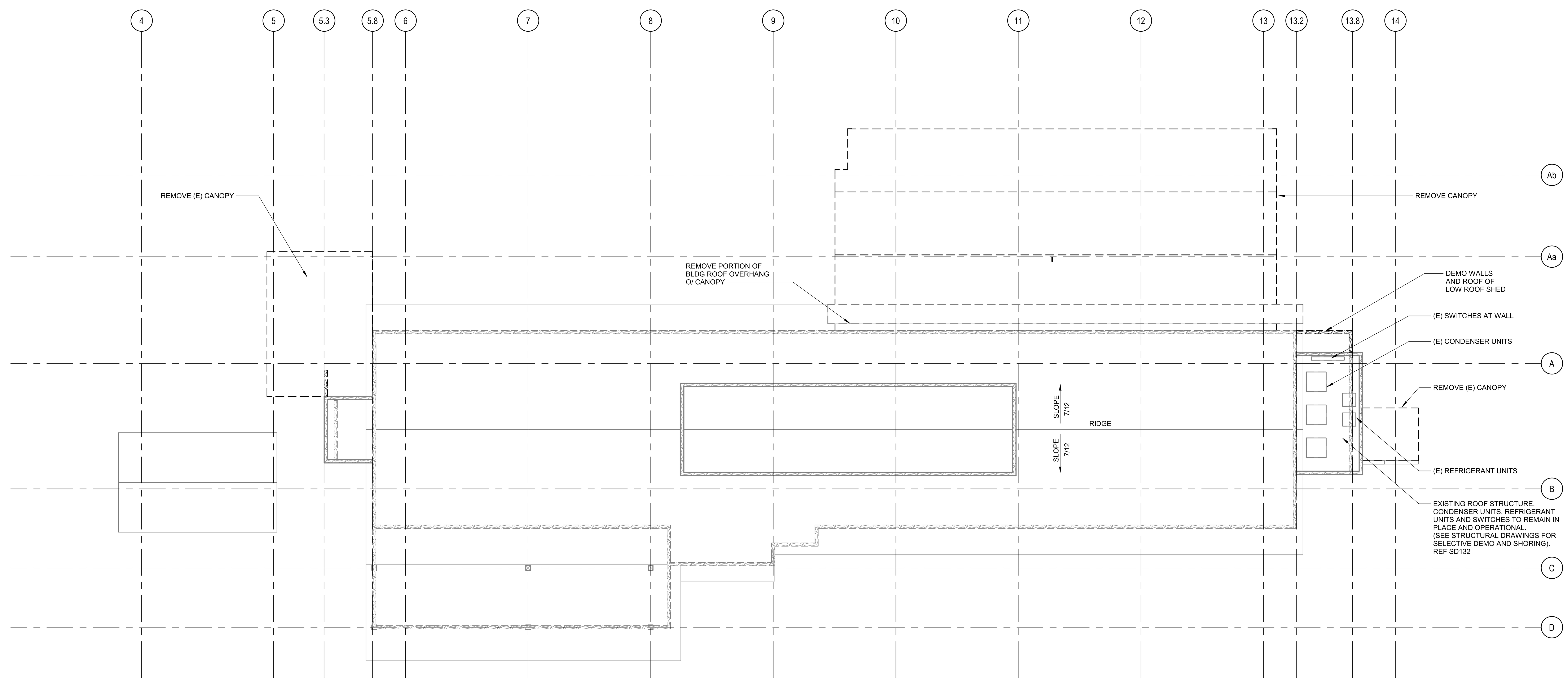

1 DEMOLTION ROOF PLAN - LEVEL 3 - OVERALL

SCALE 1/8" = 1'-0"

PLAN NORTH

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DEMOLITION ROOF PLAN - LEVEL 2

SHEET

AD132

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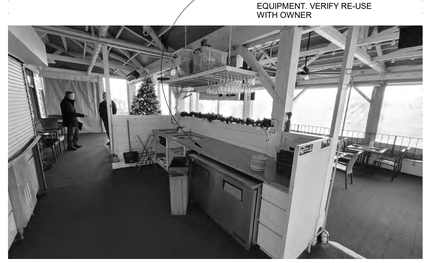
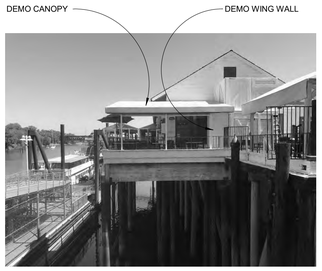
13 COUNTER - CANOPY - VIEW 1
12" = 1'-0" Q1



17 COUNTER - CANOPY - VIEW 2
12" = 1'-0" Q1



10 CANOPY AT WEST SIDE
12" = 1'-0" Q1

14 COUNTER - EXTERIOR - VIEW 1
12" = 1'-0" Q1

18 COUNTER - EXTERIOR - VIEW 2
12" = 1'-0" Q1

11 EXISTING OFFICE INTERIOR
12" = 1'-0" Q1

15 COUNTER - EXTERIOR - CORNER VIEW
12" = 1'-0" Q1

19 GUTTER AT SCUPPER DRAIN
12" = 1'-0" Q1

NOTE:
REMOVE, SAVE, AND REINSTALL STORM-WATER BARRIERS AT ALL LOCATIONS.

12 (E) STORM WATER BARRIER
12" = 1'-0" Q1

16 ROLL-DOWN SHADES
12" = 1'-0" Q1

20 LOW ROOF SHED
12" = 1'-0" Q1

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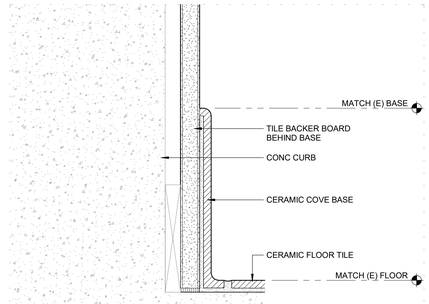
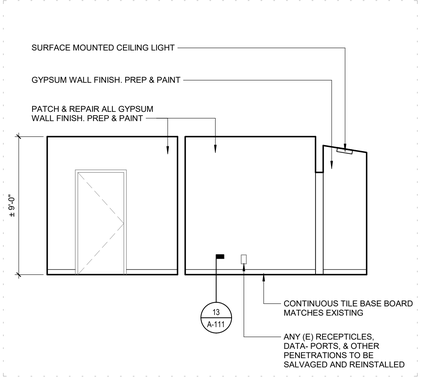
TITLE
DETAILS - ARCHITECTURAL - DEMO

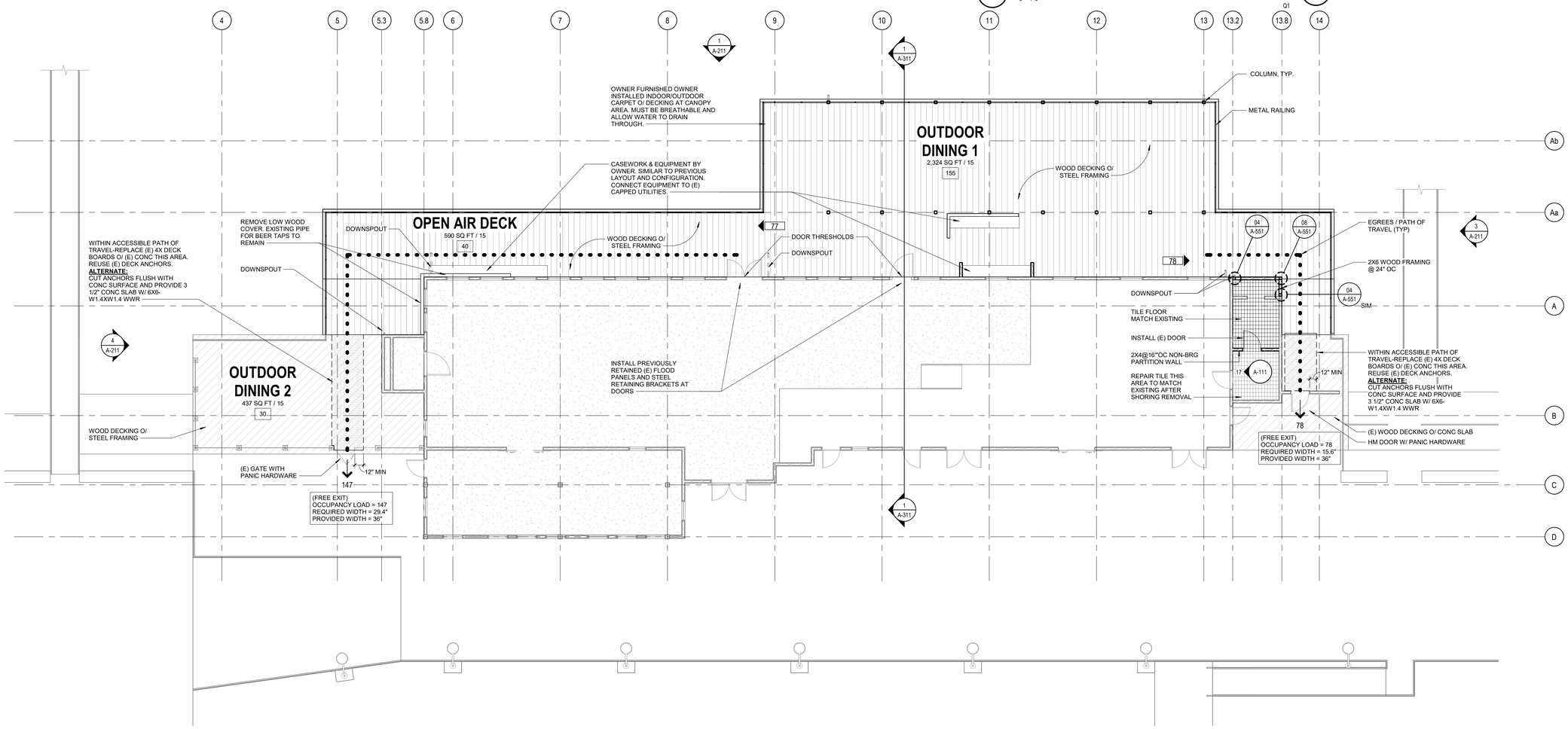
SHEET
AD551



13 WALL - TILE BASE
6" = 1'-0"



17 OFFICE INTERIORS
1/4" = 1'-0"



1 FLOOR PLAN - LEVEL 1 - OVERALL 1
SCALE 1/8" = 1'-0"

PLAN NORTH

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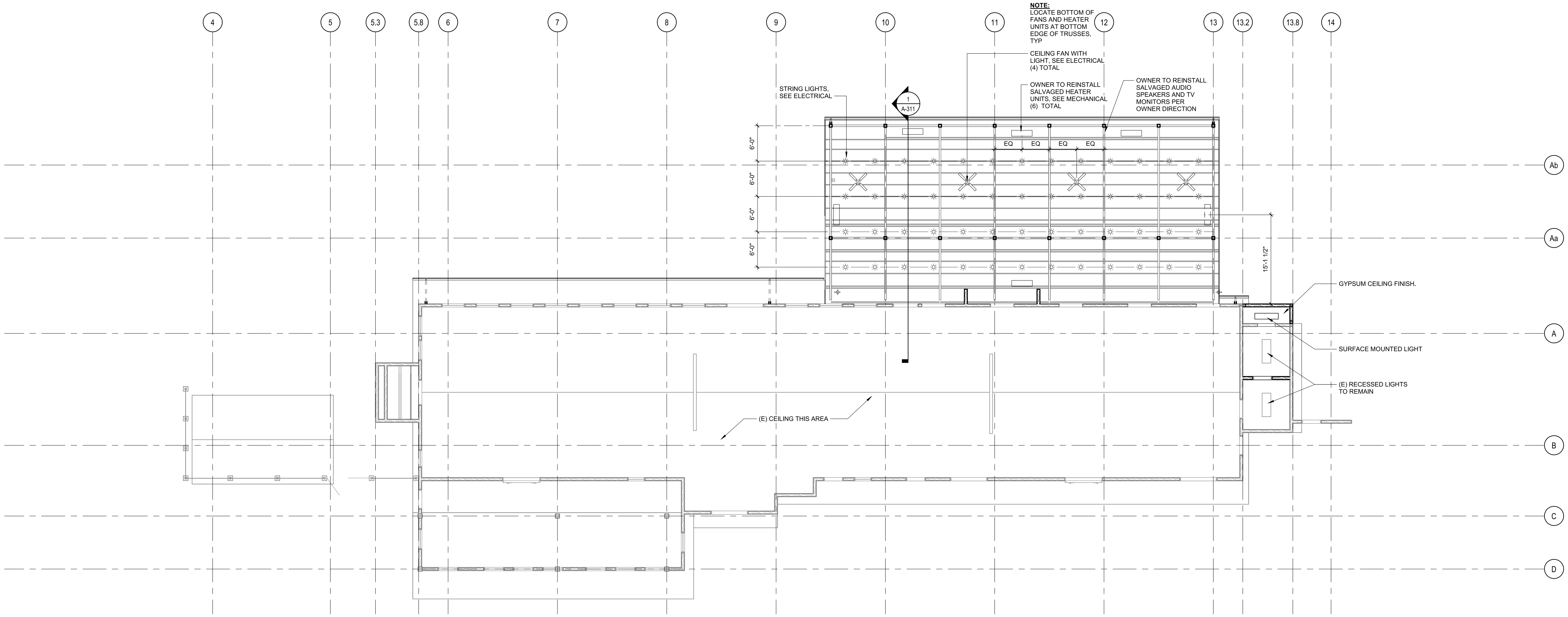
TITLE
FLOOR PLAN - LEVEL 1

SHEET
A-111



1 REFLECTED CEILING PLAN - LEVEL 1 - OVERALL 1

SCALE 1/8" = 1'-0"

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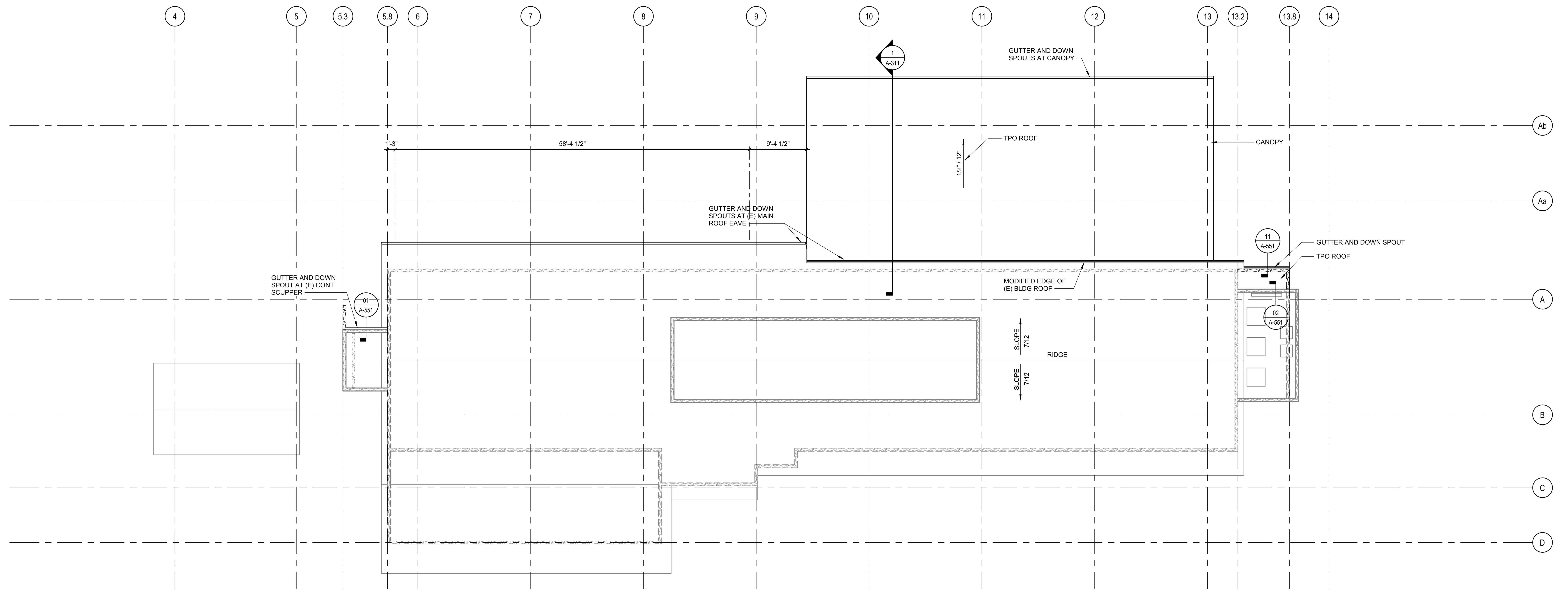
REFLECTED CEILING PLAN - LEVEL 1

SHEET

A-122



1 ROOF PLAN - LEVEL 3 - OVERALL

SCALE 1/8" = 1'-0"

PLAN NORTH

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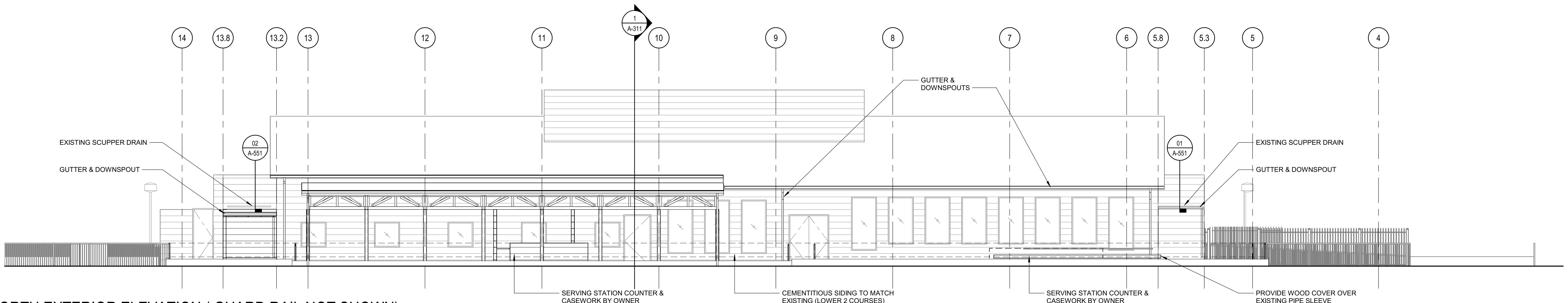
TITLE

ROOF PLAN - LEVEL 2

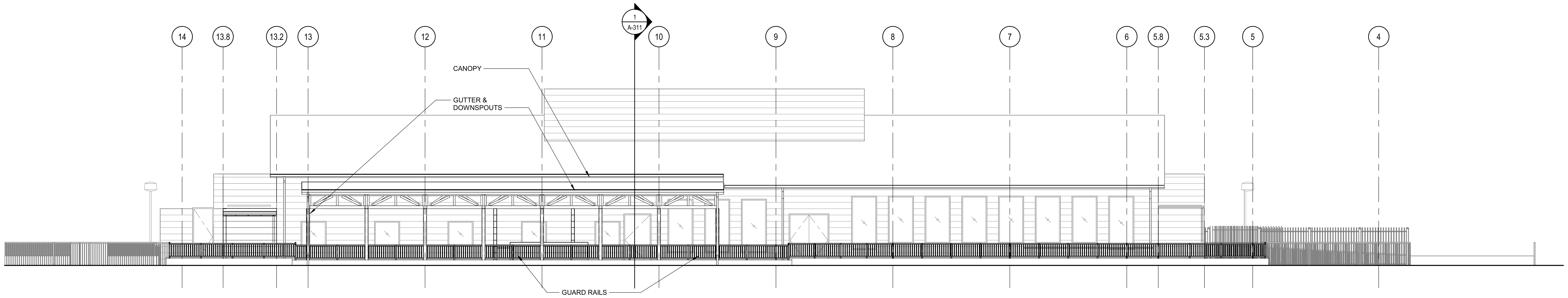
SHEET

A-132



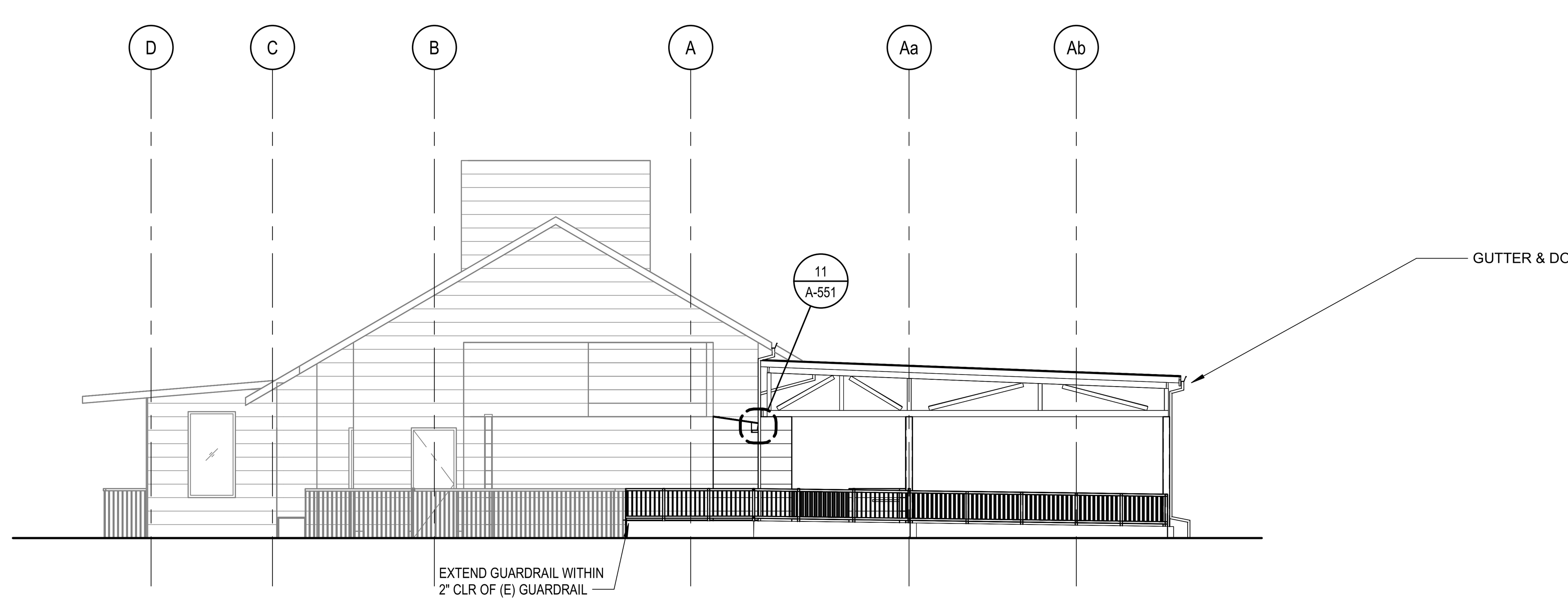
1 NORTH EXTERIOR ELEVATION (GUARD RAIL NOT SHOWN)

SCALE 1/8" = 1'-0"



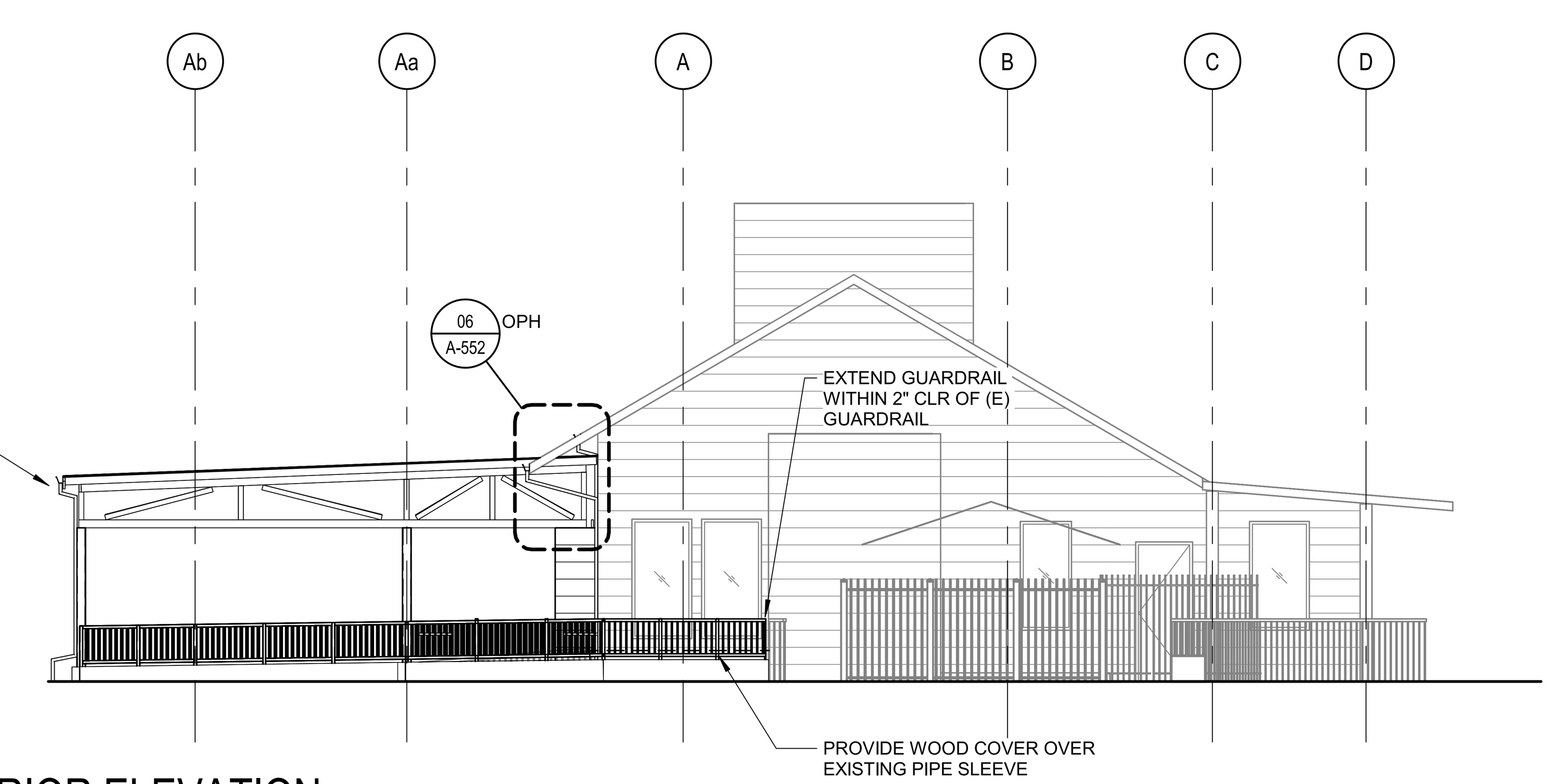
2 NORTH EXTERIOR ELEVATION

SCALE 1/8" = 1'-0"



3 EAST EXTERIOR ELEVATION

SCALE 1/8" = 1'-0"



4 WEST EXTERIOR ELEVATION

SCALE 1/8" = 1'-0"

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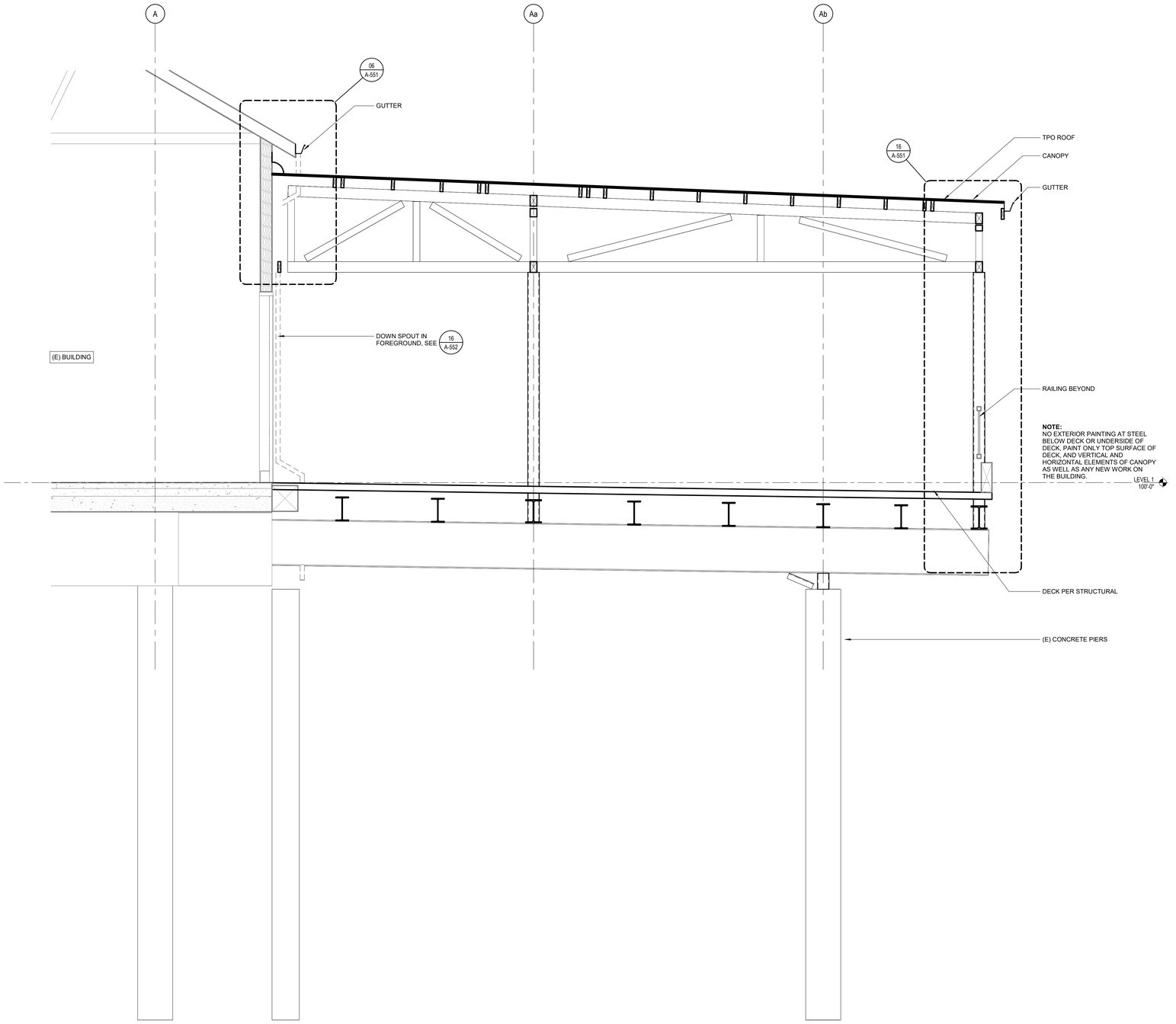
TITLE

ELEVATIONS - EXTERIOR

SHEET

A-211



1 SECTION - A BUILDING 03
SCALE 1/2" = 1'-0"

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TITLE
SECTIONS - BUILDING

SHEET
A-311

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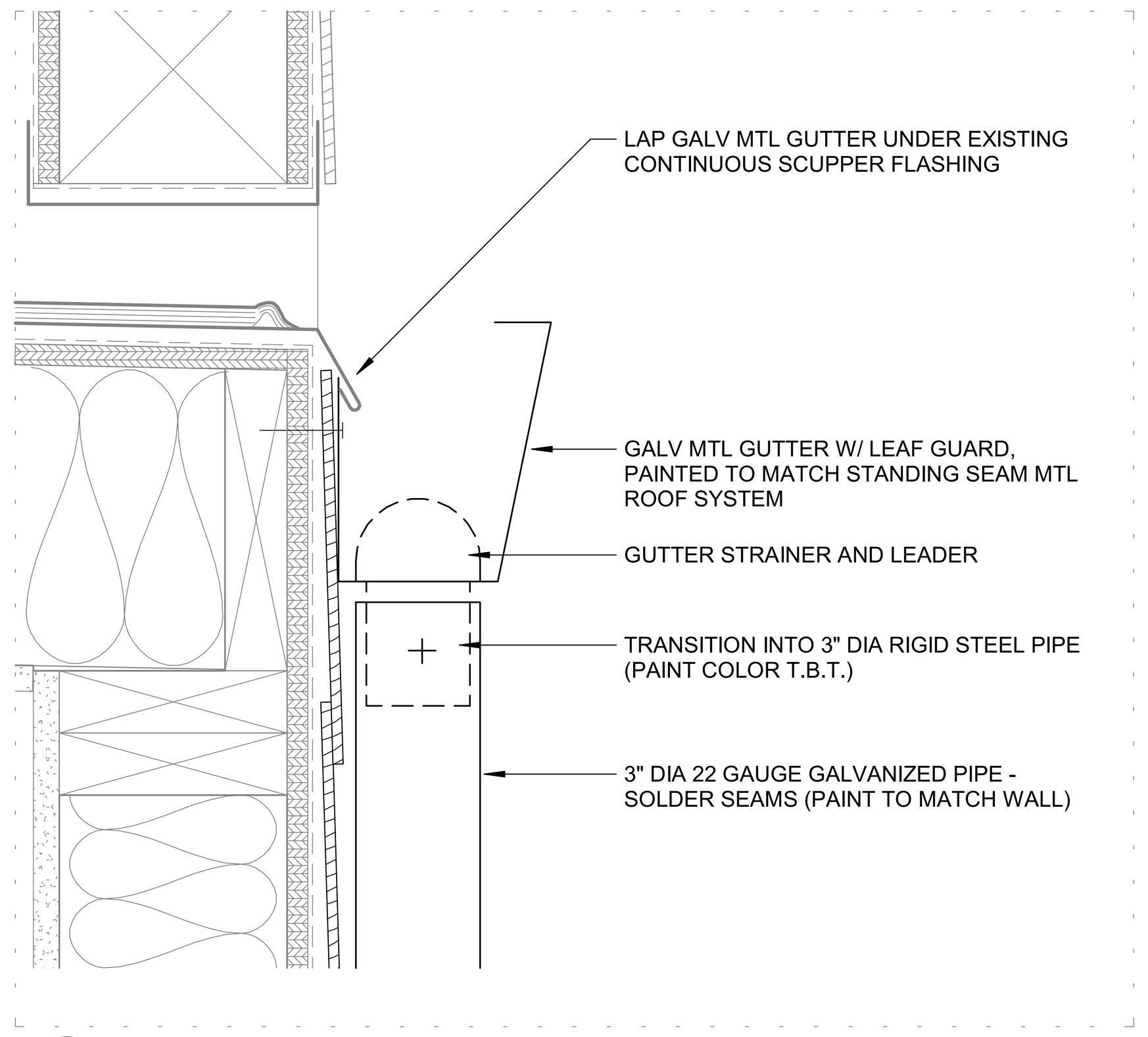
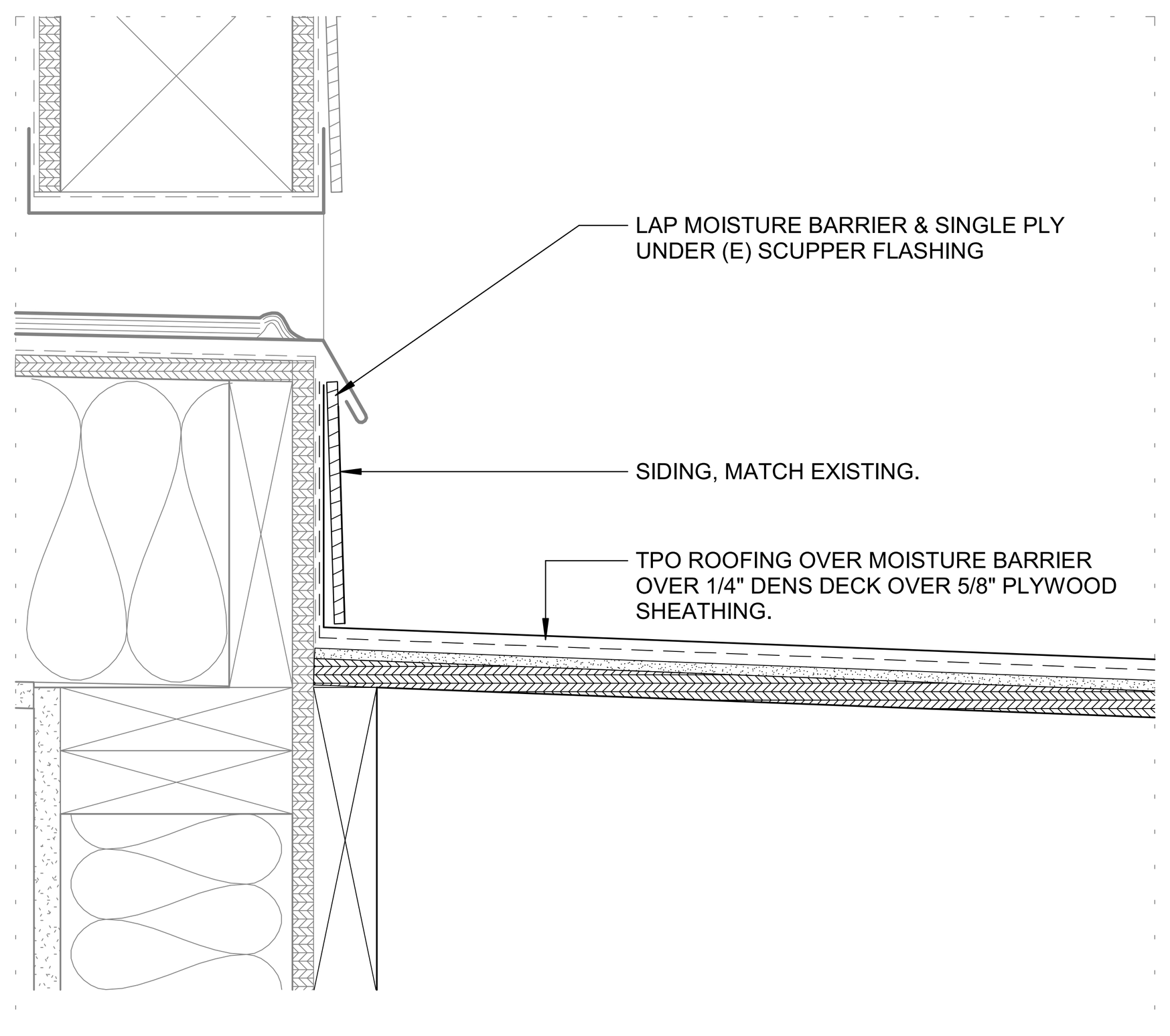
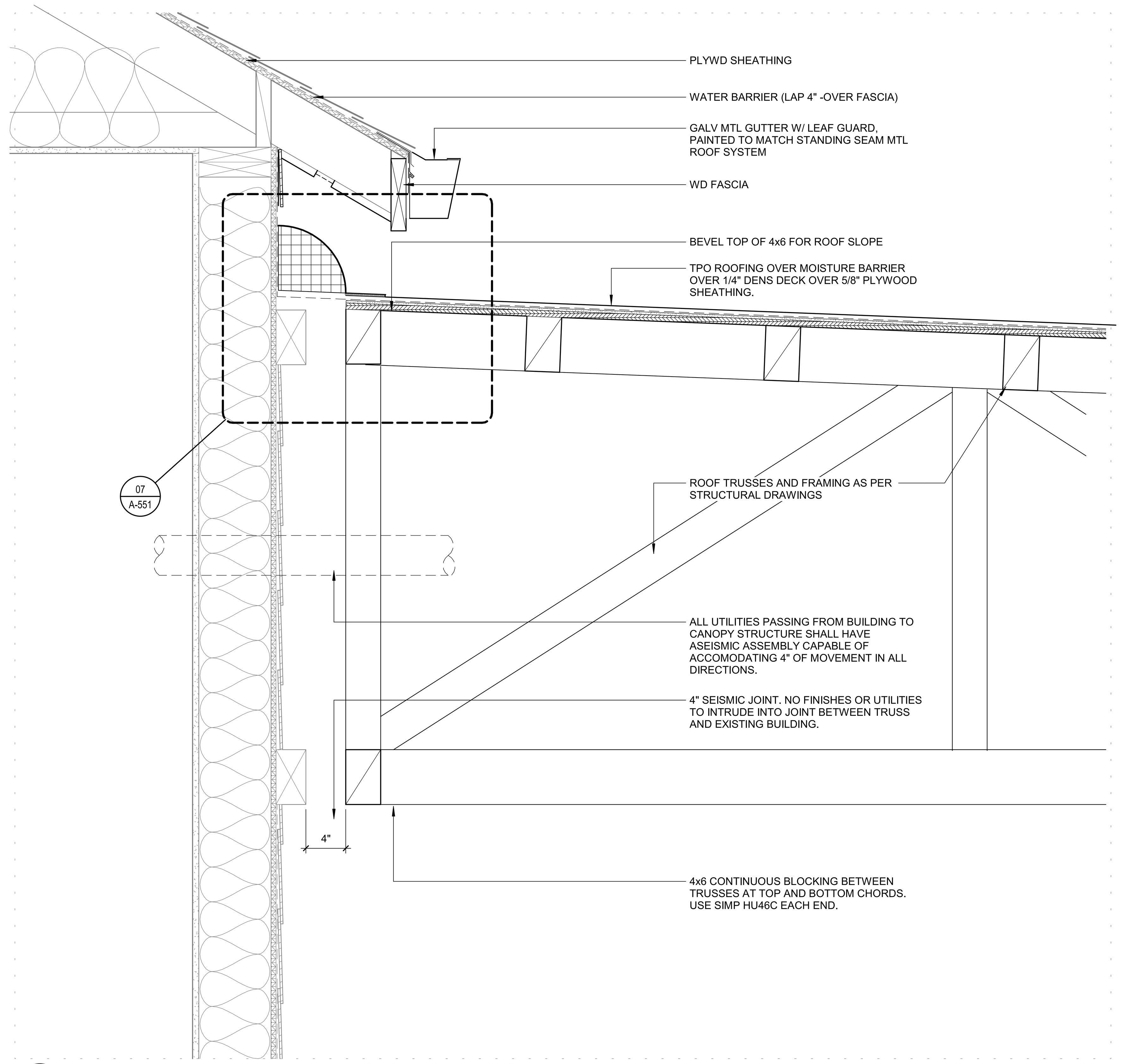


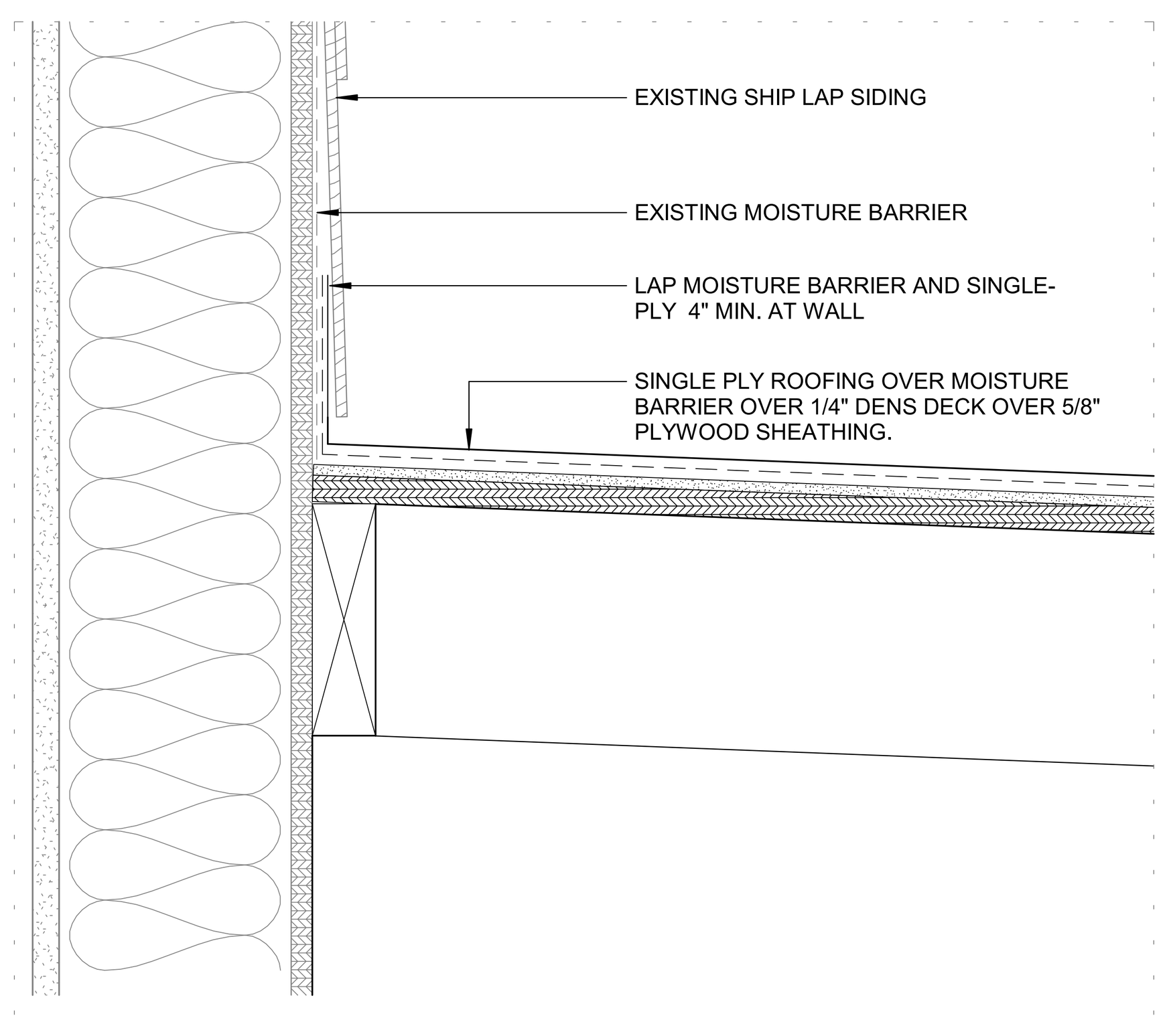
01 ROOF - GUTTER AT SCUPPER DRAIN
3" = 1'-0"



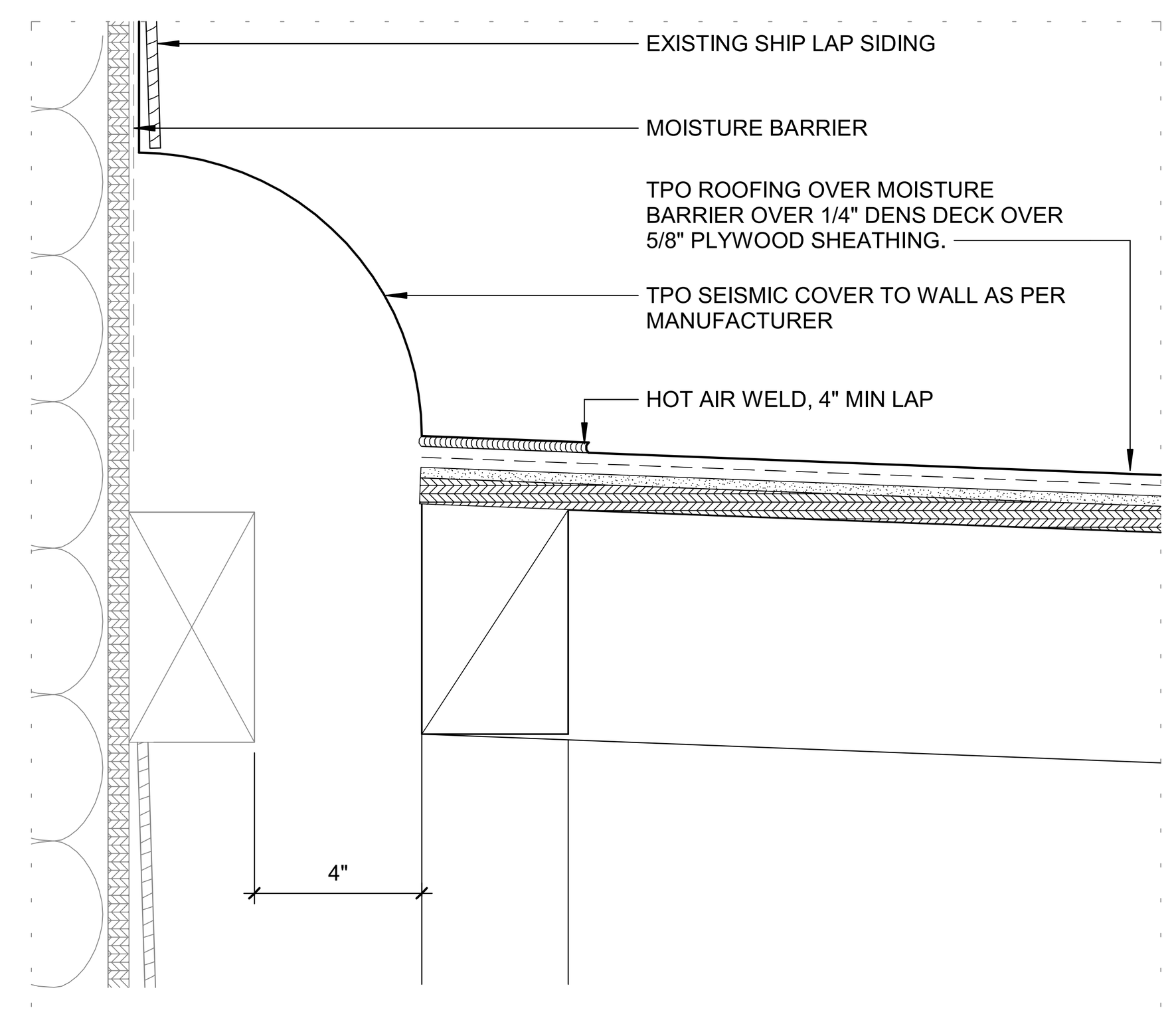
02 ROOF - SINGLE PLY AT SCUPPER DRAIN
3" = 1'-0"



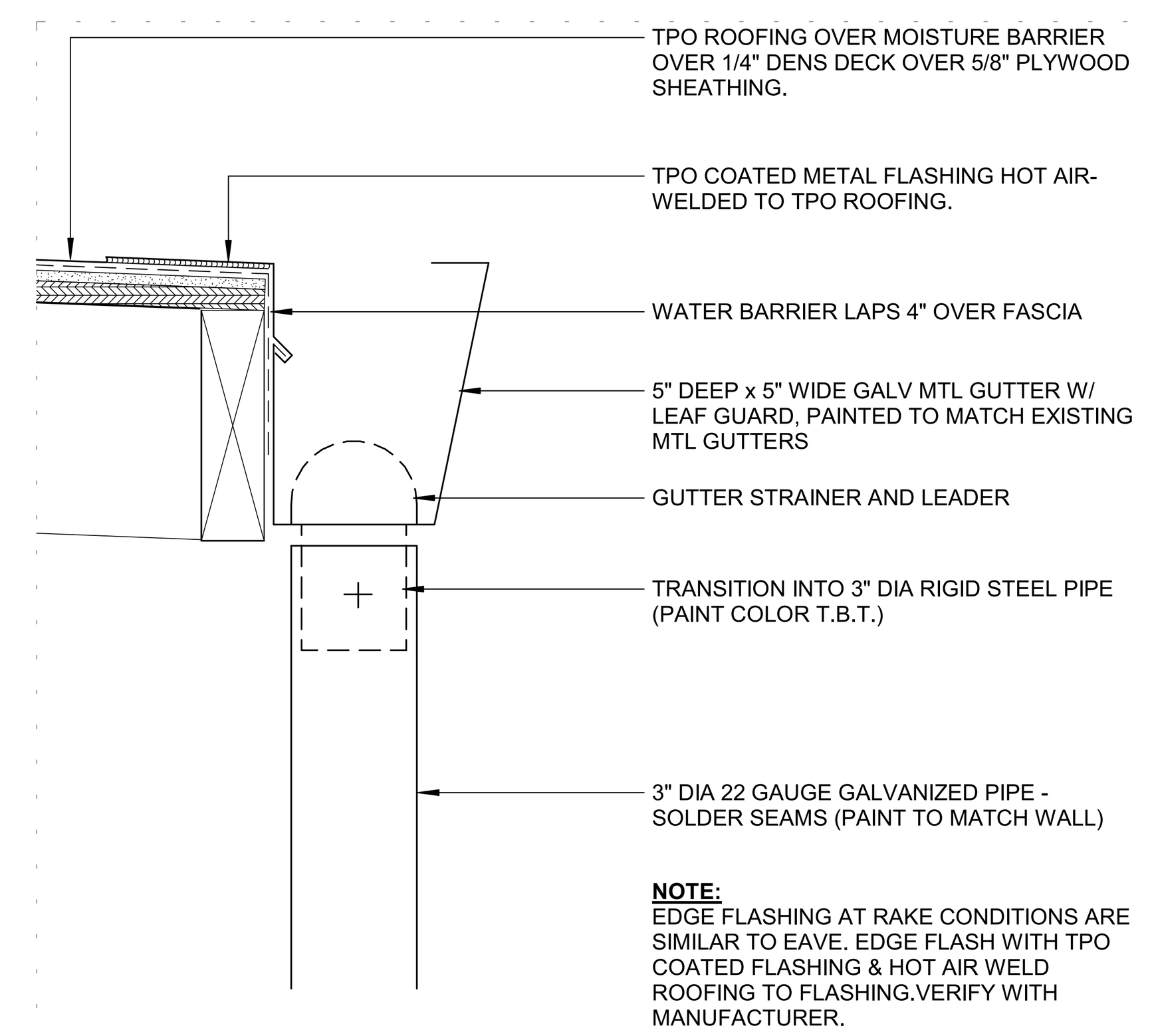
06 ROOF - EAVE AT BUILDING OVER CANOPY
1 1/2" = 1'-0"



03 ROOF - SINGLE PLY AT WALL
3" = 1'-0"

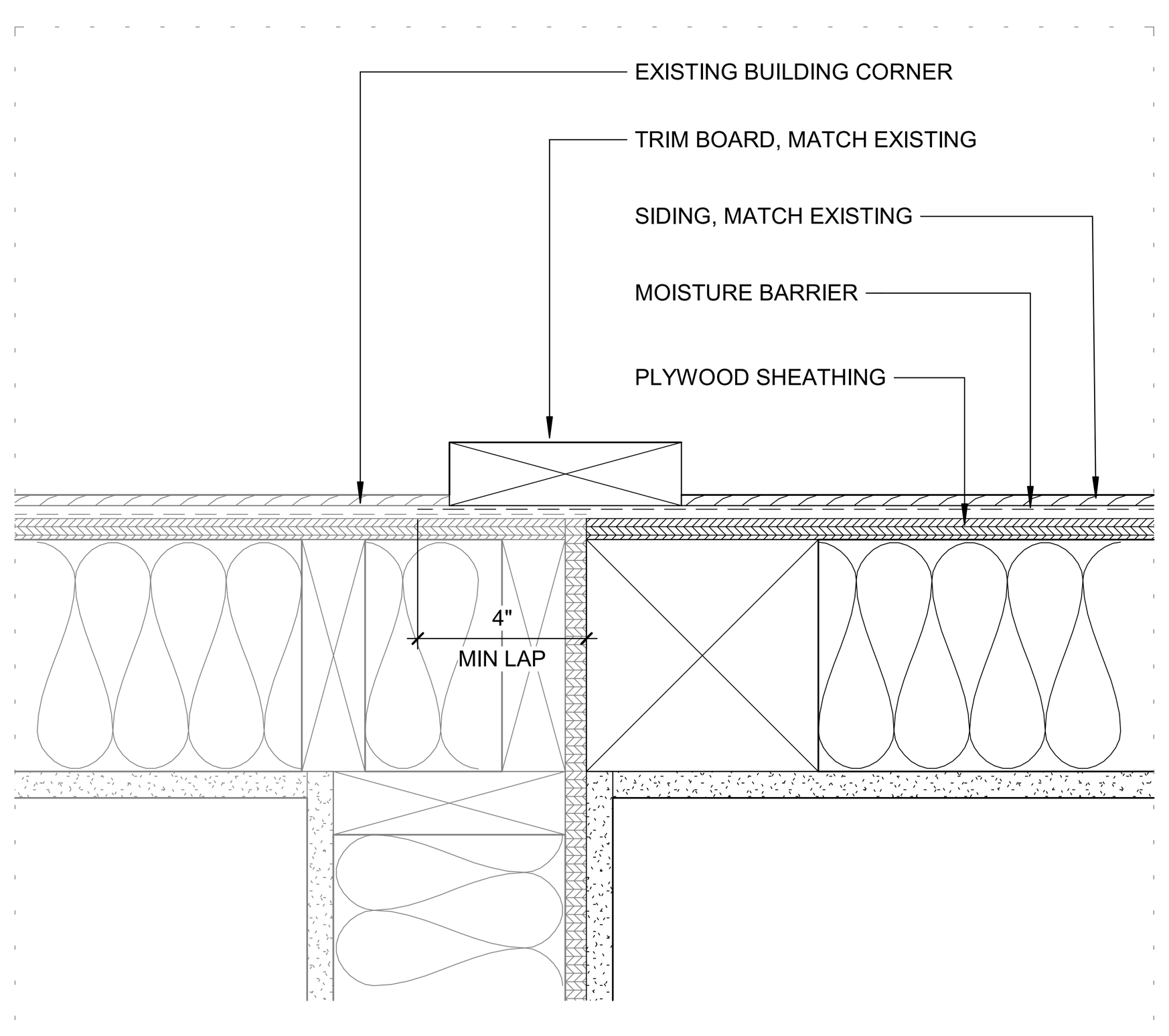


07 ROOF - SEISMIC SINGLE PLY AT WALL
3" = 1'-0"

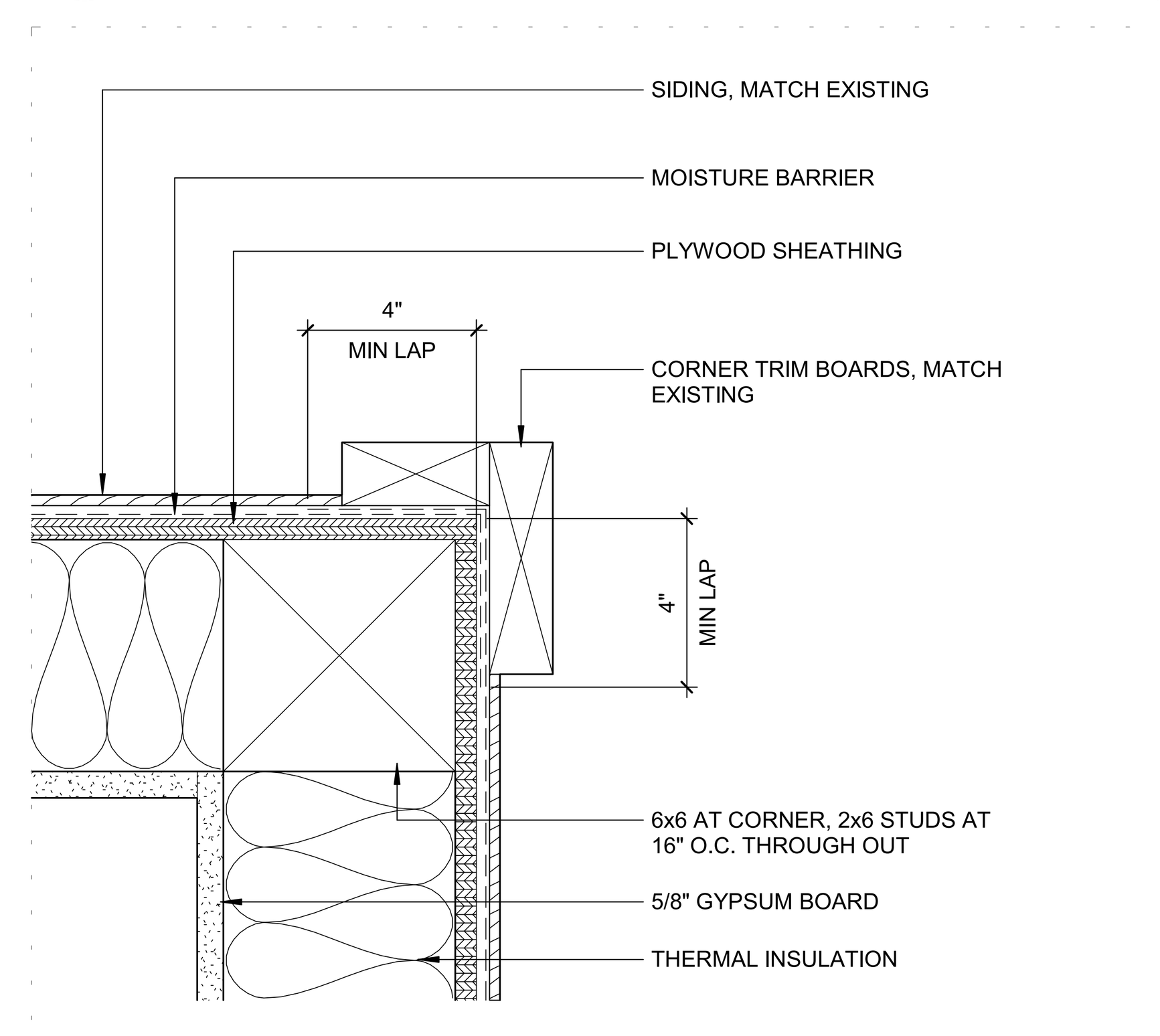


NOTE:
EDGE FLASHING AT RAKE CONDITIONS ARE SIMILAR TO EAVE. EDGE FLASH WITH TPO COATED FLASHING & HOT AIR WELD ROOFING TO FLASHING.VERIFY WITH MANUFACTURER.

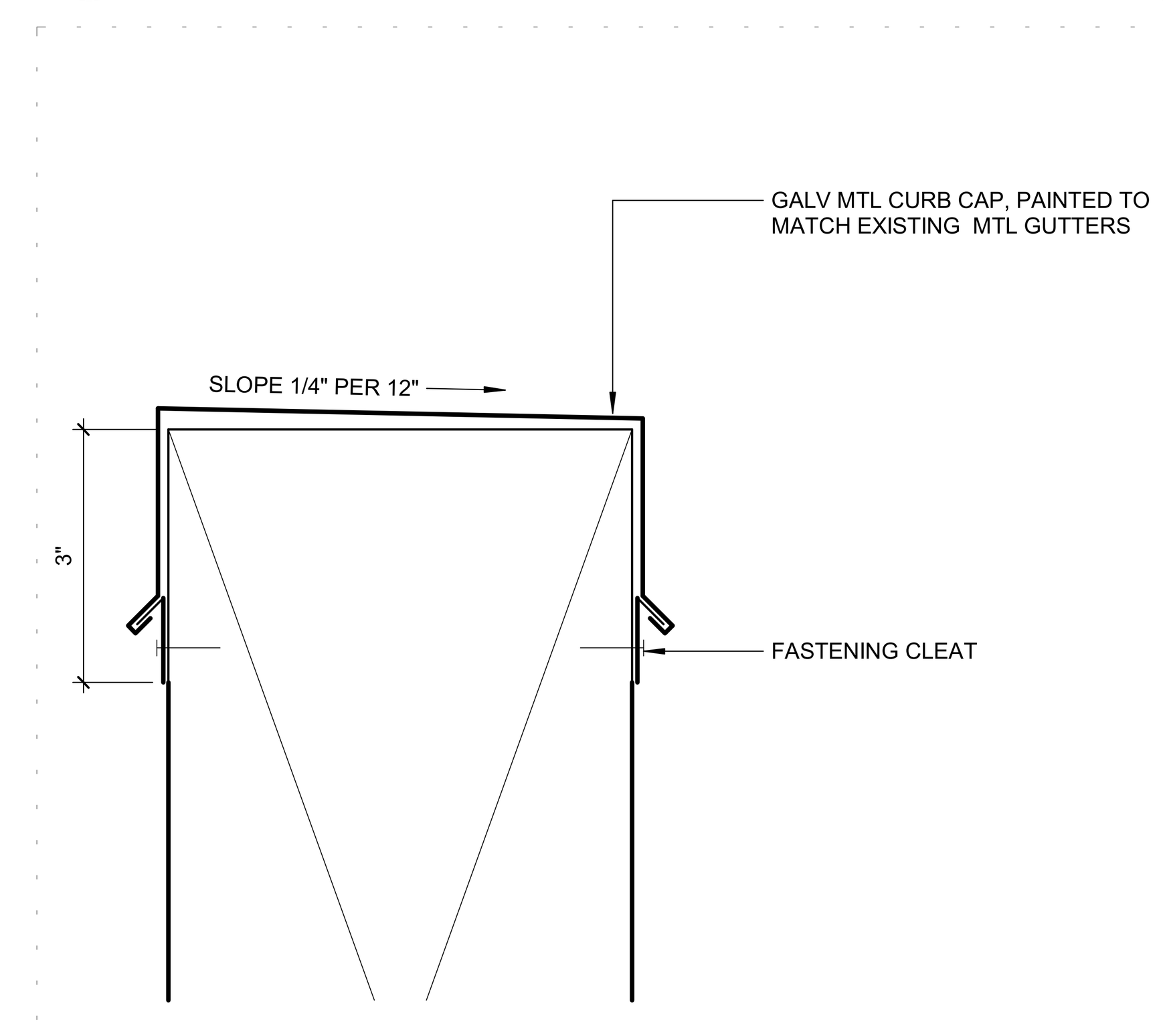
11 ROOF - GUTTER AT SINGLE PLY
3" = 1'-0"



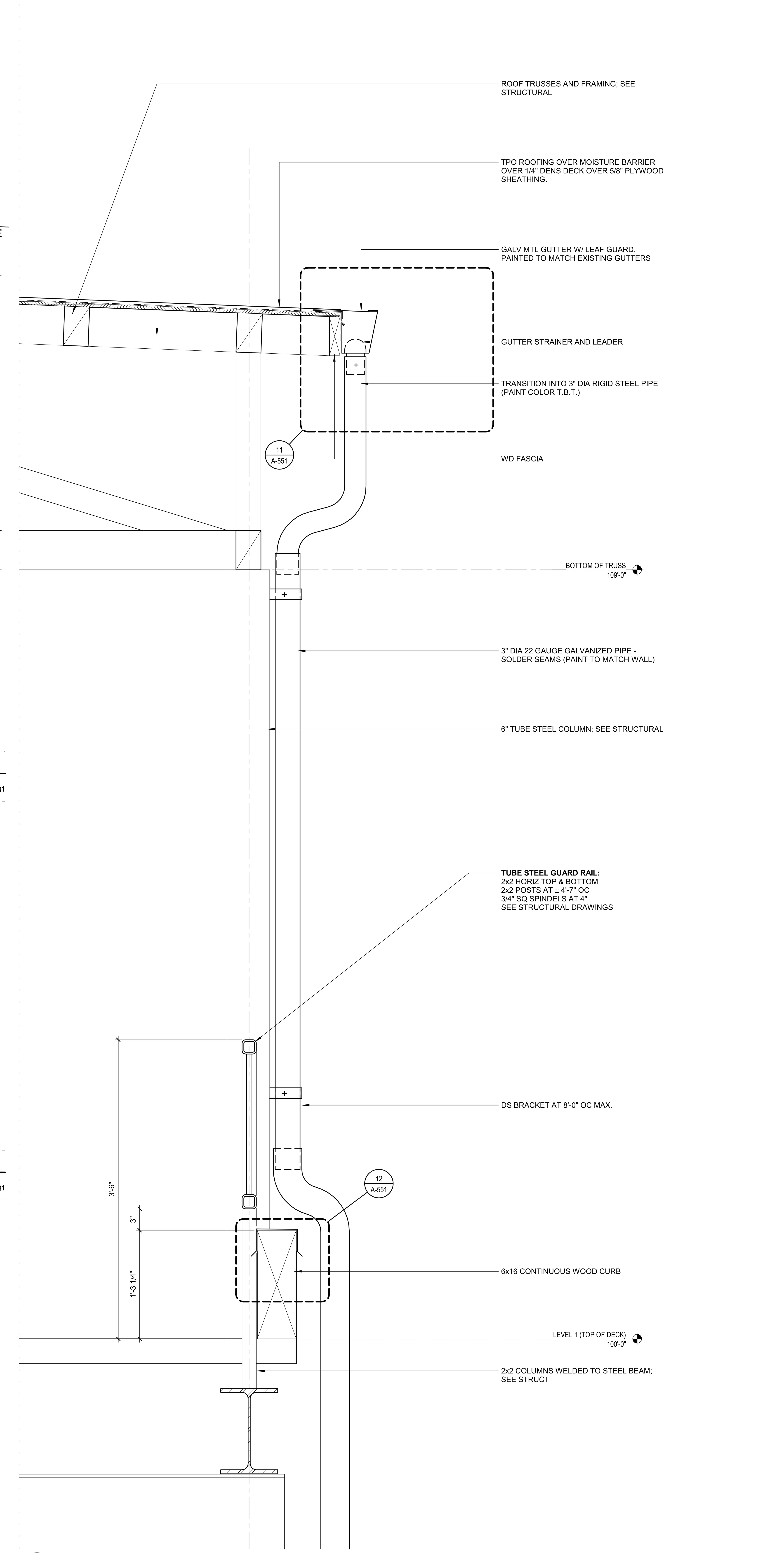
04 WALL - TRIM AT FLUSH CONDITION
3" = 1'-0"



08 WALL - TRIM AT CORNER CONDITION
3" = 1'-0"



12 CURB CAP
6" = 1'-0"



16 ROOF - EAVE GUTTER AND DOWNSPOUT AT CANOPY
1 1/2" = 1'-0"

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PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST,
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CLIENT
CITY OF SACRAMENTO

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TITLE
DETAILS - ARCHITECTURAL

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A-551

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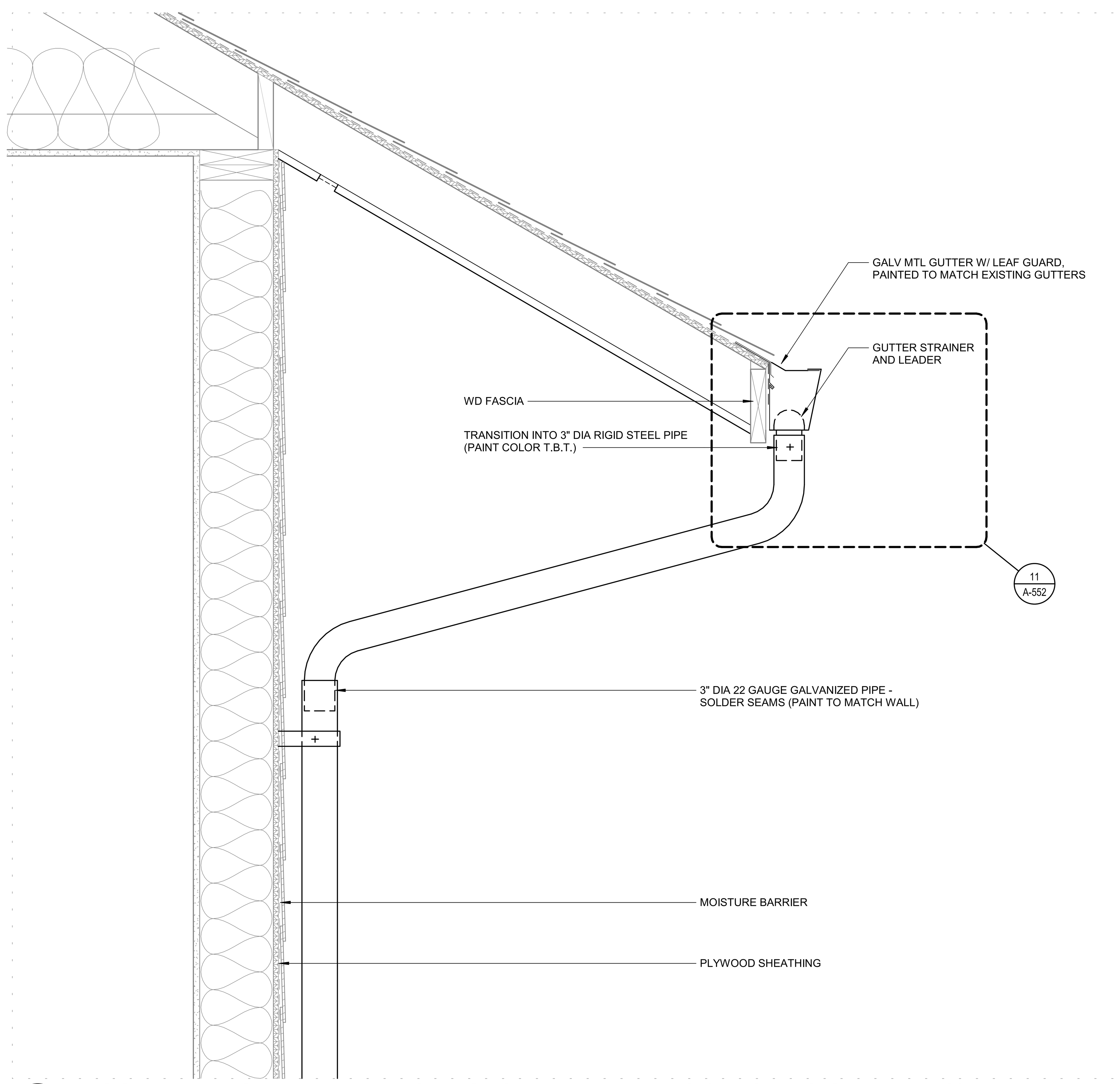
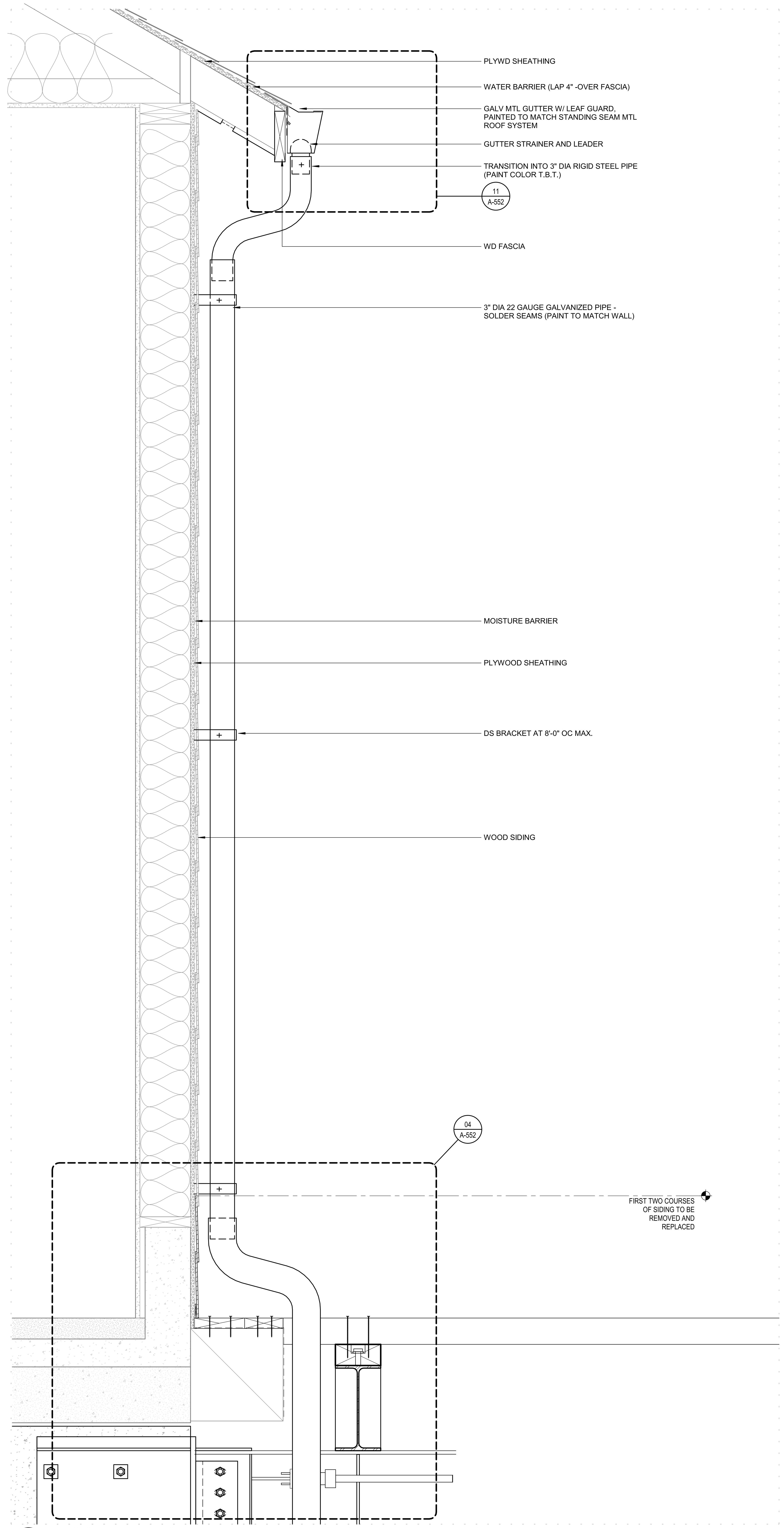
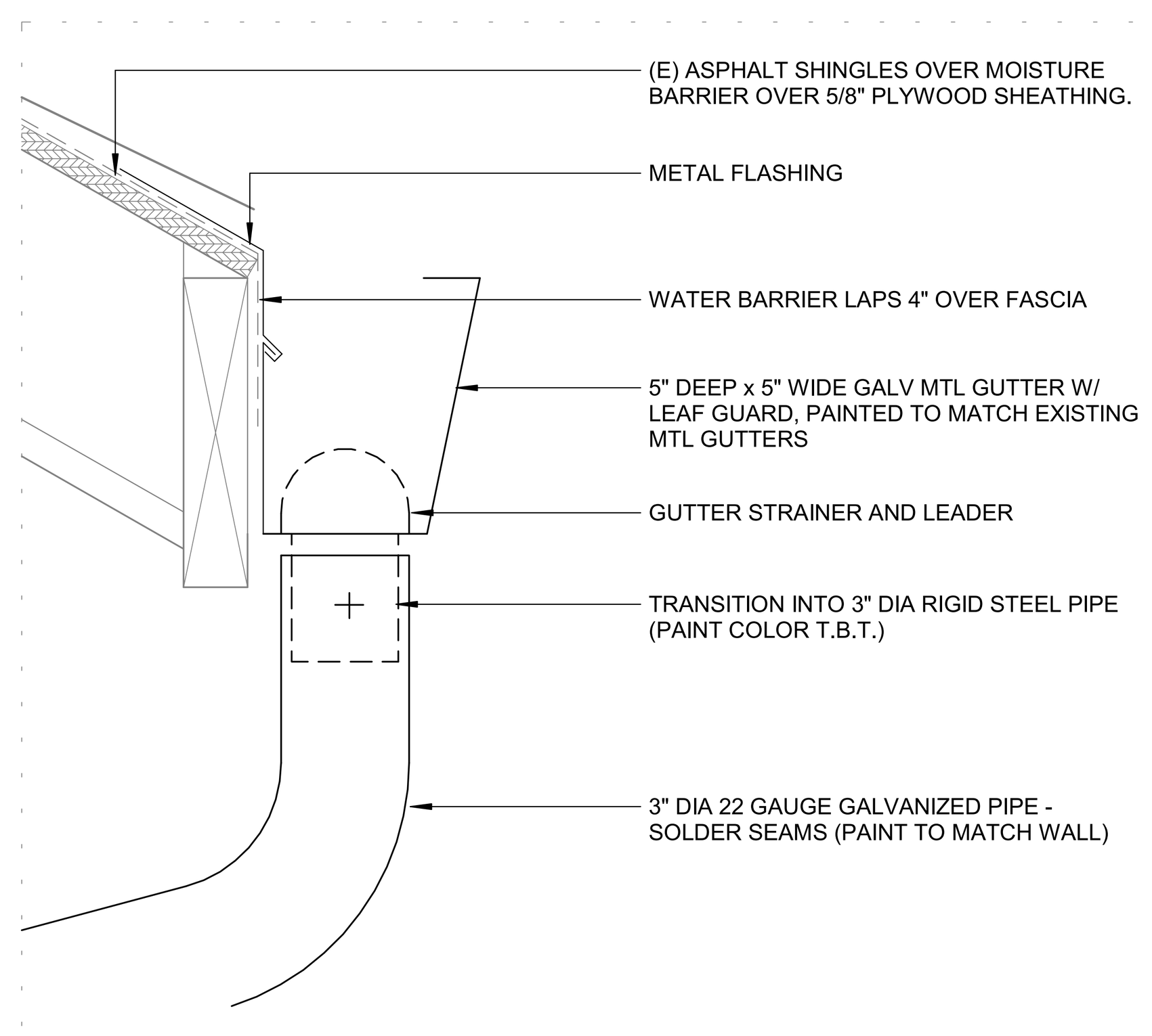


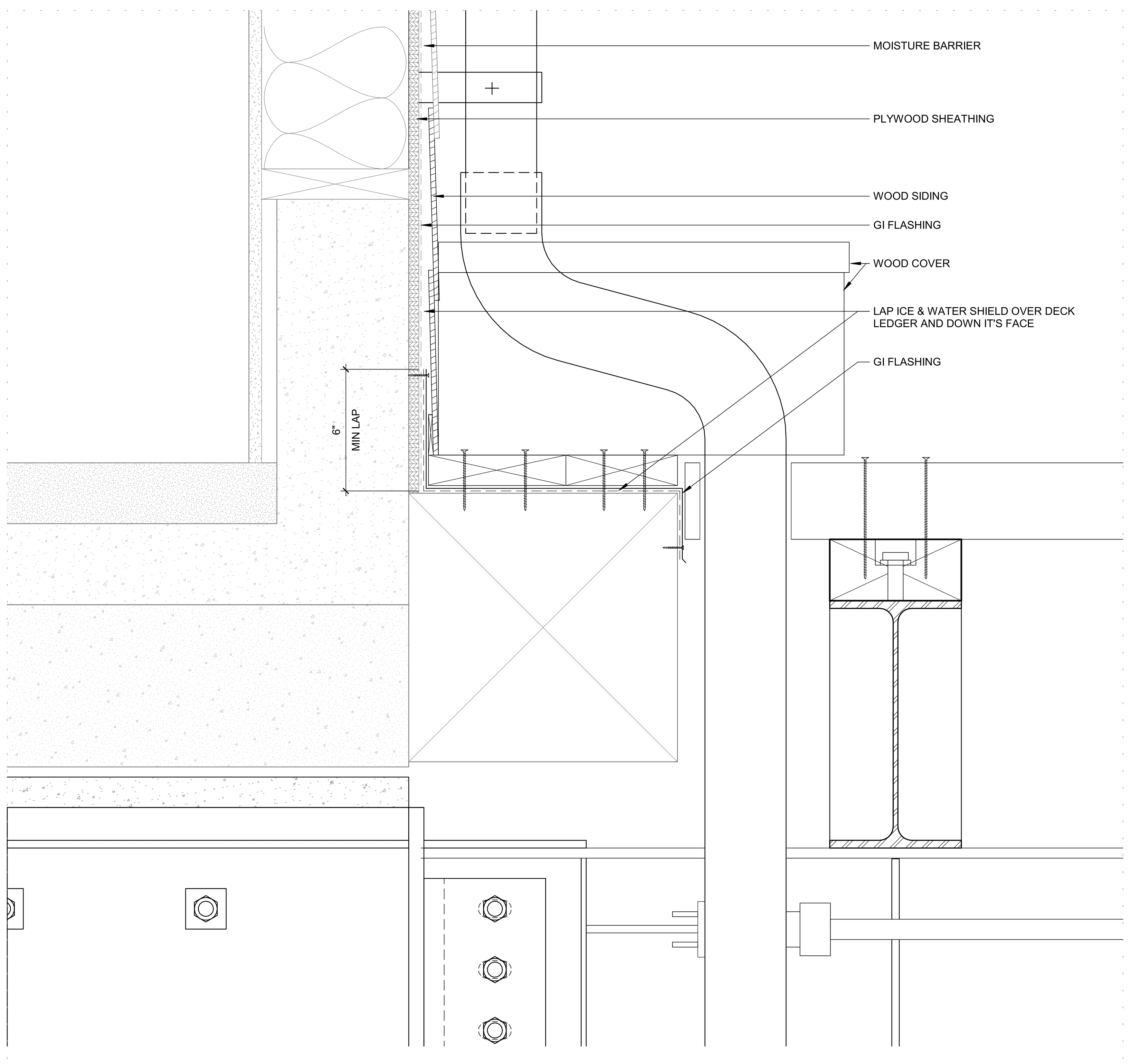
06 ROOF - EAVE GUTTER AND DOWNSPOUT AT BUILDING (EXISTING OVERHANG)
1 1/2" = 1'-0"



16 ROOF - EAVE GUTTER AND DOWNSPOUT AT BUILDING
1 1/2" = 1'-0"



11 ROOF - GUTTER AT SHINGLES
3" = 1'-0"



04 ROOF - DOWNSPOUT AT DECK
3" = 1'-0"

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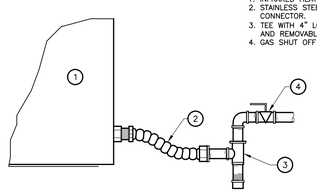
TITLE
DETAILS - ARCHITECTURAL

SHEET
A-552



1. INFRARED HEATER
2. STAINLESS STEEL FLEX CONNECTOR.
3. TEE WITH 4" LONG DIRT LEG AND REMOVABLE CAP.
4. GAS SHUT OFF VALVE.

PFUP0018 INFRARED HEATER GAS CONNECTION NTS 1

PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE	S or W	V	CW	HW	DESCRIPTION
FS-1	FLOOR SINK	2"	1-1/2"	TP	---	JAY R. SMITH MODEL 3150, COATED CAST IRON, ACID RESISTANT COATED INTERIOR, 12-1/2" SQUARE TOP, 10" DEEP, SEDIMENT BASKET, NICKLE-BRONZE RIM, 3/4 GRATE, DOUBLE DRAINAGE FLANGE, TRAP PRIMER CONNECTION SMITH 2697.

NATURAL GAS SIZING TABLE

BASED ON 2022 CPC EQUATION 1215.3(1) LOW PRESSURE (SCHEDULE 40 METALLIC)
PIPE LENGTH (FT)= 175
MAXIMUM LOAD (MBH)= 2176

PIPE SIZE	PIPE ID	MAX. MBH
1/2	0.622	36
3/4	0.824	77
1	1.049	145
1-1/4	1.38	298
1-1/2	1.61	446
2	2.067	860
2-1/2	2.469	1372
3	3.068	2427

GAS EQUIPMENT CAPACITIES

EQUIPMENT	GAS LOAD (MBH)
EXIST FC-1	115
EXIST FC-2	115
EXIST FC-3	115
EXIST FC-4	115
EXIST FC-5	115
EXIST WH	200
EXIST FP	25
EXIST CHEESE 2 AT 6	12
EXIST STEAM	40
EXIST FRYER 2 AT 110	220
EXIST GRIDDLE	220
EXIST OVEN 2 AT 250	500
EXIST BROILER	180
EXIST HEATER 6 AT 34	204
TOTAL	2176

PLUMBING SPECIFICATIONS

A. THIS CONTRACTOR SHALL COMPLY WITH ALL CODES AND REGULATIONS IN EFFECT AT THE JOB SITE, INCLUDING, BUT NOT LIMITED TO:
- A.1. 2022 CALIFORNIA BUILDING CODE
- A.2. 2022 CALIFORNIA MECHANICAL CODE
- A.3. 2022 CALIFORNIA PLUMBING CODE
- A.4. 2022 CALIFORNIA ELECTRICAL CODE
- A.5. 2022 CALIFORNIA GREEN BUILDING STANDARDS
- A.6. 2022 CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS – TITLE 24
- A.7. NATIONAL FIRE PROTECTION ASSOCIATION
- A.8. CALIFORNIA STATE FIRE MARSHAL

B. ALL MATERIALS AND EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE GUARANTEED FREE FROM ALL MECHANICAL, ELECTRICAL AND WORKMANSHIP DEFECTS FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING ALL DAMAGED ITEMS INSTALLED UNDER THIS CONTRACT WITHOUT ADDITIONAL COST TO OWNER.

C. THE PLUMBING CONTRACTOR SHALL PROVIDE THE OWNER COPIES OF OPERATION, MAINTENANCE AND PREVENTATIVE MAINTENANCE MANUALS FOR EACH MODEL AND TYPE OF PLUMBING EQUIPMENT.

D. CHECK AND VERIFY EXISTING CONDITIONS AT THE JOB SITE BEFORE BEGINNING WORK. ADJUST THE LOCATION AND CONFIGURATION OF THE WORK NECESSARY TO SUIT ACTUAL CONDITIONS AND OTHER TRADES. ANY CHANGES REQUIRED MUST FIRST BE APPROVED BY THE ARCHITECT OR ENGINEER.

E. THE LOCATIONS OF EQUIPMENT, PIPING, AND SYSTEMS SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC AND SHALL BE FOLLOWED AS CLOSELY AS POSSIBLE. CHANGES REQUIRED TO SUIT EXISTING CONDITIONS AND DUE TO COORDINATION WITH OTHER TRADES SHALL BE MADE AT NO EXTRA COST TO THE OWNER.

F. SUBMIT MANUFACTURER'S PRODUCT DATA INCLUDING NAME OF MANUFACTURER, TRADE NAME, MODEL, CAPACITY, OPTIONS, DIMENSIONS, WEIGHTS, INSTALLATION AND STARTUP DATA. EQUIPMENT PERFORMANCES SCHEDULED ARE MINIMUM CAPACITY, FLOW, EFFICIENCY, ETC. REQUIRED. WEIGHTS AND ELECTRICAL DATA SCHEDULED IS MAXIMUM AVAILABLE OR ALLOWABLE.

G. ALL EQUIPMENT IS TO BE INSTALLED AS RECOMMENDED BY THE MANUFACTURER. USING ALL ACCESSORY EQUIPMENT AVAILABLE FROM THE MANUFACTURER FOR SUPPORTS, CONTROLS, ETC., TO MAKE A COMPLETE SYSTEM. ALL EQUIPMENT OR ACCESSORIES NEEDED AND NOT SHOWN OR SPECIFIED SHALL BE FURNISHED AND INSTALLED BY THIS CONTRACTOR. ADJUST THE EQUIPMENT FOR PROPER OPERATION, CHECK ALL CONTROLS AND VERIFY THAT ALL SAFETY DEVICES ARE FUNCTIONING PROPERLY.

H. PROVIDE ACCESS DOORS WHERE ACCESS THROUGH FLOORS, WALLS OR CEILINGS IS REQUIRED TO ACCESS PLUMBING COMPONENTS OR OTHER SYSTEMS REQUIRING ACCESS FOR MAINTENANCE, TESTING OR OBSERVATION. COORDINATE THE EXACT TYPE AND LOCATION OF ACCESS DOORS TO PROVIDE PROPER ACCESS TO THE ITEM CONCEALED.

I. CHECK ALL SYSTEMS FOR LEAKS. CORRECT ANY DEFICIENCIES AS SOON AS DISCOVERED. OPERATE THE SYSTEMS AS A TEST AND DEMONSTRATE TO THE OWNER AND ARCHITECT OR ENGINEER THAT THE SYSTEM IS FUNCTIONING PROPERLY.

J. BEFORE COMMENCING WORK CHECK INVERT ELEVATIONS REQUIRED FOR SEWER CONNECTIONS, CONFIRM INVERTS AND ENSURE THAT THESE CAN BE PROPERLY CONNECTED WITH SLOPE FOR DRAINAGE AND COVER TO AVOID FREEZING. VERIFY THE LOCATION OF ALL SERVICES. NO EXTRA COSTS SHALL BE ALLOWED IF SERVICES ARE NOT AS SHOWN.

K. COORDINATE ALL NEW OR CHANGING UTILITY SERVICES WITH UTILITY PROVIDER AS SOON AS POSSIBLE. ALL WORK PERFORMED NOT IN ACCORDANCE WITH THE UTILITY COMPANIES' REQUIREMENTS PRIOR TO COORDINATING WITH THE UTILITY COMPANY SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

L. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE, JOINTS, OR CONNECTED EQUIPMENT.

M. MAKE ALL CONNECTIONS TO EQUIPMENT AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER AS FAR AS TRAPS, DRAINS, FLEXIBLE CONNECTIONS, ETC. AND AS REQUIRED BY THE EQUIPMENT AND LOCATION.

N. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS, FIXTURE MOUNTING HEIGHTS AND ADA ACCESSIBILITY REQUIREMENTS.

O. PIPING INSULATION (INTERIOR APPLICATIONS):
- O.1. GLASS FIBER INSULATION: ASTM C 547 AND ASTM C 795. 'K' ('KSI') VALUE: 0.24 AT 75 DEGREES F, WHEN TESTED IN ACCORDANCE WITH ASTM C 177. MAXIMUM SERVICE TEMPERATURE: 850 DEGREES F. MAXIMUM MOISTURE ABSORPTION: 0.20 PERCENT BY VOLUME.
- O.2. VAPOR BARRIER JACKET: WHITE KRAFT PAPER WITH GLASS FIBER YARN, BONDED TO ALUMINIZED FILM; MOISTURE VAPOR TRANSMISSION WHEN TESTED IN ACCORDANCE WITH ASTM E 96/E 96M OF 0.02.
- O.3. INSULATION THICKNESS SCHEDULES:
  - O.3.1. DOMESTIC HOT AND TEMPERED WATER SUPPLY:
    - O.3.1.1. 2 INCH THICKNESS FOR PIPING 2 INCH AND LARGER.
    - O.3.1.2. 1-1/2 INCH THICKNESS FOR PIPING 1 INCH TO 1-1/2 INCH.
    - O.3.1.3. 1 INCH THICKNESS FOR PIPING LESS THAN 1 INCH.
  - O.3.2. DOMESTIC COLD WATER LOCATED IN UNHEATED AREAS:
    - O.3.2.1. 1 INCH THICKNESS FOR PIPING 1-1/2 INCHES AND LARGER.
    - O.3.2.2. 3/4 INCH THICKNESS FOR PIPING 1 INCHES AND SMALLER.

P. INSULATE DOMESTIC HOT WATER, TEMPERED WATER AND WASTE PIPING BELOW HANDICAPPED PLUMBING FIXTURES WITH MOLDED SINGLE PIECE REMOVABLE INSULATION COVERS, FOAM, FIRE RESISTANT, TRUEBRO, OR EQUAL. INSTALL INSULATION COVERS IN ACCORDANCE WITH CBC ACCESS REQUIREMENTS.

Q. FIXTURES, DOMESTIC WATER PIPING AND COMPONENTS SHALL BE PROVIDED AND INSTALLED IN COMPLIANCE WITH CALIFORNIA AB 1953 LEGISLATION WHICH LIMITS THE ALLOWABLE LEAD CONTENT IN CERTAIN DOMESTIC WATER SYSTEM COMPONENTS.

R. PROVIDE COMPRESSION SHUTOFF CONTROL STOP VALVES WITH IPS INLETS AND THREADED BRASS NIPPLES AT PIPE CONNECTION ON WATER SUPPLIES TO EACH FIXTURE.

S. PROVIDE CHROMIUM-PLATED FINISH ON FITTINGS AND ACCESSORIES EXPOSED TO VIEW.

T. FIXTURE FITTINGS AND TRIM: CONFORM TO ASME A112.18.1M AND ASME A112.19.5, AS APPLICABLE.

U. PROVIDE WATER HAMMER ARRESTORS AT END OF PIPE RUNS TO TWO OR MORE FIXTURES, PROPERLY SIZED WITH SUFFICIENT DISPLACEMENT VOLUME TO DISSIPATE CALCULATED ENERGY IN THE PIPING SYSTEMS. WATER HAMMER ARRESTORS SHALL BE STAINLESS STEEL SHELL WITH STAINLESS STEEL BELLOWS CONTAINED WITHIN THE CASING.

V. PROVIDE PIPE SLEEVES WHERE PIPES AND TUBING PASS THROUGH WALLS, FLOORS, ROOFS, AND PARTITIONS. FINISH FLUSH AT BOTH ENDS. EXTEND 2 INCHES (50 MM) ABOVE FINISHED FLOORS. PACK SPACE BETWEEN PIPE OR TUBING AND SLEEVE, AND CALK.

W. IDENTIFY PIPING WITH TAPE AND DECALS. INSTALL LABELING ON PIPE AT INTERVALS OF NOT MORE THAN 20 FEET (6 METERS) AND AT LEAST ONCE IN EACH ROOM AND EACH STORY TRAVERSED BY PIPELINE.

X. PROVIDE NON-CONDUCTING DIELECTRIC CONNECTIONS WHEREVER JOINTING DISSIMILAR METALS.

Y. ALL PLUMBING VENTS SHALL TERMINATE NOT LESS THAN 10' FROM ANY OUTSIDE AIR INTAKE OR OPENING TO THE BUILDING.

Z. ALL EXPOSED MATERIAL SHALL BE PREPARED WITH A PRIME COAT AND THEN PAINTED.

PLUMBING LEGEND

SYMBOL	ITEM	ABBR.
	FIXTURE DESIGNATION UNIT ABBREVIATION NUMBER	
	DETAIL DESIGNATION DETAIL NUMBER SHEET NO. WHERE SHOWN	
-CW-	DOMESTIC COLD WATER	CW
-HW-	DOMESTIC HOT WATER	HW
	DOMESTIC HOT WATER SUPPLY	HWS
	DOMESTIC HOT WATER RETURN	HWR
-V-	VENT	V
G	GAS	G
MG	MEDIUM PRESSURE GAS	MG
LPG	LIQUID PROPANE GAS	LPG
S	SEWER	S
GW	GREASE WASTE	GW
OS	OIL/SAND WASTE	OS
AW	ACID WASTE	AW
SD	STORM DRAIN	SD
RD	ROOF DRAIN	RD
OD	OVERFLOW DRAIN	OD
C	CONDENSATE DRAIN	C
SCD	SECONDARY DRAIN	SCD
D	DRAIN	D
T&P	TEMPERATURE & PRESSURE RELIEF	T&P
FS	FIRE SPRINKLER	FS
	PIPE CAP	
	PIPE RISER/DROP	(R)/(D)
	SHUT-OFF VALVE IN BOX	SOV
FCO	FLOOR CLEANOUT	FCO
COTG	CLEANOUT TO GRADE	COTG
	WALL CLEANOUT	WCO
	CLEANOUT	CO
	HOSE BIBB	HB
	OVERFLOW DRAIN OUTLET	
	BALL VALVE	BV
	GATE VALVE	GV
	CHECK VALVE	CHK.V
	MIXING VALVE	TMV
	SHUT-OFF COCK	SOC
	CIRCULATION PUMP	CP
	BALANCING VALVE	BLV
	TRAP PRIMER	TP
	TYPICAL	(TYP)
	VENT THRU ROOF	VTR
	UNDERGROUND	UG
	UNDER FLOOR	UF
	ABOVE CEILING	AB.C.
	TO ABOVE/BELOW	TA/TB
	FROM ABOVE/BELOW	FA/FB
	CONTINUATION	CONT.
	NEW	(N)
	EXISTING	(E)
	DEMOLITION	DEMO
	POINT OF DIS/CONNECTION	POD/POC

PLUMBING SHEET INDEX

SHEET NO.	SHEET TITLE
P-001	PLUMBING NOTES, LEGEND AND SCHED.
PD111	PLUMBING DEMOLITION FLOOR PLAN
P-111	PLUMBING FLOOR PLAN
P-132	PLUMBING ROOF PLAN

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JASON DEDOLPH
M 34661
REN. 12-31-23
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PLUMBING NOTES LEGEND AND SCHEDULES

SHEET

P-001

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2" 1" 0 1/4" 1/2"

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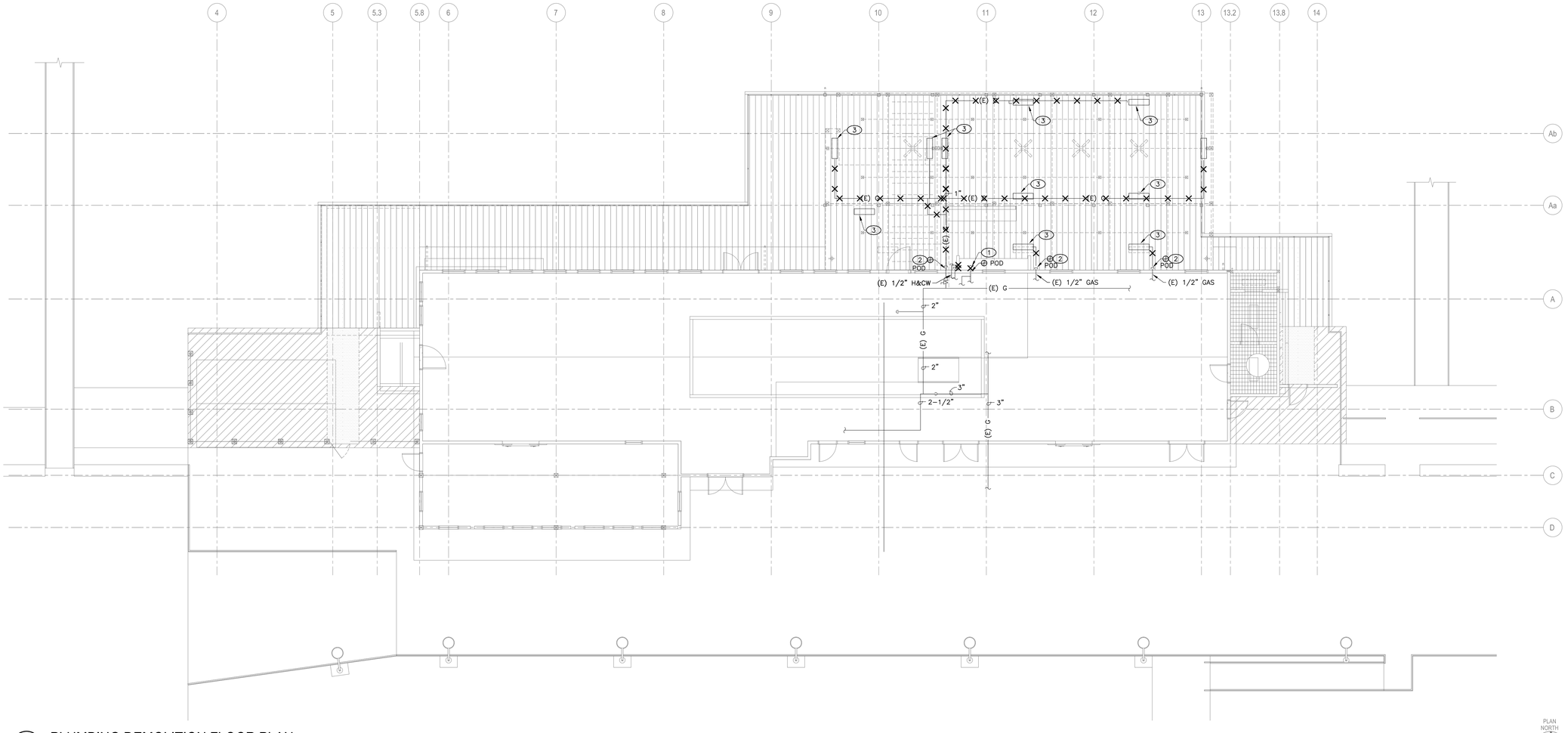
KEY NOTES

1. REMOVE (E) SINK AND PLUG WASTE AND VENT PIPING AT POD SHOWN. HOT AND COLD WATER ARE TO BE CAPPED AT WALL.
2. REMOVE (E) GAS PIPING AND CAP (E) GAS PIPING AT POD SHOWN AT WALL.
3. REMOVE (E) UNIT HEATER AND ASSOCIATED GAS PIPING. SALVAGE (E) UNIT HEATERS AND MOUNTING BRACKETS FOR REINSTALLATION AFTER DECK RECONSTRUCTION. RETURN UNUSED UNITS TO OWNER.



1 PLUMBING DEMOLITION FLOOR PLAN
SCALE 1/8" = 1'-0"

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TITLE
PLUMBING DEMOLITION FLOOR PLAN

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PD111

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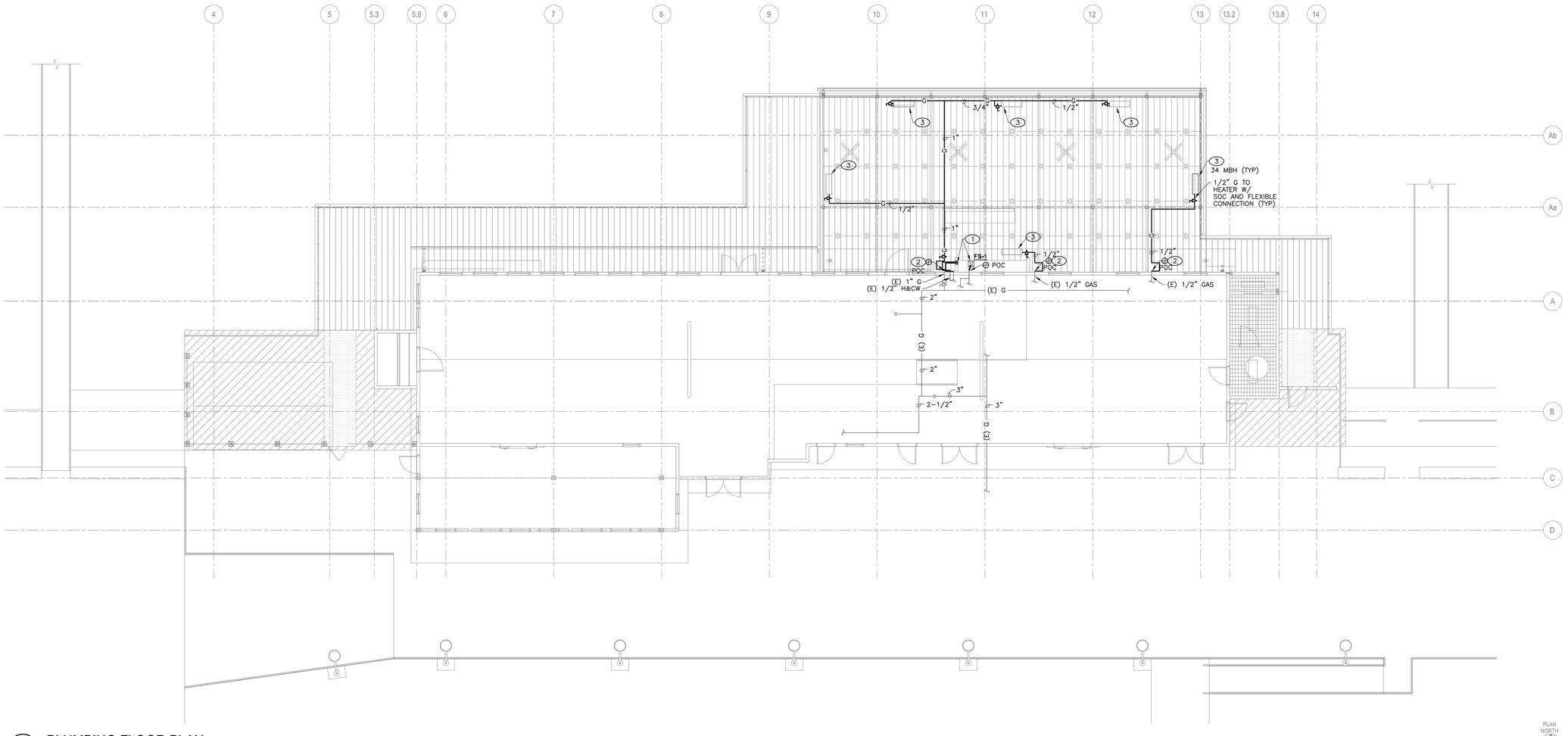
KEY NOTES

1. INSTALL (N) FLOOR SINK AND CONNECT TO (E) WASTE AND VENT PIPING AT POC SHOWN. COORDINATE FLOOR SINK LOCATION WITH DECKING. CONNECT TO (E) HOT AND COLD WATER AND EXTEND TO NEW FIXTURE.
2. INSTALL (N) GAS PIPING AT POC SHOWN AT WALL. PROVIDE METRAFLEX MLACT SEISMIC LOOP AT CONNECTION.
3. REINSTALL (E) UNIT HEATER AND MOUNTING BRACKET & CONNECT TO (N) GAS PIPING WITH SHUT-OFF COCK. COORDINATE POWER AND ON/OFF SWITCH WITH ELECTRICAL.



1 PLUMBING FLOOR PLAN
SCALE 1/8" = 1'-0"

PLAN NORTH

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TITLE
PLUMBING FLOOR PLAN

SHEET
P-111

RAINWATER PIPE SIZING

PROJECT LOCATION		SACRAMENTO, CA	
MAXIMUM RAINFALL RATE		3"/HR	
ROOF DRAIN SIZE (IN INCHES)	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREA FOR ROOF DRAIN, LEADERS & VERTICAL RAINWATER PIPING	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREA FOR HORIZONTAL RAINWATER (SLOPE: 1/4" = 1'-0")	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREA FOR HORIZONTAL RAINWATER (SLOPE: 1/8" = 1'-0")
2"	960 SQ FT	N/A	N/A
3"	2,930 SQ FT	1,546 SQ FT	1,096 SQ FT
4"	6,130 SQ FT	3,533 SQ FT	2,506 SQ FT
6"	17,995 SQ FT	10,066 SQ FT	7,133 SQ FT
8"	38,660 SQ FT	21,733 SQ FT	15,330 SQ FT

* AS PER 2022 CALIFORNIA PLUMBING CODE TABLE 1103.1 & 1103.2

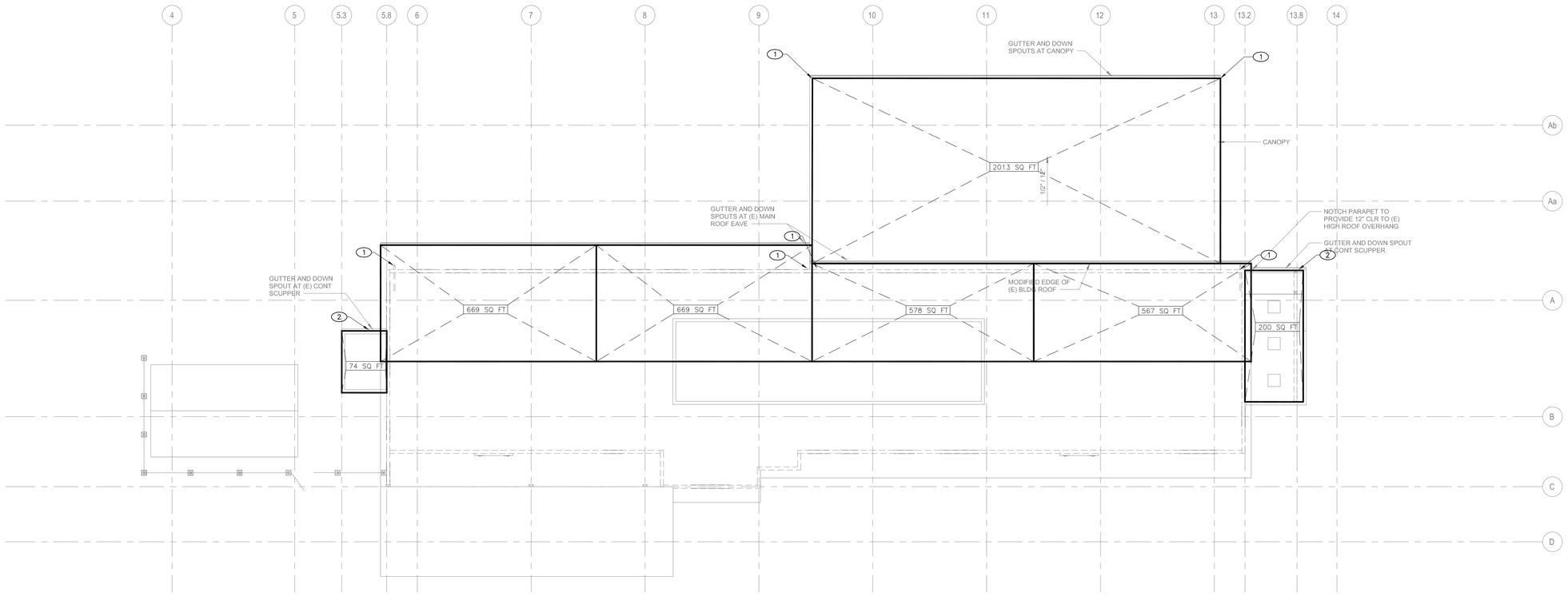
GUTTER SIZING

PROJECT LOCATION			SACRAMENTO, CA
MAXIMUM RAINFALL RATE			3"/HR
DIAM. GUTTER SIZE (IN INCHES)	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREA FOR GUTTER SIZE (SLOPE: 1/4" = 1'-0")	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREA FOR GUTTER SIZE (SLOPE: 1/8" = 1'-0")	MAXIMUM ALLOWABLE HORIZONTAL PROJECTED ROOF AREA FOR GUTTER SIZE (SLOPE: 1/16" = 1'-0")
2"	N/A	N/A	N/A
3"	454 SQ FT	320 SQ FT	226 SQ FT
4"	960 SQ FT	681 SQ FT	480 SQ FT
5"	1,668 SQ FT	1,172 SQ FT	834 SQ FT
6"	2,560 SQ FT	1,815 SQ FT	1,280 SQ FT
7"	3,680 SQ FT	2,600 SQ FT	1,840 SQ FT
8"	5,310 SQ FT	3,740 SQ FT	2,655 SQ FT

* AS PER 2022 CALIFORNIA PLUMBING CODE TABLE 1103.3.

KEY NOTES

1. (N) GUTTER AND DOWNSPOUT BY ARCHITECTURAL. SEE ARCHITECTURAL PLANS FOR SIZE AND ROUTING.
2. (N) SCUPPER AND DOWNSPOUT BY ARCHITECTURAL. SEE ARCHITECTURAL PLANS FOR SIZE AND ROUTING



1 PLUMBING ROOF PLAN
SCALE 1/8" = 1'-0"

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MARK	DATE	DESCRIPTION
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT
LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
PLUMBING ROOF PLAN

SHEET
P-132

DEMOLITION GENERAL NOTES

ALL DEMOLITION GENERAL NOTES SHOWN BELOW ARE NOT NECESSARILY USED ON PLANS IF NOT REQUIRED.

1. ALL EXISTING EQUIPMENT, DEVICES, CONDUIT, AND WIRING, ETC., WHERE SHOWN ON PLANS ARE BASED ON AVAILABLE EXISTING DOCUMENTS AND LIMITED SITE SURVEYS AND ARE SHOWN FOR CLARITY. IT SHALL BE REGARDED AS AN APPROXIMATION ONLY. CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT. PRIOR TO SUBMITTING BID AND BEFORE START OF ANY ELECTRICAL WORK, CONTRACTOR SHALL VERIFY ON–SITE ALL EXISTING LOCATIONS AND CONDITIONS TO ASCERTAIN ALL WORK REQUIRED.
2. EXISTING ELECTRICAL MAIN SERVICE IS BEING REPLACED WITH NEW THAT IS TO BE INCLUDED IN THE SCOPE OF WORK. CONTRACTOR SHALL VERIFY AND COORDINATE THE SEQUENCE OF WORK WITH THE LOCAL UTILITY COMPANY, THE OWNER/DISTRICT'S REPRESENTATIVE, AND OTHER TRADES AT THE EARLIEST START OF CONSTRUCTION FOR ALL REQUIREMENTS AND SCHEDULING OF THE REQUIRED WORK FOR A SMOOTH AND TIMELY TRANSFORMATION FROM THE EXISTING SERVICE TO THE NEW SERVICE TO ENSURE THAT ALL WORK PROCEEDS WITH A MINIMUM OF INTERFERENCE AND DELAY. LIMIT THE ELECTRICAL SHUTDOWN TO A MINIMUM SO IT WILL NOT AFFECT THE EXISTING FACILITY'S NORMAL DAILY FUNCTIONS AND OPERATION.
3. CAUSE AS LITTLE INTERFERENCE OR INTERRUPTION OF EXISTING UTILITIES AND/OR OTHER EXISTING FACILITY'S SYSTEMS AND SERVICES AS POSSIBLE. CONTRACTOR SHALL NOTIFY THE OWNER/DISTRICT'S REPRESENTATIVE AT LEAST 72 HOURS TO SCHEDULE ALL NECESSARY SHUTDOWN. SHUTDOWN WORK SHALL BE PERFORMED AFTER THE NORMAL OPERATION HOURS OF THE FACILITY, IF SO DIRECTED BY THE OWNER/DISTRICT'S REPRESENTATIVE.
4. ALL REMOVED AND/OR DEMOLISHED ELECTRICAL MATERIALS AND EQUIPMENT TO BE ACCOMPLISHED UNDER THIS CONTRACT, WHICH IN THE OPINION OF THE OWNER/DISTRICT'S REPRESENTATIVE ARE DEEMED SALVAGEABLE, SHALL REMAIN THE PROPERTY OF THE OWNER/DISTRICT. ALL ELECTRICAL MATERIAL AND EQUIPMENT CONSIDERED NOT SALVAGEABLE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF BY THE CONTRACTOR ACCORDINGLY.
5. WHERE REMOVAL OF AN EXISTING SYSTEM'S DEVICE WILL RESULT IN LOSS OF CIRCUIT CONTINUITY, THE ISOLATED PORTIONS OF THE CIRCUIT SHALL BE RECONNECTED TO PROVIDE SERVICE TO ALL REMAINING DEVICES. IF SITE CONDITIONS MAKE RECONNECTION IMPOSSIBLE, CONNECTION SHALL BE MADE FROM AN ADJACENT AVAILABLE DEVICE AS NOTED AND/OR AS DIRECTED BY THE ARCHITECT AND/OR THE OWNER/DISTRICT'S REPRESENTATIVE.
6. WHERE EXISTING CONCEALED CONDUITS, WHETHER SHOWN OR NOT, OR SPECIFIED TO BE REUSED, WHICH BECAME EXPOSED DUE TO CONSTRUCTION CHANGES, IT SHALL BE REROUTED TO THE NEAREST AVAILABLE REUSED OUTLET.
7. ALL EXISTING EXPOSED CONDUITS AND/OR WIRING THAT ARE DETERMINED BY THE DISTRICT AND ARCHITECT TO BE MAINTAINED FOR EXISTING SYSTEM FUNCTION AND CONTINUITY, WHETHER SHOWN ON PLAN OR NOT, ARE TO BE REROUTED CONCEALED IN WALL AND/OR CEILING FOR A CLEAN FINISHED SURFACE WITH NO EXPOSED CONDUITS AND/OR WIRING WITHIN THE REMODELED AREA.
8. REMOVE ALL EXISTING EXPOSED CONDUITS, WIRING, ELECTRICAL OUTLETS, DEVICES, AND EQUIPMENT THAT ARE DETERMINED BY THE DISTRICT REPRESENTATIVE/OWNER AND ARCHITECT TO BE NON FUNCTIONAL AND/OR NOT BEING USED FROM WITHIN THE REMODELED AREA FOR A CLEAN FINISHED SURFACE.
9. WHERE EXISTING WIRING OR EQUIPMENT IS ABANDONED AS A RESULT OF THIS CONTRACT, IT SHALL BE REMOVED INSOFAR AS POSSIBLE. THIS INCLUDES BUT IS NOT LIMITED TO:
   A. REMOVE ALL WIRE AND CABLE.
   B. REMOVE ALL DEVICES AND EQUIPMENT.
   C. REMOVE ALL EXPOSED CONDUIT AND CONDUIT IN ACCESSIBLE CONCEALED AREAS, AS FAR AS POSSIBLE.
   D. CUT OFF AND CAP ALL ABANDONED CONDUIT. STUBS SHALL NOT BE PROTRUDED ABOVE FLOOR AND/OR FINISHED WALLS AND CEILINGS.
10. WHEREVER EXISTING ELECTRICAL DEVICES, PANELS, CONDUITS, CABLES, ETC., CONFLICT WITH REMODEL WORK, WHETHER SHOWN OR NOT, RELOCATE THESE ITEMS AS DIRECTED BY THE ARCHITECT AND/OR OWNER/DISTRICT'S REPRESENTATIVE.
11. WHERE SHOWN ON PLAN FOR REMOVAL OF EXISTING CONDUITS, REMOVE ALL PORTIONS OF CONDUITS WHERE IT IS ACCESSIBLE AND ABANDON PORTIONS OF CONDUITS WHERE IT IS INACCESSIBLE. CUT OFF AND CAP ALL ABANDONED CONDUITS. STUBS SHALL NOT BE PROTRUDED ABOVE FLOOR AND/OR FINISHED WALLS AND CEILINGS.
12. CONTRACTOR SHALL UPDATE WITH NEW TYPEWRITTEN PANEL DIRECTORIES TO EXISTING PANELS INVOLVED IN THIS RENOVATION WORK THAT SHALL REFLECT ALL CHANGES TO THE CIRCUIT DESIGNATIONS.
13. PROVIDE AND INSTALL PROTECTIVE COVERING OVER EXISTING EQUIPMENT IN AREA WHEN INSTALLING ANY NEW WORK.
14. COORDINATE WITH OTHER TRADES AND PROMPTLY TRANSMIT ALL INFORMATION REQUIRED BY THEM. COORDINATE THE SEQUENCE OF DEMOLITION WITH OTHER TRADES TO ENSURE THAT ALL WORK PROCEEDS WITH A MINIMUM OF INTERFERENCE AND DELAY.
15. REFER TO MECHANICAL AND PLUMBING DRAWINGS FOR HEATERS, EXHAUST FANS, WATER HEATERS, PUMPS, ETC., WHICH ARE REQUIRED TO BE DISCONNECTED BY THE ELECTRICAL CONTRACTOR FOR REMOVAL OR ABANDONMENT BY THE MECHANICAL AND/OR PLUMBING CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE SEQUENCE OF WORK WITH THE MECHANICAL AND/OR PLUMBING CONTRACTOR FOR REMOVAL OF ALL APPLICABLE STARTERS, DISCONNECT SWITCHES, AND ASSOCIATED CONDUIT, AND WIRING.
16. ALL LIGHT FIXTURES INDICATED AS RELOCATED SHALL BE CLEANED AND RE–LAMPED PRIOR TO THE RE–INSTALLATION.

GENERAL NOTES

ALL GENERAL NOTES SHOWN BELOW ARE NOT NECESSARILY USED ON PLANS IF NOT REQUIRED.

1. THESE GENERAL NOTES ARE INTENDED TO ASSIST THE CONTRACTOR IN THE EXECUTION OF THE ELECTRICAL WORK AND TO BE INCLUDED IN CONJUNCTION WITH THE CONTRACT DOCUMENT DRAWINGS AND SPECIFICATION REQUIREMENTS. SOME OF THE GENERAL NOTES ARE EXCERPTS FROM THE SPECIFICATION.
2. PROCURE PERMITS AND LICENSES REQUIRED. PAY ALL NECESSARY FEES AND ARRANGE FOR INSPECTIONS REQUIRED BY LOCAL CODES AND ORDINANCES AND UTILITY COMPANIES.
3. COORDINATE ALL ELECTRICAL SERVICES WITH THE RESPECTIVE UTILITY COMPANIES AND PROVIDE ALL TRENCHING, CONDUITS, WIRING, METER FACILITIES AND OUTLETS REQUIRED BY THEM.
4. WORKMANSHIP SHALL BE OF THE HIGHEST GRADE. DEFECTIVE EQUIPMENT OR EQUIPMENT DAMAGED IN THE COURSE OF INSTALLATION OR TEST SHALL BE REPLACED OR REPAIRED IN A MANNER MEETING WITH THE ACCEPTANCE OF THE ARCHITECT.
5. INSTALL ALL EQUIPMENT, CONDUITS, OUTLETS, AND FIXTURES IN STRICT ACCORDANCE WITH THE CURRENT EDITION OF ALL APPLICABLE CODES (CEC, STATE, COUNTY AND CITY).
6. DO NOT SCALE PLANS FOR FIXTURES, DEVICES, OR APPLIANCE LOCATIONS. USE FIGURED DIMENSIONS IF GIVEN OR CHECK MECHANICAL AND ARCHITECTURAL PLANS. ALSO REFER TO ACTUAL ON–SITE CONDITIONS.
7. ALL MATERIAL AND EQUIPMENT IS TO BE LISTED AND INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND CEC 110.3.
8. ALL ELECTRICAL DEVICES AND EQUIPMENT, FIXTURES, CONDUITS AND WIRING SHOWN ON THESE PLANS ARE NEW, UNLESS OTHERWISE NOTED.
9. OUTLET BOXES INSTALLED IN FIRE WALLS SHALL BE ONE–PIECE STEEL AND INSTALLED IN SEPARATE (STAGGERED) STUD PENETRATIONS, MINIMUM 24 INCHES HORIZONTAL SEPARATION. FIRE WALLS SHALL BE MADE IN ACCORDANCE WITH CBC AND ELECTRICAL CODES.
10. THE FINAL LOCATION OF ALL OUTLETS SHALL BE VERIFIED WITH THE ARCHITECT AND/OR OWNER AT TIME OF CONSTRUCTION.
11. ALL OUTDOOR ELECTRICAL EQUIPMENT SHALL BE WEATHER–PROTECTED.
12. CONTRACTOR SHALL VERIFY THAT ALL LIGHTING FIXTURES, CEILING TRIMS, AND FRAMES ARE COMPATIBLE WITH CEILING SYSTEM INSTALLED.
13. CONTRACTOR SHALL COORDINATE LIGHT FIXTURE LOCATIONS AND INSTALLATIONS WITH THE MECHANICAL CONTRACTOR. MAINTAIN REQUIRED CLEARANCES (MINIMUM 3 INCHES) BETWEEN THE LIGHT FIXTURES AND MECHANICAL DUCTS OR EQUIPMENT FOR PROPER OPERATION, INSTALLATION AND/OR REMOVAL OF FIXTURES.
14. BEFORE SUBMITTING FOR ARCHITECT'S REVIEW AND PLACING ORDER FOR THE LIGHT FIXTURES, THE CONTRACTOR SHALL VERIFY THE VOLTAGE OF ALL THE LIGHTING FIXTURES TO MATCH THE VOLTAGE OF THE SERVICE PANEL, WHETHER THE VOLTAGE FOR THE LIGHT FIXTURES ARE SHOWN ON THE PLAN OR NOT.
15. PLACEMENT AND CIRCUITING OF EXIT SIGNS AND EGRESS LIGHTING SHALL COMPLY WITH CBC REQUIREMENTS.
16. ALL CONDUIT SHALL BE ROUTED CONCEALED UNLESS NOTED ON PLAN OR ACCEPTED BY THE ARCHITECT.
17. PROVIDE ALL NECESSARY SLEEVES AND INSERTS FOR ALL WORK PASSING THROUGH OR ATTACHING TO WALLS, FLOORS, OR CEILINGS.
18. ALL WIRING SHALL BE INSTALLED IN RIGID METALLIC CONDUIT, UNLESS OTHERWISE NOTED. CONDUITS INSTALLED CONCEALED IN WALL AND CEILING MAY BE EMT WITH STEEL COMPRESSION TYPE FITTINGS. PVC WHERE INSTALLED UNDERGROUND AND/OR UNDER SLAB. ALL EXPOSED CONDUITS SHALL BE RIGID STEEL CONDUITS WITH THREADED TYPE FITTINGS. INSTALL ALL CONDUITS IN ACCORDANCE WITH CECA STANDARDS OF INSTALLATION.
19. ELECTRICAL NON–METALLIC TUBING (ENT) AND MC CABLE ARE NOT PERMITTED TO BE USED FOR THIS PROJECT, NO EXCEPTIONS.
20. WHERE EXISTING CONDUITS, CONCEALED OR EXPOSED, AND (WIREMOLD) SURFACE RACEWAY IS NOT IN PLACE AS SHOWN ON PLANS, PROVIDE NEW CONDUITS AND (WIREMOLD) SURFACE RACEWAY FOR THE NEW WORK. VERIFY EXISTING CONDITION ON SITE AND PROVIDE ALL NECESSARY NEW MATERIAL, APPARATUS, AND WORK THAT ARE REQUIRED TO BE INCLUDED IN THE BID PACKAGE.
21. CONDUCTORS, #8 AND LARGER, SHALL BE STRANDED COPPER WITH THHN/THWN INSULATION, UNLESS OTHERWISE NOTED.
22. PROVIDE WORKING CLEARANCE PER CEC 110.26 FOR SERVICE PANEL, SUBPANELS, MOTOR DISCONNECT SWITCHES, CONTROL SECTIONS. HVAC EQUIPMENT, APPLIANCES, ETC.
23. PROVIDE A WARNING LABEL (SIGN) CLEARLY VISIBLE TO QUALIFIED PERSONS TO COMPLY WITH NEC AND CEC 116.16 OF POTENTIAL ELECTRIC ARC FLASH HAZARDS AT SWITCHBOARDS, PANELBOARDS, INDUSTRIAL CONTROL PANELS AND MOTOR CONTROL CENTERS THAT ARE LIKELY TO REQUIRE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE WHILE ENERGIZED. SERVICE EQUIPMENT SHALL BE LEGIBLY MARKED WITH THE MAXIMUM AVAILABLE FAULT CURRENT PER CEC SECTION 110.24(A).
24. BUILDING SERVICE AND SUBPANELS TO COMPLY WITH CEC 110.9 AND 110.10 INTERRUPTING RATING AND BRACING. PROVIDE A.I.C. CALCULATIONS FOR SUBPANELS IF INTERRUPTING RATING TO BE USED IS LOWER THAN MAIN SERVICE RATING.
25. ALL APPLIANCES SHALL COMPLY WITH CEC ARTICLE 422. APPLIANCE CONTROL AND PROTECTION PER CEC 422–III; BRANCH CIRCUITS PER 422–II.
26. BUILDING EXPANSION JOINTS MAY OR MAY NOT BE INDICATED ON THE ELECTRICAL DRAWINGS. VERIFY THE LOCATIONS OF ALL APPLICABLE BUILDING EXPANSION JOINTS WITH THE ARCHITECTURAL DRAWINGS. WIRING METHODS ACROSS EXPANSIONS JOINTS SHALL INCLUDE USE OF FLEXIBLE FITTINGS OR OTHER DEVICES AS APPROPRIATE TO EACH APPLICATION. IN NO CASE SHALL CONDUIT CROSS SUCH A JOINT IN BUILDING CONSTRUCTION WITHOUT USE OF THE APPROPRIATE WIRING METHODS.
27. CONTRACTOR SHALL SIZE ALL THE INTERIOR AND EXTERIOR BUILDING PULL BOXES AND UNDERGROUND PULL BOXES PER CEC 314.16 AND COMPLY WITH CEC 314.28 FOR INSTALLATION OF RACEWAYS AND WIRING AS REQUIRED BY CODE, UNLESS OTHERWISE NOTED.
28. WHERE ACCESSIBILITY IS NOT AVAILABLE TO ELECTRICAL OUTLETS, DEVICES AND/OR EQUIPMENT, COORDINATE WITH THE ARCHITECT FOR PROVISIONS TO PROVIDE ACCESSIBILITY TO THEM.
29. CONTRACTOR IS RESPONSIBLE FOR REVIEWING THE MECHANICAL DRAWINGS AND PROVIDES ALL CONDUITS AND CONTROL WIRING AND POWER WIRING SHOWN ON THE MECHANICAL DRAWINGS THAT IS NOT SHOWN ON THE ELECTRICAL PLANS.
30. CONTRACTOR SHALL REFER TO THE MECHANICAL DRAWINGS AND COORDINATE FOR THE EQUIPMENT LOCATIONS. COORDINATE ROOF PENETRATION WITH THE MECHANICAL CONTRACTOR FOR MECHANICAL CONNECTIONS. ENTER ROOF MOUNTED UNITS THROUGH EQUIPMENT MOUNTING CURBS WHERE POSSIBLE. VERIFY ON–SITE.
31. PROVIDE CONVENIENCE OUTLET WITHIN 25 FEET OF MECHANICAL EQUIPMENT PER U.M.C. WHERE LOCATED OUTSIDE, PROVIDE WEATHER PROOF AND GFCI CONVENIENCE OUTLET. SECURE ROOF MOUNTED OUTLET TO THE MECHANICAL EQUIPMENT. VERIFY LOCATION IN FIELD WITH THE MECHANICAL CONTRACTOR.
32. VERIFY SINGLE–POINT CONNECTIONS TO ROOF MOUNTED HVAC UNITS WITH MECHANICAL CONTRACTOR ON–SITE PRIOR TO ELECTRICAL ROUGH–IN. PROVIDE DUAL DISCONNECTS IF TWO–POINT CONNECTIONS ARE REQUIRED, WHETHER SHOWN ON PLANS OR NOT.
33. SWITCH DEVICES CONTROLLING MECHANICAL EQUIPMENT SHALL BE SIZE AND TYPE REQUIRED AND SHALL BE SERVED WITH QUANTITY OF WIRES AS REQUIRED. REFER TO DIVISION 23 MECHANICAL PLANS AND SPECIFICATIONS.
34. COORDINATE THE HVAC EQUIPMENT FOR FUSES REQUIRE. WHERE FUSES ARE REQUIRED, VERIFY FUSE SIZE ON–SITE AND PROVIDE FOR HVAC EQUIPMENT PER UNIT NAMEPLATE SPECIFICATIONS.
35. MOTOR DISCONNECT SWITCHES SHALL COMPLY WITH CEC 430–IX AND 440.II.
36. MOTOR STARTERS FOR HVAC EQUIPMENT ARE PROVIDED BY MECHANICAL CONTRACTOR AND CONNECTED BY ELECTRICAL CONTRACTOR, UNLESS NOTED OTHERWISE.
37. ALL CONNECTIONS FROM THE DISCONNECT SWITCHES TO HVAC UNITS SHALL BE COPPER CONDUCTORS. MOTOR DISCONNECT SWITCHES SHALL COMPLY WITH CEC 430–VII, 430–VIII, AND 440–II.
38. VERIFY LOCATION AND HEIGHT OF ALL MECHANICAL OR FIXTURE EQUIPMENT OUTLETS WITH SUPPLIER PRIOR TO ANY ROUGH–IN WORK. PROVIDE ALL RUNS AND CONNECTIONS TO EQUIPMENT.
39. ALL TERMINATION PROVISIONS OF EQUIPMENT, INCLUDING CIRCUITS RATED 100 AMPERES OR LESS, SHALL BE RATED AT 60 DEGREE, CENTIGRADE PER CEC 110.14(c).
40. ALL LIGHT FIXTURES INSTALLED OVER FOOD HANDLING OR FOOD PREPARATION AREAS, OPEN FOOD STORAGE AND UTENSIL WASHING AREAS SHALL BE OF SHATTERPROOF CONSTRUCTION OR SHALL BE PROTECTED WITH SHATTERPROOF SHIELDS AND SHALL BE READILY CLEANABLE.
41. ALL CONDUITS SHALL BE CONCEALED BELOW SLAB, IN WALLS AND/OR ABOVE CEILINGS EXCEPT IN ELECTRICAL ROOMS, MECHANICAL ROOMS, AND OTHER SIMILAR UTILITY ROOMS AS APPROVED BY THE ARCHITECT. NO CONDUIT SHALL BE EXPOSED ON EXTERIOR BUILDING SURFACES WITHOUT PRIOR APPROVAL FROM THE ARCHITECT.
42. PROVIDE A CODE SIZED GROUND CONDUCTOR IN ALL CONDUITS WHETHER INDICATED ON PLANS OR NOT.

ELECTRICAL ABBREVIATIONS

ABBREV	DESCRIPTIONS	ABBREV	DESCRIPTIONS
A, AMP	AMPERES	MAX	MAXIMUM
AC	ABOVE COUNTER	MC	METAL–CLAD CABLE
AF/AT	AMPERE FRAME / AMPERE TRIP	MCA	MINIMUM CIRCUIT AMPACITY
AFCI	ARC FAULT CIRCUIT INTERRUPTER	MCB	MAIN CIRCUIT BREAKER
AFF	ABOVE FINISHED FLOOR	MCC	MOTOR CONTROL CENTER
AHJ	AUTHORITY HAVING JURISDICTION	MGB	MAIN GROUND BAR
AIC	AMPERE INTERRUPTING CAPACITY	MG SET	MOTOR–GENERATOR SET
AL	ALUMINUM	MLO	MAIN LUGS ONLY
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	MOCP	MAXIMUM OVERCURRENT PROTECTION
AS/AF	AMPERE SWITCH / AMPERE FUSE	MPOE	MINIMUM POINT OF ENTRY
AT	AMPERE TRIP RATING OF BREAKER	MS	MOTION SENSOR
AUTO	AUTOMATIC	MSB	MAIN SWITCHBOARD
ATS	AUTOMATIC TRANSFER SWITCH	MTD	MOUNTED
AWG	AMERICAN WIRE GAUGE	MTS	MANUAL TRANSFER SWITCH
BMS	BUILDING MANAGEMENT SYSTEM	MV	MEDIUM VOLTAGE CABLE
C, CDT	CONDUIT	MW	MEGAWATTS
CATV	COMMUNITY ANTENNA TELEVISION	(N)	NEW
CB	CIRCUIT BREAKER	NECA	NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION
CEC	CALIFORNIA ELECTRICAL CODE	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
CFL	COMPACT FLUORESCENT	NIC	NOT IN CONTRACT
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED	NL	NIGHT LIGHT
CKT	CIRCUIT	NRTL	NATIONALLY RECOGNIZED TESTING LABORATORIES
cmil	CIRCULAR MIL	NTS	NOT TO SCALE
CO	CONDUIT ONLY w/PULL STRING	OC	ON CENTER
CSFM	CALIFORNIA STATE FIRE MARSHALL	OCPD	OVERCURRENT PROTECTIVE DEVICE
CT	CURRENT TRANSFORMER	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
CU	COPPER	OFOI	OWNER FURNISHED, OWNER INSTALLED
DET	DETAIL	PH, Ø	PHASE OR POLE
DISC	DISCONNECT	PB	PULL BOX
DIST	DISTRIBUTION	PF	POWER FACTOR
DWG	DRAWING	PFB	PROVIDE FOR FUTURE BREAKER
EC	ELECTRICAL CONTRACTOR	PIV	POST INDICATOR VALVE
EGC	EQUIPMENT GROUNDING CONDUCTOR	PLC	PROGRAMMABLE LOGIC CONTROLLERS
ELEV, EL	ELEVATION	PNL	PANEL
EM, EMERG	EMERGENCY	PoE	POWER OVER INTERNET
EMT	ELECTRICAL METALLIC TUBING	PV	PHOTOVOLTAICS
ENT	ELECTRICAL NONMETALLIC TUBING	PVC	POLYVINYL CHLORIDE
EOL	END OF LINE RESISTOR	PWR	POWER
EPO	EMERGENCY POWER OFF	(R)	RELOCATED
EQPT	EQUIPMENT	RCP	REFLECTED CEILING PLAN
EV	ELECTRIC VEHICLE	REC, RECPT	RECEPTACLE
EVSE	ELECTRIC VEHICLE SUPPLY EQUIPMENT	REQD	REQUIRED
EXH	EXHAUST	RGSC	RIGID GALVANIZED STEEL CONDUIT
(E)	EXISTING	RMC	RIGID METAL CONDUIT
(F)	FUTURE	RMS	ROOT–MEAN–SQUARE
FACP	FIRE ALARM CONTROL PANEL	SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
FBO	FURNISHED BY OTHERS	SCR	SILICON CONTROLLED RECTIFIER
FF	FINISHED FLOOR	SHLD	SHIELDED
FG	FINISHED GRADE	SPD	SURGE–PROTECTIVE DEVICE
FLA	FULL LOAD AMPS	SPECS	SPECIFICATIONS
FLEX	FLEXIBLE	SW	SWITCH
FLUOR	FLUORESCENT	T, XFMR	TRANSFORMER
FMC	FLEXIBLE METAL CONDUIT	TEMP	TEMPORARY
FMT	FLEXIBLE METAL TUBING	THHN	THERMOPLASTIC, HEAT RESISTANT CABLE, NYLON JACKET OUTER SHEATH
GEC	GROUNDING ELECTRODE CONDUCTOR	THWN	THERMOPLASTIC, HEAT AND MOISTURE RESISTANT CABLE, NYLON JACKET OUTER SHEATH
GFCI	GROUND–FAULT CURRENT INTERRUPTER	TR	TAMPER–RESISTANT
GFPE	GROUND–FAULT PROTECTION OF EQUIPMENT	TS	TAMPER SWITCH
GND	GROUND	TSTAT	THERMOSTAT
HID	HIGH INTENSITY DISCHARGE	TYP	TYPICAL
HP	HORSEPOWER	UG	UNDERGROUND
HVAC	HEATING, VENTILATION & AIR CONDITIONING	UGPS	UNDERGROUND PULL SECTION
Hz	HERTZ (cycle per second)	UL	UNDERWRITERS LABORATORIES
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS	UNO	UNLESS NOTED OTHERWISE
IG	ISOLATED GROUND	UPS	UNINTERRUPTIBLE POWER SUPPLY
IMC	INTERMEDIATE METAL CONDUIT	USB	UNIVERSAL SERIAL BUS
ISC, SC	SHORT CIRCUIT	VFD	VARIABLE FREQUENCY DRIVE
ISOL	ISOLATED	V	VOLTS
JBOX	JUNCTION BOX	VA	VOLT–AMPERE
kcmil	ONE THOUSAND CIRCULAR MILS	Vac	VOLTS ALTERNATING CURRENT
kV	KILOVOLTS	Vdc	VOLTS DIRECT CURRENT
kW	KILOWATTS	VNEM	VIRTUAL NET ENERGY METERING
kVA	KILOVOLT–AMPERES	W	WATTS
LED	LIGHT–EMITTING DIODE	W–hr	WATT–HOUR
LCP	LIGHTING CONTROL PANEL	w/	WITH
LPG	LIQUEFIED PETROLEUM GAS	WP	WEATHERPROOF
LRC	LOCKED–ROTOR CURRENT	WPL	WEATHERPROOF LOCKING
LTG	LIGHTING	WPU	WEATHERPROOF WHILE IN USE
		WR	WEATHER RESISTANT
		(X)	REMOVE OR DEMO

ELECTRICAL SHEET INDEX

SHEET NO.	SHEET TITLE
E-001	ELECTRICAL SHEET INDEX, ABBREVIATIONS AND NOTES
E-002	ELECTRICAL SYMBOL LEGEND
ED111	ELECTRICAL DEMOLITION FLOOR PLAN
EL111	LIGHTING FLOOR PLAN
EP111	POWER FLOOR PLAN

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CLIENT

CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE

ELECTRICAL SHEET INDEX, ABBREVIATIONS AND NOTES

SHEET

E-001

ELECTRICAL SYMBOL LEGEND

ALL SYMBOLS SHOWN IN THIS LEGEND ARE NOT NECESSARILY USED ON PLANS IF NOT REQUIRED.

SYMBOL	DESCRIPTION
	POWER
	MAIN SWITCHBOARD OR DISTRIBUTION BOARD, PAD OR FLOOR MOUNTED AS NOTED.
	RECESSED MOUNTED LIGHTING OR DISTRIBUTION PANEL
	SURFACE MOUNTED LIGHTING OR DISTRIBUTION PANEL
	RECESSED TERMINAL CABINET WITH 3/4"C PLYWOOD BACKBOARD, DUPLEX RECEPTACLE & #6 CU GND, UNO.
	SURFACE MOUNTED TERMINAL CABINET WITH 3/4"C PLYWOOD BACKBOARD, DUPLEX RECEPTACLE & #6 CU GND, UNO.
T	DISTRIBUTION TRANSFORMER, MOUNTING AND SIZE AS NOTED
	NON-FUSED DISCONNECT SWITCH
	ENCLOSED CIRCUIT BREAKER DISCONNECT SWITCH
F	FUSED DISCONNECT SWITCH; SIZE DISCONNECT AND FUSES PER UNIT LABEL
	MOTOR STARTER/CONTROLLER
	COMBINATION CIRCUIT BREAKER DISCONNECT/MOTOR STARTER
	COMBINATION FUSIBLE DISCONNECT/MOTOR CONTROLLER; PROVIDE FUSES PER MANUFACTURER'S REQUIREMENTS. N.F. INDICATES NON-FUSED
	POWER POINT OF CONNECTION
	DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO. SPLIT-WIRED CIRCUIT, TOP RECEPTACLE SWITCHED CONTROLLED.
A	DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO. SUBSCRIPT TEXT WHERE OCCURS, SEE RECEPTACLE SUBSCRIPT LEGEND BELOW.
	DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER TOP AND/OR SINK BACKSPLASH [1]
	ISOLATED GROUND DUPLEX RECEPTACLE, 20A, 125V @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	GFCI DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	GFCI DUPLEX RECEPTACLE OUTLET MOUNTED ABOVE COUNTER TOP AND/OR SINK BACKSPLASH [1]
	ISOLATED GROUND GFCI DUPLEX RECEPTACLE 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED GFCI DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	DOUBLE DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	DOUBLE DUPLEX MOUNTED ABOVE COUNTER TOP AND/OR SINK BACKSPLASH [1]
	ISOLATED GROUNDED DOUBLE DUPLEX RECEPTACLE 20A, 125V @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED DOUBLE DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	GFCI DOUBLE DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO
	GFCI DOUBLE DUPLEX RECEPTACLE OUTLET MOUNTED ABOVE COUNTER TOP AND/OR SINK BACKSPLASH [1]
	ISOLATED GROUND GFCI DOUBLE DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	DEDICATED GFCI DOUBLE DUPLEX RECEPTACLE OUTLET 20A, 125V, @ +16" TO BOTTOM OF BOX, UNO.
	SPECIAL RECEPTACLE OUTLET, SIZE AND NEMA CONFIGURATION AS NOTED, MOUNTED @ +16" TO BOTTOM OF BOX, UNO.
	FLOOR MOUNTED DUPLEX RECEPTACLE, 20A, 125V FLUSH IN FINISHED FLOOR
	FLOOR MOUNTED DOUBLE DUPLEX RECEPTACLE, 20A, 125V FLUSH IN FINISHED FLOOR
	CEILING MOUNTED DUPLEX RECEPTACLE, 20A, 125V
	CEILING MOUNTED DOUBLE DUPLEX RECEPTACLE, 20A, 125V
	FLOOR MOUNTED COMBINATION DUPLEX RECEPTACLE AND TELECOM
	FLOOR MOUNTED COMBINATION DOUBLE DUPLEX RECEPTACLE AND TELECOM
	FLOOR MOUNTED COMBINATION POWER AND TELCOM WITH WHIP FOR PARTITION FURNITURE
	POWER AND TELECOM WITH WHIP FOR PARTITION FURNITURE
	WALL MOUNTED JUNCTION BOX - SIZE AS REQUIRED BY CODE
	CEILING JUNCTION BOX - SIZE AS REQUIRED BY CODE
	FLOOR MOUNTED JUNCTION BOX - SIZE AS REQUIRED BY CODE
	PLUGMOLD
	POWER POLE
EV EV	ELECTRIC VEHICLE CHARGING STATION, DUAL PORT & SINGLE PORT
$^T	THERMAL OVERLOAD SWITCH
$^M	MOTOR RATED SWITCH

RECEPTACLE SUBSCRIPTS (APPLIES TO ALL RECEPTACLES)

C	CONTROLLED/UNCONTROLLED [2]
LC	LOCKING COVER
TR	TAMPER-RESISTANT
U	USB (UNIVERSAL SERIAL BUS)
WP	WEATHERPROOF
WPU	WEATHERPROOF WHILE IN USE

FOOTNOTES:

[1] PROVIDE 44" MAX. TO TOP OF BOX AT AREAS WITH FORWARD ACCESSIBLE APPROACH KNEE CLEARANCE, OR PROVIDE 46" MAX. TO TOP OF BOX AT AREAS WITH PARALLEL ACCESSIBLE APPROACH (PER CBC 11B-308).

[2] FOR DUPLEX RECEPTACES: ONE HALF IS CONTROLLED, AND ONE HALF IS UNCONTROLLED. PLACE CONTROLLED HALF AT BOTTOM. FOR DOUBLE DUPLEX RECEPTACLES: ONE DUPLEX IS CONTROLLED, AND ONE DUPLEX IS UNCONTROLLED. PLACE CONTROLLED DUPLEX AT RIGHT.

SYMBOL	DESCRIPTION
	LIGHTING
	LED LUMINAIRE - T-BAR LAY-IN
	LED LUMINAIRE - RECESSED IN GYPBOARD
	LED LUMINAIRE - SURFACE
	LED LUMINAIRE - SUSPENDED
	LED STRIP LIGHT - SURFACE OR SUSPENDED
	DOWNLIGHT LUMINAIRE - RECESSED
	WALLWASH LUMINAIRE - RECESSED
	LUMINAIRE - SURFACE
	LUMINAIRE - WALL
	LUMINAIRE - PENDANT
	TRACK LIGHT - SUSPENDED OR SURFACE MOUNTED
	CONTINUOUS LINEAR LED TAPE OR LED COVE LIGHT
	HATCHED LUMINAIRE INDICATES AN EMERGENCY LUMINAIRE CONNECTED TO A EMERGENCY POWER DISTRIBUTION SYSTEM, OR INTEGRAL EMERGENCY BATTERY BACKUP.
	SINGLE FACE EXIT SIGN. SEE LIGHTING FIXTURE SCHEDULE FOR SPECIFICATION.
	DOUBLE FACE EXIT SIGN. SEE LIGHTING FIXTURE SCHEDULE FOR SPECIFICATION. DIRECTIONAL ARROW AS INDICATED ON PLANS. (CEILING OR WALL)
	COMBINATION EMERGENCY EXIT SIGN WITH DUAL HEAD LIGHTS WITH EMERGENCY BATTERY BACK-UP.
	BATTERY POWERED EMERGENCY EGRESS LUMINAIRE - SURFACE MOUNTED
	SPOT/FLOOD LUMINAIRE - GROUND MOUNTED. FOR BLDG WALL MOUNTED AS WELL.
	EXTERIOR POLE FIXTURE - SINGLE HEAD
	EXTERIOR POLE FIXTURE - TWIN HEAD
	EXTERIOR PATHWAY POST TOP POLE FIXTURE
	BOLLARD FIXTURE
	STEP LUMINAIRE
	LIGHTING CONTROLS
$	SINGLE POLE TOGGLE SWITCH, 20A, 120-277V @ +46" TO TOP OF BOX, UNO [1].
$^3	THREE WAY TOGGLE SWITCH 20A,120-277V @ +46" TO TOP OF BOX, UNO.
$^{a,b,c}	SUBSCRIPTS "a,b,c" DESIGNATE THE QUANTITY OF SWITCHES AT EACH LOCATION (TYPICAL FOR ALL SWITCH TYPES).
$^K	SINGLE POLE KEYED BARREL SWITCH 20A, 120-277 @ +46" TO TOP OF BOX, UNO.
	PUSH BUTTON
	WALL DIMMER SEE CONTROL DRAWINGS FOR TYPE
DCR	DIGITAL WALL CONTROL OVERRIDE SWITCH. RUN CABLING BACK TO LIGHTING CONTROL PANEL
OS	WALL MOUNTED OCCUPANCY SENSOR. DUAL TECHNOLOGY, PASSIVE INFRA-RED OR ULTRASONIC.
OS	CEILING, OR PENDANT, MOUNTED OCCUPANCY SENSOR. DUAL TECHNOLOGY, PASSIVE INFRA-RED OR ULTRASONIC.
OS	CORNER MOUNT OCCUPANCY SENSOR. DUAL TECHNOLOGY, PASSIVE INFRA-RED OR ULTRASONIC.
PC	PHOTOCONTROL DAYLIGHT SENSOR.
	TAGS & LEADERS
X	KEYNOTE SHOWN ON SAME SHEET
'XX' XX-Xx	LIGHT FIXTURE TAG: FIXTURE TAG 'XX' / XX-Xx; CIRCUIT NUMBER; PANEL; SWITCH LEG
X	FEEDER DESIGNATION TAG
X	FOOD SERVICE EQUIPMENT DESIGNATION TAG
X Ex.1	DETAIL DESIGNATION: TOP LETTER INDICATES DETAIL NUMBER, BOTTOM LETTER/NUMBER INDICATES SHEET NUMBER
REF #	MECHANICAL OR PLUMBING EQUIPMENT TAG
	BRACKET
	LEADERS

SYMBOL	DESCRIPTION
	ONE LINE DIAGRAM
(N) PANEL "A"	PANEL IDENTIFICATION
100A 3P	CIRCUIT BREAKER
100A 3P	FUSED SWITCH
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
	GROUND
	UNDERGROUND TERMINATION SERVICE LUG
M	UTILITY METER WITH CURRENT TRANSFORMER COMPARTMENT METER SOCKET
M	CUSTOMER-OWNED MULTIFUNCTION METER WITH CURRENT TRANSFORMERS
	MOTOR
	TRANSFORMER WITH GROUND
	UFER GROUND
	BOND TO COLD WATER PIPE, GAS PIPE, BUILDING STEEL
	AUTOMATIC TRANSFER SWITCH
	NEUTRAL LINK
SPD	SURGE PROTECTIVE DEVICE
	CIRCUITS
	STUB
	CONTINUATION
	CONDUIT RISER - UP
	CONDUIT DROP - DOWN
	CONDUIT CONCEALED IN CEILING OR WALL.
	CONDUIT CONCEALED IN UNDERFLOOR OR UNDERGROUND
	EXISTING CONDUIT TO REMAIN.
	CONDUIT & CONDUCTORS FOR LOW VOLTAGE MOTION SENSORS
	EXISTING CONDUIT & CONDUCTORS TO REMAIN FOR LOW VOLTAGE MOTION SENSORS OTHER THAN 12 AWG CU. NO TICKS INDICATE 2#12 CU, 1#12 CU GND, IN 1/2" CONDUIT.
	EXISTING CONDUIT AND/OR CONDUCTORS TO BE REMOVED. UNDERGROUND CONDUIT MAY BE ABANDONED IN PLACE.
	HOMERUN TO PANELBOARD OR TERMINAL CABINET WITH CONDUCTORS AS NOTED
#	CIRCUIT CONDUCTORS: LONG TICK INDICATES NEUTRAL CONDUCTOR; SHORT TICKES INDICATE PHASE CONDUCTORS; CURVED TICK INDICATES EQUIPMENT GROUNDING CONDUCTOR; ADDITIONAL CURVED TICK INDICATES ISOLATED GROUNDING CONDUCTOR. NUMBER BY TICKES INDICATE WIRE GAUGE
	OTHERS AS NOTED ON PLAN. NOTE: PROVIDE A CODE SIZED EQUIPMENT GROUNDING CONDUCTOR IN ALL CONDUITS FOR THIS PROJECT, WHETHER SHOWN ON PLAN OR NOT.
	FLEXIBLE CONDUIT, 6'-0" LONG MAX. WITH #12 CU GROUND, UNO.

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CLIENT

CITY OF SACRAMENTO

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MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE

ELECTRICAL SYMBOL LEGEND

SHEET

E-002

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY

0 1/4" 1/2" 1"

KEY NOTES

(1) REMOVE EXISTING CONDUIT UNDER EXISTING DECK. PRESERVE ALL CONDUCTORS, WIRE AND HARDWARE FOR RE-INSTALLATION LATER.

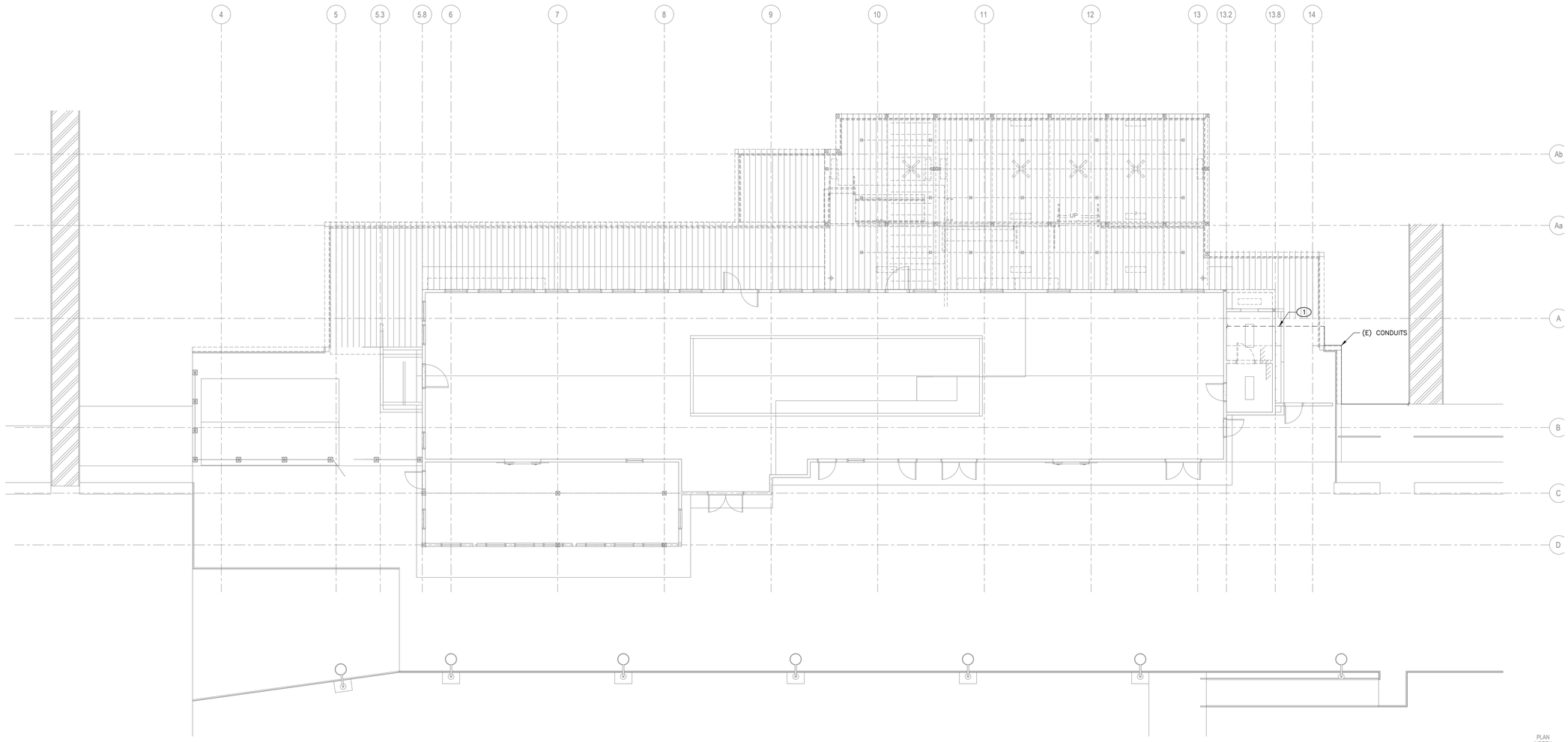
DEMOLITION NOTES

THE RIO CITY CAFÉ MANAGER WAS NOT AWARE OF WHERE THE EXISTING ELECTRICAL POWER IS COMING INTO THE BUILDING. THERE IS AN EXISTING METER/MAIN MOUNTED ON THE ADJACENT BUILDING WHICH IS USED AS THE PREP KITCHEN FOR THE CAFÉ. THERE IS A POSSIBILITY THAT THIS METER FEEDS THE RIO CITY CAFÉ BUILDING. IT APPEARS THAT THE POWER TO THE PATIO OUTDOOR DINNING AREA IS FED FROM ELECTRICAL PANEL "A" IN THE KITCHEN (I.E. LIGHTS, FANS, HEATERS, RECEPTACLES, ETC.). THERE IS ALSO AN ELECTRICAL PANEL IN THE MEZZANINE ALTHOUGH THERE IS NO LEGIBLE PANEL DIRECTORY. ALL ELECTRICAL CONDUITS FEEDING THE DECK ARE THROUGH WALL PENETRATIONS FROM MAIN RESTAURANT AND APPEAR TO BE ABOVE THE DECK LINE. THESE CONDUITS CAN BE REMOVED FROM THE DECK BACK TO BUILDING WALL, PROVIDE JUNCTION BOX AT EXTERIOR WALL, PRESERVE CONDUCTORS AND TIE OFF FOR FUTURE RECONNECTION. THERE IS ONE LIQUID TIGHT FLEXIBLE CONDUIT RUNNING ON UNDERSIDE OF DECK. THIS CAN BE REROUTED DURING NEW DECK CONSTRUCTION IF STILL REQUIRED.

LIGHTING: THERE ARE CANOPY MOUNTED FANS WITH LIGHT KITS THAT ARE CONTROLLED BY OUTDOOR SWITCHES THAT WILL NEED TO BE REMOVED AS CANOPY IS CONNECTED TO THE EXISTING DECK. THERE ARE POST MOUNTED LIGHT SCONCES THAT WILL NEED TO BE REMOVED. THERE ARE STRING LIGHTS AND FLOOD LIGHTS AROUND CANOPIES THAT WILL ALSO NEED TO BE REMOVED. CURRENTLY THERE IS NO EVIDENCE OF EMERGENCY EGRESS LIGHTING FOR OUTDOOR LIGHTING, ONLY EXIT SIGNS. NEW DECK DESIGN WILL REQUIRE EMERGENCY EGRESS LIGHTING BY CODE. THIS CAN BE ACHIEVED WITH LIGHT FIXTURES WITH INTEGRAL EMERGENCY BATTERY PACKS, OR SMALL INVERTER TO POWER EGRESS LIGHT FIXTURES. THERE ARE EXISTING EXTERIOR RLM TYPE WALL LIGHT FIXTURES CONTRIBUTING TO THE DECK LIGHTING AND CAN REMAIN. WITH NEW DESIGN, THESE LIGHT FIXTURES COULD BE REPLACED WITH NEW TO HELP ACHIEVE EGRESS LIGHTING. SOME EXTERIOR FAN, LIGHT AND HEATER CONTROLS ARE LOCATED ON THE EXTERIOR BUILDING WALL. CONTROL CONDUITS FROM FANS, LIGHTS AND HEATERS CAN BE REMOVED BACK TO CONTROL LOCATION ON WALL. RECOMMEND NEW CONTROLS.

POWER: ON THE SOUTHERLY PORTION OF DECK IS A BEVERAGE STATION AND REFRIGERATOR. THERE IS AN OUTDOOR SERVING KITCHEN ON MAIN DECK WHICH HAS AN OVEN, SODA MACHINE, COFFEE MAKER, REFRIGERATOR AND POINT OF SALE. FOR EACH PIECE OF EQUIPMENT LOCATED AGAINST THE EXTERIOR BUILDING WALL WHERE THERE IS A RECEPTACLE, PRESERVE RECEPTACLE AND PROVIDE WHILE-IN-USE COVERPLATE. FOR EQUIPMENT LOCATED AGAINST THE EXTERIOR BUILDING WALL WHERE EQUIPMENT IS HARD WIRED, REMOVE CONDUIT BACK TO WALL, PROVIDE JUNCTION BOX AND TIE OFF CONDUCTORS. FOR REMOTE EQUIPMENT LOCATED OUT ON DECK OR CANOPIES, REMOVE CONDUIT BACK TO WALL, PROVIDE JUNCTION BOX AND TIE OFF CONDUCTORS.

TECHNOLOGY: THERE ARE SPEAKERS, TVS, AND POINT OF SALE IN OUTDOOR DECK AREA. TV AND SPEAKERS ON EXTERIOR BUILDING WALL CAN REMAIN. RECEPTACLE FOR POINT OF SALE IS IN A LOCATION THAT WILL LIKELY BE DEMOLISHED. FOR THIS RECEPTACLE, REMOVE CONDUIT BACK TO REMAINING WALL, PROVIDE JUNCTION BOX AND TIE OFF CONDUCTORS. FOR REMOTE SPEAKERS AND TV LOCATED OUT ON DECK CANOPIES, REMOVE CONDUIT BACK TO WALL, PROVIDE JUNCTION BOX AND TIE OFF CONDUCTORS.



1 ELECTRICAL DEMOLITION FLOOR PLAN
SCALE 1/8" = 1'-0"

PLAN NORTH

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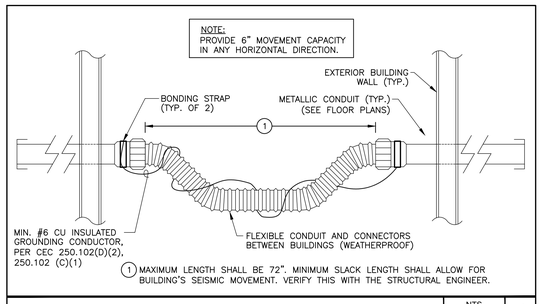
ELECTRICAL DEMOLITION FLOOR PLAN

SHEET
ED111



SEISMIC JOINT CONDUIT CROSSING DETAIL | NTS | 1

LIGHTING FIXTURE SCHEDULE

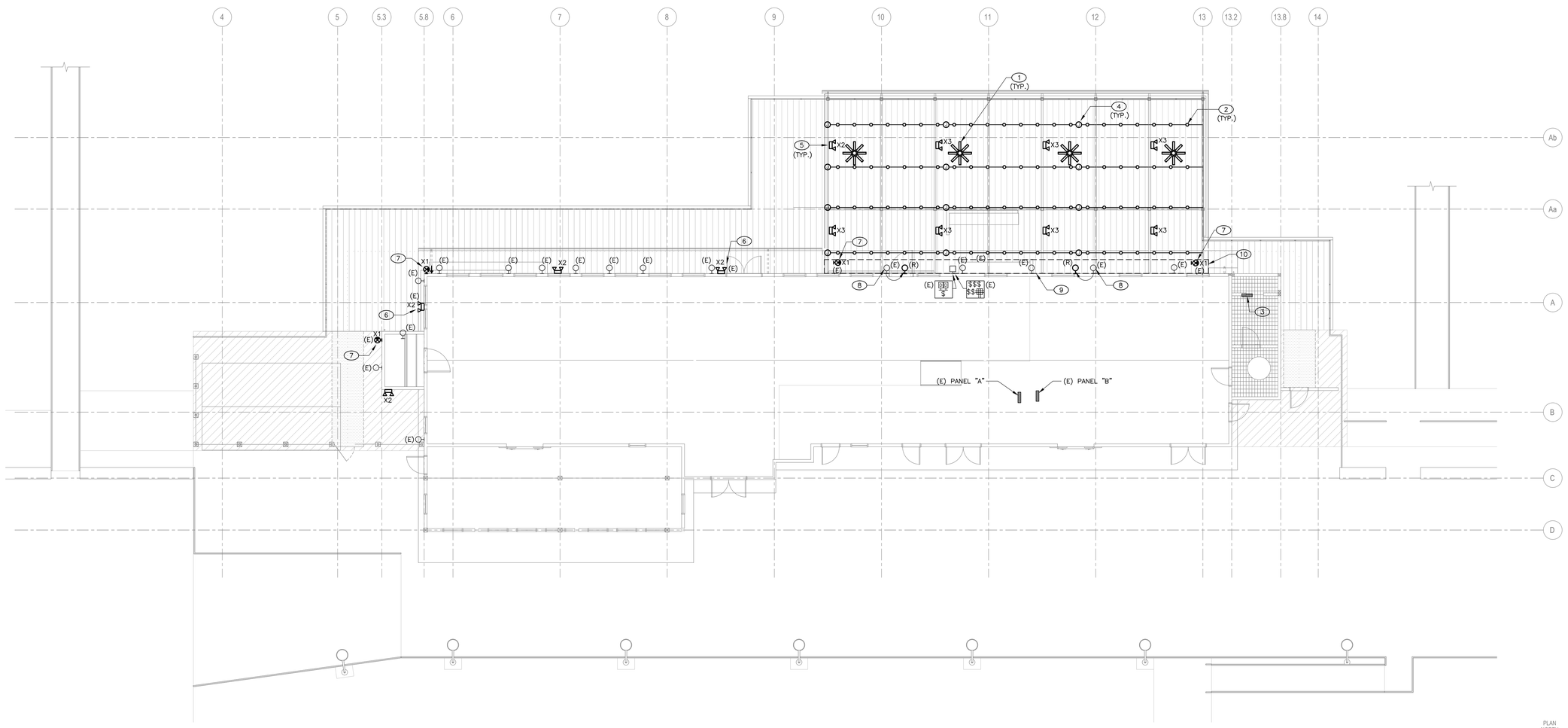
TYPE	MANUFACTURER & CATALOG NUMBER	LAMP (CROSS SECTION)	VOLTS / VA	MOUNTING	REMARKS
A	TIVOLI LSL2-B-06-V-27-C-12-B-XX (STRING LIGHTS) INF-J-30-1.2.5-12 (STRING LIGHTS DRIVER)	LED (2700K)	120V / 30W	CANOPY	LED STRING LIGHTS.
X1	EVENLITE TWLCOM-G-1-W-SD	LED	120V /	UNIVERSAL	EXIT SIGN WITH 90 MINUTE BATTERY BACK UP.
X2	EVENLITE TCSWL-L67-CEC	LED	120V /	WALL/BEAM	EMERGENCY EGRESS LIGHT WITH 90 MINUTE BATTERY BACK UP.

LIGHTING FIXTURE NOTES:

1. PROVIDE ALL LED FIXTURES WITH ENERGY SAVING ELECTRONIC DRIVERS.
3. ALL DRIVERS SHALL BE C.E.C. CERTIFIED.
4. COORDINATE LUMINAIRE FINISH WITH ARCHITECT (TYPICAL).

KEY NOTES

1. CEILING FAN WITH LIGHT. SEE ARCHITECTURAL DRAWINGS FOR TYPE.
2. STRING LIGHTS. FIXTURE TYPE "A". SEE FIXTURE SCHEDULE.
3. EXISTING PANEL IN THE OFFICE ON THE MEZZANINE FLOOR.
4. STRING LIGHT DRIVER. DRIVER FOR FIXTURE TYPE "A". CONNECT TO EXISTING BUILDING MOUNTED DIMMERS. SEE FIXTURE SCHEDULE.
5. NEW EMERGENCY EGRESS LIGHT. CONNECT TO EXISTING EXIT SIGN CIRCUIT. TYPICAL OF (10) UNLESS NOTED OTHERWISE.
6. EXISTING EMERGENCY EGRESS LIGHT. DISCONNECT, REMOVE AND REPLACE WITH NEW AS INDICATED.
7. EXISTING EXIT SIGN. DISCONNECT, REMOVE AND REPLACE WITH NEW AS INDICATED.
8. RELOCATE (E) LIGHT TO AVOID TRUSS.
9. PROVIDE SEISMIC LOOP AT CONDUIT CROSSING SEISMIC JOINT WHERE BUILDING AND DECK CANOPY MEET. SEE DETAIL 1.
10. SEISMIC JOINT AT CANOPY ROOF.



1 ELECTRICAL FLOOR PLAN
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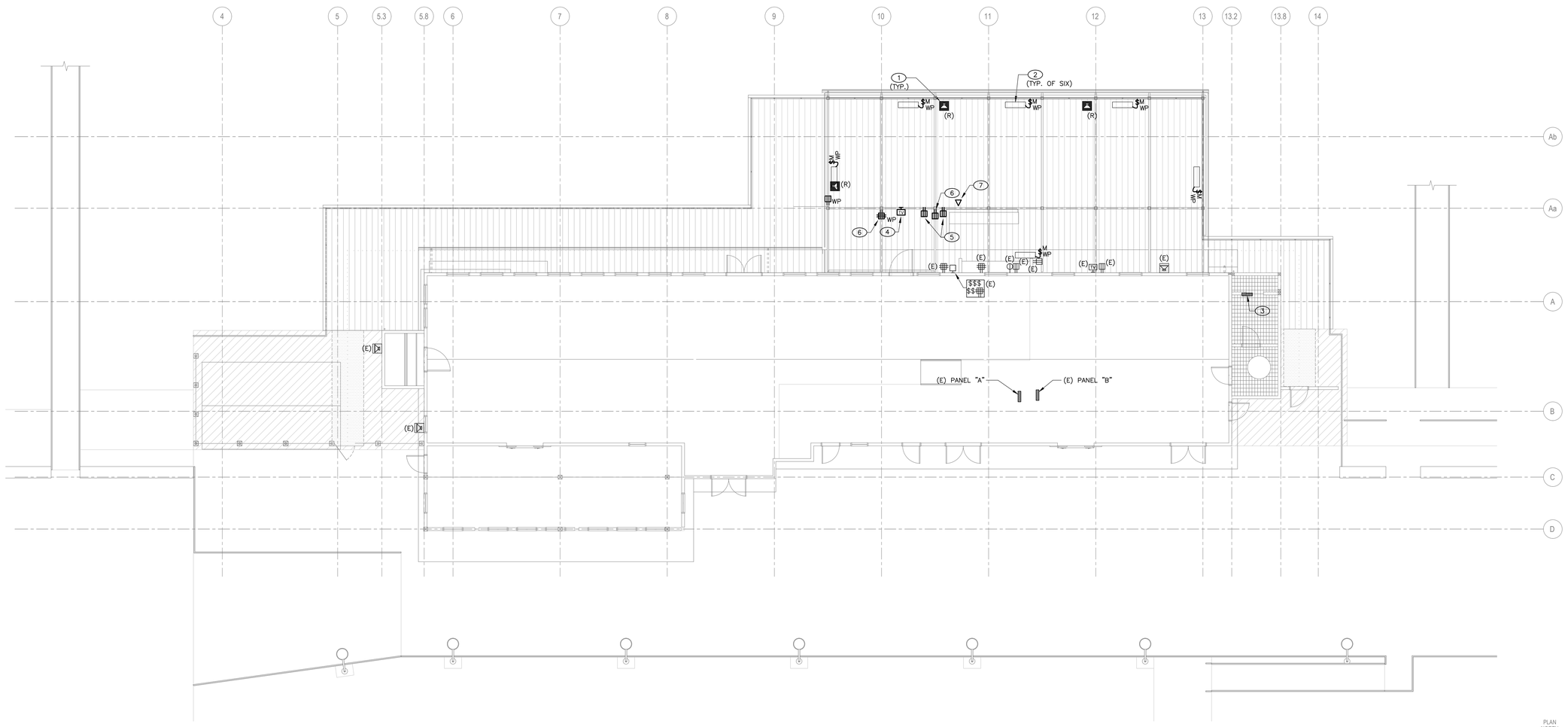
KEY NOTES

1. RELOCATED DECK CANOPY SPEAKER. MATCH EXISTING SPEAKER WIRE AND RECONNECT AS BEFORE (TYPICAL OF 3).
2. INFRARED HEATER. RECONNECT TO EXISTING CIRCUITS AS BEFORE. SEE MECHANICAL DRAWINGS.
3. EXISTING PANEL IN THE OFFICE ON THE MEZZANINE FLOOR.
4. EXISTING TV CABLE BOX MOUNTED ABOVE ON SHELF WITH TV. MATCH EXISTING CABLE AND RECONNECT AS BEFORE.
5. UNDER COUNTER REFRIGERATORS. RECONNECT TO EXISTING CIRCUITS AS BEFORE.
6. RECEPTACLE MOUNTED ABOVE COUNTER ON POST. RECONNECT TO EXISTING CIRCUIT AS BEFORE.
7. WAP AND ANTENNA. MATCH EXISTING CABLE AND RECONNECT AS BEFORE.



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POWER FLOOR PLAN

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MECHANICAL SPECIFICATIONS

A. THIS CONTRACTOR SHALL COMPLY WITH ALL CODES AND REGULATIONS IN EFFECT AT THE JOB SITE, INCLUDING, BUT NOT LIMITED TO:
- A.1. 2022 CALIFORNIA BUILDING CODE
- A.2. 2022 CALIFORNIA MECHANICAL CODE
- A.3. 2022 CALIFORNIA PLUMBING CODE
- A.4. 2022 CALIFORNIA ELECTRICAL CODE
- A.5. 2022 CALIFORNIA GREEN BUILDING STANDARDS
- A.6. 2022 CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS – TITLE 24
- A.7. NATIONAL FIRE PROTECTION ASSOCIATION
- A.8. CALIFORNIA STATE FIRE MARSHAL

B. ALL MATERIALS AND EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE GUARANTEED FREE FROM ALL MECHANICAL, ELECTRICAL AND WORKMANSHIP DEFECTS FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING ALL DAMAGED ITEMS INSTALLED UNDER THIS CONTRACT WITHOUT ADDITIONAL COST TO OWNER.

C. THE MECHANICAL CONTRACTOR SHALL PROVIDE THE OWNER COPIES OF OPERATION, MAINTENANCE AND PREVENTATIVE MAINTENANCE MANUALS FOR EACH MODEL AND TYPE OF MECHANICAL EQUIPMENT.

D. CHECK AND VERIFY EXISTING CONDITIONS AT THE JOB SITE BEFORE BEGINNING WORK. ADJUST THE LOCATION AND CONFIGURATION OF THE WORK NECESSARY TO SUIT ACTUAL CONDITIONS AND OTHER TRADES. ANY CHANGES REQUIRED MUST FIRST BE APPROVED BY THE ARCHITECT OR ENGINEER.

E. THE LOCATIONS OF EQUIPMENT, PIPING, DUCTWORK AND SYSTEMS SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC AND SHALL BE FOLLOWED AS CLOSELY AS POSSIBLE. CHANGES REQUIRED TO SUIT EXISTING CONDITIONS AND DUE TO COORDINATION WITH OTHER TRADES SHALL BE MADE AT NO EXTRA COST TO THE OWNER.

F. SUBMIT MANUFACTURER'S PRODUCT DATA INCLUDING NAME OF MANUFACTURER, TRADE NAME, MODEL, CAPACITY, OPTIONS, DIMENSIONS, WEIGHTS, INSTALLATION AND STARTUP DATA. EQUIPMENT PERFORMANCES SCHEDULED ARE MINIMUM CAPACITY, AIR FLOW, EFFICIENCY, ETC. REQUIRED. WEIGHTS AND ELECTRICAL DATA SCHEDULED IS MAXIMUM AVAILABLE OR ALLOWABLE.

G. ALL EQUIPMENT IS TO BE INSTALLED AS RECOMMENDED BY THE MANUFACTURER. USING ALL ACCESSORY EQUIPMENT AVAILABLE FROM THE MANUFACTURER FOR SUPPORTS, CONTROLS, ETC., TO MAKE A COMPLETE SYSTEM. ALL EQUIPMENT OR ACCESSORIES NEEDED AND NOT SHOWN OR SPECIFIED SHALL BE FURNISHED AND INSTALLED BY THIS CONTRACTOR. ADJUST THE EQUIPMENT FOR PROPER OPERATION, CHECK ALL CONTROLS AND VERIFY THAT ALL SAFETY DEVICES ARE FUNCTIONING PROPERLY.

H. PROVIDE ACCESS DOORS WHERE ACCESS THROUGH FLOORS, WALLS OR CEILINGS IS REQUIRED TO ACCESS MECHANICAL CONTROL SYSTEM COMPONENTS, FIRE/SMOKE DAMPERS, SMOKE DETECTORS, ETC., OR OTHER SYSTEMS REQUIRING ACCESS FOR MAINTENANCE, TESTING OR OBSERVATION. COORDINATE THE EXACT TYPE AND LOCATION OF ACCESS DOORS TO PROVIDE PROPER ACCESS TO THE ITEM CONCEALED.

I. CHECK ALL PIPE AND DUCTWORK FOR LEAKS AND EXCESSIVE AIR LOSS AND NOISE. CORRECT ANY DEFICIENCIES AS SOON AS DISCOVERED. OPERATE THE SYSTEMS AS A TEST AND DEMONSTRATE TO THE OWNER AND ARCHITECT OR ENGINEER THAT THE SYSTEM IS FUNCTIONING PROPERLY.

J. GALVANIZED STEEL DUCTS SHALL BE ASTM A 653/A 653M GALVANIZED STEEL SHEET, FORMING STEEL (FS) DESIGNATION, WITH G90/Z275 ZINC COATING.

K. FABRICATE, SUPPORT AND SEAL DUCTWORK IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, AND AS INDICATED. PROVIDE DUCT MATERIAL, GAGES, REINFORCING, AND SEALING FOR 4" STATIC PRESSURE UPSTREAM OF TERMINAL UNITS (VAV, CAV BOXES) AND 2" STATIC PRESSURE DOWNSTREAM OF TERMINAL UNITS (VAV, CAV BOXES).

L. CONSTRUCT DUCTWORK "S, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1-1/2 TIMES WIDTH OF DUCT ON CENTERLINE. WHERE NOT POSSIBLE RECTANGULAR ELBOWS MUST BE USED, PROVIDE AIR FOIL TURNING VANES. WHERE ACOUSTICAL LINING IS INDICATED, PROVIDE TURNING VANES OF PERFORATED METAL WITH GLASS FIBER INSULATION.

M. COMBINATION FIRE AND SMOKE DAMPERS SHALL MEET THE REQUIREMENTS OF NFPA 90A, UL 555, UL 555S, AND AS INDICATED. PROVIDE FACTORY SLEEVE AND COLLAR FOR EACH DAMPER.

N. ALL INSULATION AND LINER PRODUCTS SURFACE BURNING CHARACTERISTICS: FLAME SPREAD/SMOKE DEVELOPED INDEX OF 25/50, MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E 84, NFPA 255, OR UL 723.

O. DUCT INSULATION BLANKET (INTERIOR APPLICATIONS):
- O.1. INSULATION: ASTM C553; FLEXIBLE, NONCOMBUSTIBLE BLANKET. 'K' ('KSI') VALUE: 0.31 AT 75 DEGREES F (0.045 AT 24 DEGREES C), WHEN TESTED IN ACCORDANCE WITH ASTM C 518. MAXIMUM SERVICE TEMPERATURE: 250 DEGREES F (121 DEGREES C). MAXIMUM MOISTURE ABSORPTION: 0.20 PERCENT BY VOLUME. DUCT APPLICATION: 2" THICK, 3/4 LB. DENSITY.
- O.2. VAPOR BARRIER JACKET: KRAFT PAPER WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM. MOISTURE VAPOR TRANSMISSION: ASTM E 96; 0.02 PERM. SECURE WITH PRESSURE SENSITIVE TAPE.

P. DUCT INSULATION BOARD (EXTERIOR APPLICATIONS):
- P.1. INSULATION: ASTM C 612; RIGID, NONCOMBUSTIBLE BLANKET. 'K' ('KSI') VALUE; 0.24 AT 75 DEGREES F (0.036 AT 24 DEGREES C), WHEN TESTED IN ACCORDANCE WITH ASTM C 518. MAXIMUM SERVICE TEMPERATURE: 250 DEGREES F (121 DEGREES C). MAXIMUM MOISTURE ABSORPTION: 0.20 PERCENT BY VOLUME. DENSITY: 3.0 LB/CU FT (48 KG/CU M).
- P.2. VAPOR BARRIER JACKET: KRAFT PAPER WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM. MOISTURE VAPOR TRANSMISSION: ASTM E 96; 0.04 PERM. SECURE WITH PRESSURE SENSITIVE TAPE.
- P.3. ALUMINUM JACKET: ASTM B 209 (ASTM B 209M). THICKNESS: 0.016 INCH (0.40 MM) SHEET. FINISH: SMOOTH. JOINING: LONGITUDINAL SLIP JOINTS AND 2 INCH (50 MM) LAPS. FITTINGS: 0.016 INCH (0.4 MM) THICK DIE SHAPED FITTING COVERS WITH FACTORY ATTACHED PROTECTIVE LINER. METAL JACKET BANDS: 3/8 INCH (10 MM) WIDE; 0.015 INCH (0.38 MM) THICK ALUMINUM.

Q. DUCT LINER:
- Q.1. INSULATION: INCOMBUSTIBLE GLASS FIBER COMPLYING WITH ASTM C 1071; FLEXIBLE BLANKET; WITH ACRYLIC POLYMER SHOWN TO BE FUNGUS AND BACTERIA RESISTANT BY TESTING TO ASTM G 21 IMPREGNATED SURFACE AND EDGE COAT. APPARENT THERMAL CONDUCTIVITY: MAXIMUM OF 0.31 AT 75 DEGREES F (0.045 AT 24 DEGREES C). DUCT APPLICATION: 1-1/2" THICK, 1-1/2 POUND DENSITY. SERVICE TEMPERATURE: UP TO 250 DEGREES F (121 DEGREES C). RATED VELOCITY ON COATED AIR SIDE FOR AIR EROSION: 5,000 FPM (25.4 M/S), MINIMUM.
- Q.2. LINER FASTENERS: GALVANIZED STEEL, SHEET METAL WELD PINS OR CLINCH PINS AND WASHERS.

R. INSULATED FLEXIBLE DUCTS
- R.1. FLEXIBLE DUCTS SHALL BE U.L. LISTED AND SHALL COMPLY WITH UMC STANDARD 6-1.
- R.2. THE MAXIMUM LENGTH OF FLEXIBLE DUCTWORK SHALL BE 5 FEET PER CMC SECTION 603.4.1 DUCTWORK SHALL BE EXTENDED TO FULL LENGTH WHENEVER POSSIBLE WITHOUT SEVERE BENDS OR KINKS. BENDS SHALL BE MADE TO MAINTAIN R/W EQUAL TO 1.5.
- R.3. BLACK POLYMER FILM SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE; FIBERGLASS INSULATION; POLYETHYLENE VAPOR BARRIER FILM.
  - R.3.1. PRESSURE RATING: 4 INCHES WG POSITIVE PRESSURE AND 1 INCH NEGATIVE PRESSURE.
  - R.3.2. INSULATION SHALL BE 1-1/2 INCH THICK FIBERGLASS.
  - R.3.3. MAXIMUM VELOCITY: 4000 FPM (20.3 M/SEC).
  - R.3.4. TEMPERATURE RANGE: -20 DEGREES F TO 175 DEGREES F (-28 DEGREES C TO 79 DEGREES C).

S. SEAL ALL STANDING SEAMS AND TRANSVERSE JOINTS IN ALL SHEETMETAL DUCTWORK WITH HARDCAST IRON GRIP PREMIUM FLEXIBLE WATER BASED DUCT SEALANT.

T. DURING CONSTRUCTION PROVIDE TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.

U. ALL BRANCH DUCTS SHALL HAVE BALANCING DAMPERS WITH ACCESSIBLE LOCKING TYPE QUADRANT. WHERE DAMPER IS INACCESSIBLE, PROVIDE YOUNG REGULATOR MODEL 270-301 CABLE KIT WITH EITHER 830A-CC (RECTANGULAR) OR 5020-CC (ROUND) DAMPER.

V. PERFORM TOTAL SYSTEMS BALANCE IN ACCORDANCE WITH AABC, ASHRAE STD 111, OR NEBB PROCEDURAL STANDARDS FOR TESTING, BALANCING AND ADJUSTING OF ENVIRONMENTAL SYSTEMS.

W. THE INSTALLATION OF DUCT SMOKE DETECTORS FOR AUTOMATIC SHUTDOWN OF AIR MOVING SYSTEMS AS REQUIRED BY CMC SECTION 609 OR AS REQUIRED FOR THE OPERATION OF FIRE SMOKE DAMPERS SHALL COMPLY WITH THE REQUIREMENTS OF THE LOCAL FIRE DEPARTMENT'S STANDARD "FIRE PROTECTION DESIGN GUIDELINES FOR SMOKE CONTROL WITHIN BUILDINGS". WHERE AIR DUCT SMOKE DETECTORS SERVING AIR-MOVING SYSTEMS ARE INSTALLED WITHIN CONDCEALED SPACES, AND/OR DROP CEILING AREAS, THE DETECOR SHALL BE PROVIDED WITH THE UNIT SERVED. SAID REMOTE ALARM LED DEVICE SHALL BE LABELED TO CLEARLY IDENTIFY THE UNIT SERVED (AC-1, ETC.). WHERE AIR DUCT SMOKE DETECTORS SERVING AIR-MOVING SYSTEMS ARE INSTALLED IN CONCEALED SPACES, AND/OR DROP CEILING AREAS MORE THAN 10 FEET ABOVE THE FINISHED FLOOR, THE DETECTOR SHALL BE PROVIDED WITH A REMOTE TEST AND RESET SWITCH, SAID REMOTE TEST AND RESET SWITCH SHALL BE ATTACHED TO AN ADJACENT WALL OR STRUCTURAL COLUMN AT A MAXIMUM HEIGHT OF 6 FEET ABOVE FINISHED FLOOR. PRIOR TO MECHANICAL PERMIT FINAL, A SMOKE DETECTOR SHUT-OFF TEST WILL BE REQUIRED.

MECHANICAL LEGEND

SYMBOL	ITEM	ABBR.
	SUPPLY AIR	SA
	RETURN AIR	RA
	EXHAUST AIR	EA
	OUTSIDE AIR	OSA
	TRANSFER AIR	TA
1 / M-1	DETAIL DESIGNATION DETAIL NUMBER SHEET NO. WHERE SHOWN	
AC-1	EQUIPMENT DESIGNATION UNIT ABBREVIATION NUMBER	
A 10x10-3 120, FD	GRILLE DESIGNATION NECK SIZE & BLOW (4 UON) FIRE DAMPER WHERE REQ'D CFM	
	ACOUSTIC LINED DUCT	L
	TURNING VANES	TV
	DUCT FLEXIBLE CONNECTION	
	DUCT RISER	
	DUCT DROP	
	RECTANGULAR TO ROUND FITTING	
	VOLUME CONTROL DAMPER	VD
FD	FIRE DAMPER W/ ACCESS	FD
FSD	FIRE SMOKE DAMPER W/ ACCESS	FSD
	OPPOSED BLADE DAMPER	OBD
	BACKDRAFT DAMPER	BDD
M	MOTORIZED DAMPER	
T	THERMOSTAT @ +48" AFF	T-STAT
S	SENSOR @ +48" AFF	
TC	TIMECLOCK @ +48" AFF	
TCP	TEMPERATURE CONTROL PANEL	TCP
SD	DUCT SMOKE DETECTOR	SD
	PIPE RISER/DROP	(R)/(D)
	ABOVE FINISHED FLOOR	AFF
	UNLESS OTHERWISE NOTED	UON
	TYPICAL	(TYP)
	BOTTOM OF DUCT	BOD
	BOTTOM OF PIPE	BOP
	AUTOMATIC AIR VENT	AAV
	MANUAL AIR VENT	MAV
	TEMP. CONTROL CONTRACTOR	TCC
	TEMPERATURE CONTROL VALVE	TCV
	COMBUSTION AIR	CA
	NEW	(N)
	EXISTING	(E)
	POINT OF DIS/CONNECTION	POD/POC
	HEATING HOT WATER SUPPLY	HHWS
	HEATING HOT WATER RETURN	HHWR
	2-WAY CONTROL VALVE	
	BACKFLOW PREVENTER	BFP
	BALL VALVE	
	BUTTERFLY VALVE	
	CAP	
	CHECK VALVE	
	AUTOMATIC BALANCE VALVE (B&G ULTRA SET)	ABV
	AUTOMATIC BALANCE VALVE (B&G CIRCUIT SETTER)	CBV
	CONTROL VALVE (2-WAY)	
	FLEX CONNECTOR	FC
	FLOW ARROW	
	GATE VALVE	
	PRESSURE GAUGE	
	PLUG VALVE	
	REDUCER	
	STRAINER	
	TEMPERATURE SENSOR	TS
	TEST PORT (PETE'S PLUG)	PP
	THERMOMETER	
	TRIPLE DUTY VALVE	

MECHANICAL SHEET INDEX

SHEET NO.	SHEET TITLE
M-001	MECHANICAL NOTES, LEGEND AND SCHED.
MD111	MECHANICAL DEMOLITION FLOOR PLAN
M-111	MECHANICAL FLOOR PLAN

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STATE OF CALIFORNIA

PROJECT
RIO CITY CAFE DECK REPAIR

1110 FRONT ST.
SACRAMENTO, CA 95814

CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	02/07/2025	100% CONSTRUCTION DOCUMENTS

MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

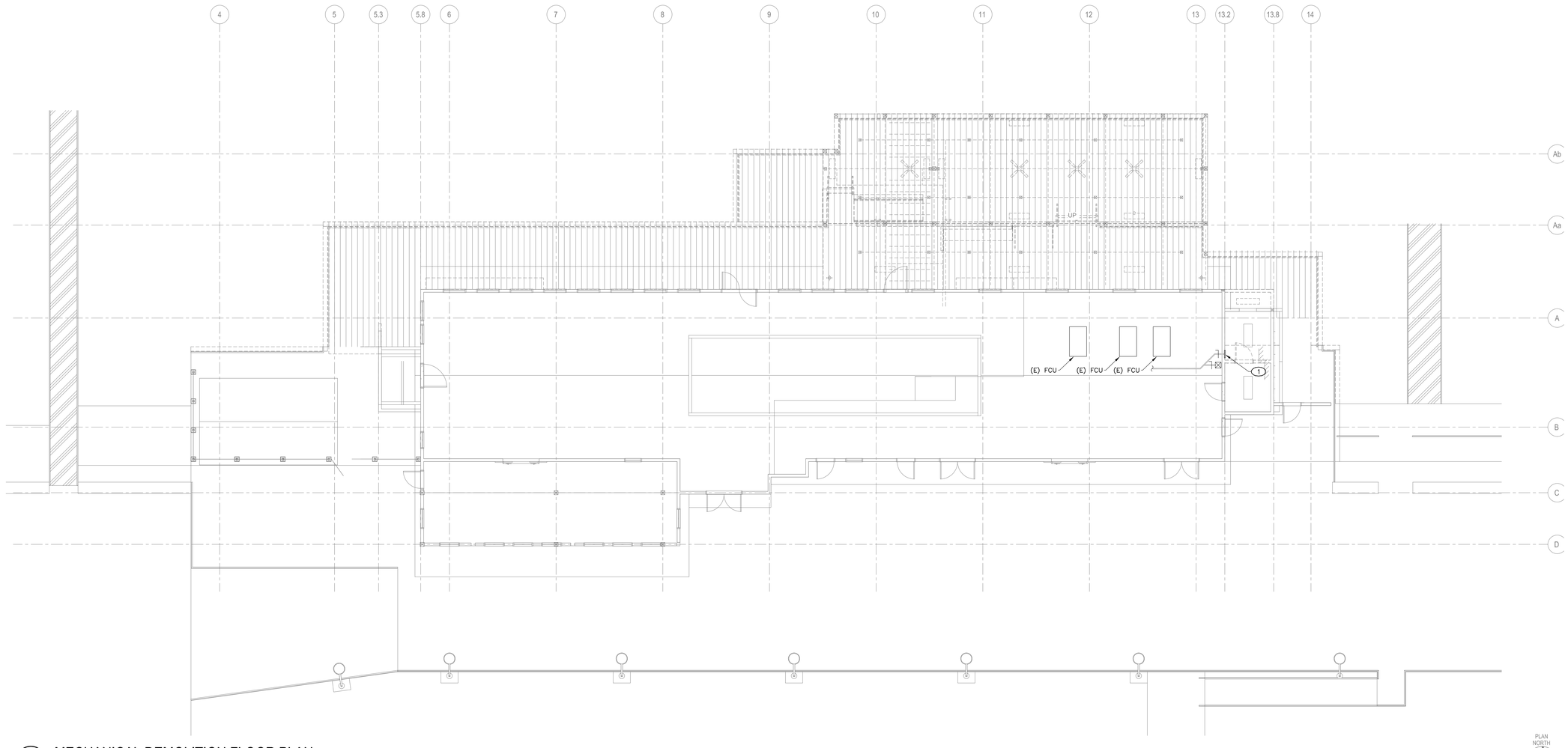
AGENCY

TITLE
MECHANICAL NOTES
LEGEND AND SCHEDULES

SHEET
M-001

KEY NOTES

(1) TEMPORARILY CAP AND PROTECT (E) SUPPLY GRILLE DURING CONSTRUCTION.



1 MECHANICAL DEMOLITION FLOOR PLAN
SCALE 1/8" = 1'-0"

PLAN NORTH

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MANAGEMENT

LIONAKIS PROJECT NO:	019124.02
CLIENT PROJECT NO:	
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AGENCY

TITLE
MECHANICAL DEMOLITION FLOOR PLAN

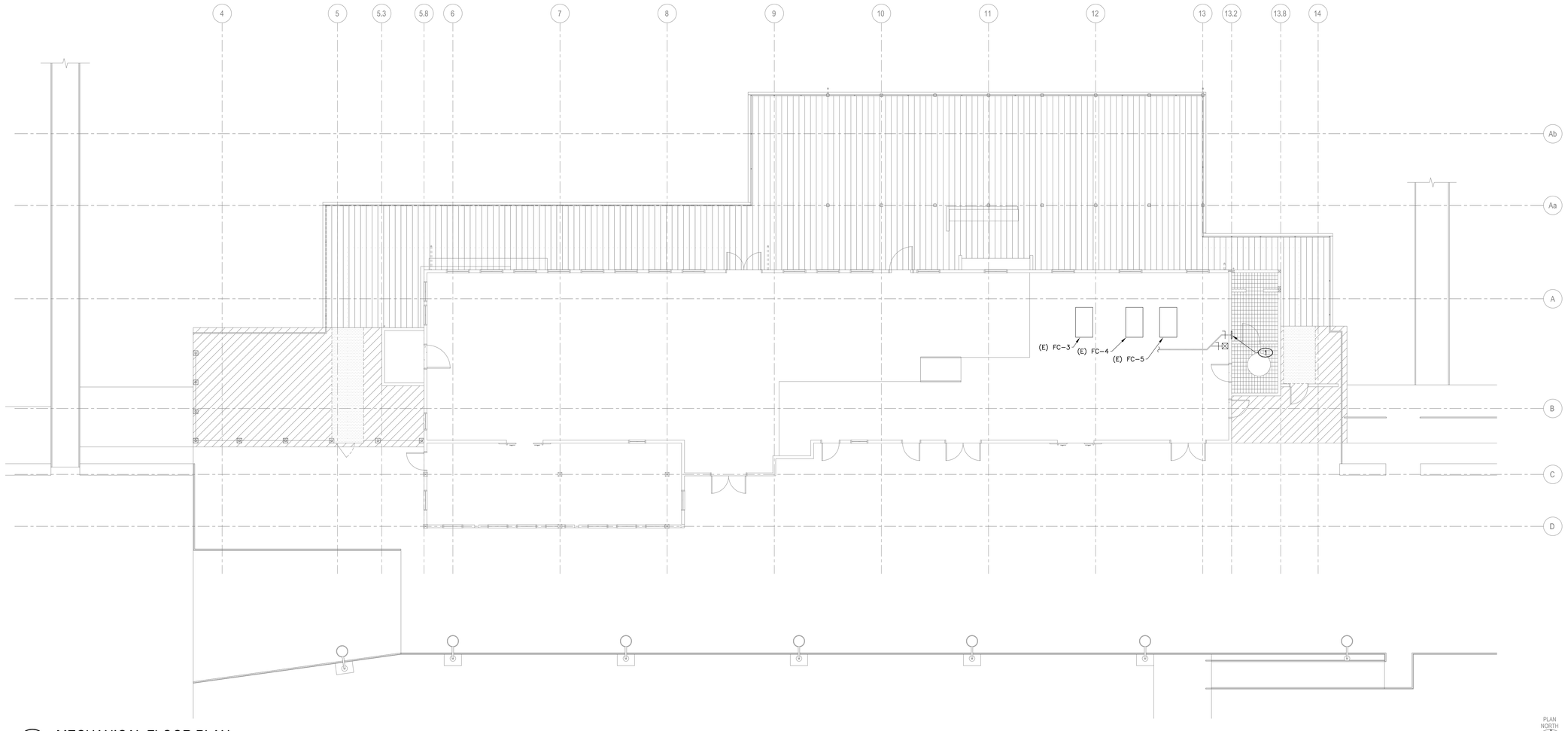
SHEET
MD111

IF THIS SHEET IS NOT 30"x42", IT IS A REDUCED PRINT - SCALE ACCORDINGLY

2"
1"
0 1/4" 2/1 1/8"

KEY NOTES

(1) REMOVE TEMPORARY CAP ON (E) SUPPLY GRILLE AFTER OFFICE RECONSTRUCTION.



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LIONAKIS PROJECT NO:	019124.02
CLIENT PROJECT NO:	

AGENCY

TITLE

MECHANICAL FLOOR PLAN

SHEET

M-111

FIRE PROTECTION NOTES

1. ALL WORKS AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN COMPLIANCE WITH THE FOLLOWING CODES AS AMENDED AND ADOPTED BY THE INSPECTION AUTHORITY. NOTHING IN THESE PLANS IS TO BE CONSTRUCTED TO PERMIT WORK NOT CONFORMING TO THESE CODES OR OTHERS APPLICABLE TO THIS PROJECT.

   A. CALIFORNIA FIRE CODE, 2022
   B. NFPA–13, 2022
   C. NFPA–24, 2019
   D. NFPA–25, 2013CA
   E. CALIFORNIA BUILDING CODE – 2022
   F. CALIFORNIA MECHANICAL CODE– 2022
   G. CALIFORNIA PLUMBING CODE – 2022
   H. CALIFORNIA ELECTRICAL CODE – 2022
   I. STATE OF CALIFORNIA ENERGY CONSERVATION TITLE 24 –REGULATIONS, 2022
   J. NATIONAL FIRE PROTECTION ASSOCIATION
   K. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

2. SEISMIC RESTRAINT: ALL PIPING SHALL CONFORM TO THE FOLLOWING CONDITIONS. SEISMIC RESTRAINTS MAY BE OMITTED ACCORDING TO NFPA 13, 2022 ED. SECTION 18.6.5:

   A. ALL OTHER PIPING 2–1/2" AND LARGER MUST BE SUSPENDED BY INDIVIDUAL HANGERS 6" OR LESS IN LENGTH FROM THE TOP OF PIPE TO THE POINT OF THE ATTACHMENT TO STRUCTURE.

3. THE CONTRACTOR SHALL SURVEY EXISTING FIELD CONDITIONS PRIOR TO BIDDING.

4. ANY DAMAGE TO NEW BUILDING ARCHITECTURAL, STRUCTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL SYSTEMS THAT OCCURS DURING INSTALLATION SHALL BE RESTORED TO THE ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE. IF LANDSCAPED AREAS INCLUDING NATURAL SPACES, MUST BE USED FOR BUILDING ACCESS THE LANDSCAPING SHALL BE RETURNED TO IT'S ORIGINAL CONDITION. THE CONTRACTOR MAY INCLUDE COSTS IN THE BID FOR THIS WORK IF THIS APPROACH IS USED. THE OWNER WILL NOT PAY ANY ADDITIONAL COSTS TO COVER DAMAGE TO THE BUILDING SYSTEMS, LANDSCAPING, OR DRIVE AREAS.

5. COORDINATE THE FOLLOWING WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWING ELEMENTS INSTALLED INCLUDING EXISTING BUILDING SYSTEMS:

   A. EXACT LOCATION OF ALL EQUIPMENT.
   B. ALL PENETRATIONS THRU ROOF, WALLS AND FLOORS.
   C. EXACT SIZE AND ROUTING OF PIPING.

6. DRAWINGS ARE DIAGRAMMATIC ONLY. PIPE, VALVES, AND EQUIPMENT SHALL FOLLOW THE ARRANGEMENT SHOWN WHILE STILL COORDINATING ROUTING AROUND OBSTRUCTIONS TO THE SPRINKLER LAYOUT.

7. INSTALLATION OF THE SPRINKLER SYSTEM SHALL NOT BE STARTED UNTIL COMPLETE PLANS AND SPECIFICATION, INCLUDING WATER SUPPLY INFORMATION, HAVE BEEN SUBMITTED AND APPROVED BY LP CONSULTING ENGINEERS AND THE FIRE MARSHAL. AT VARIOUS STAGES AND UPON COMPLETION THE SYSTEM MUST BE TESTED IN THE PRESENCE OF THE AUTHORITY HAVING JURISDICTION (AHJ).

8. ALL EXISTING FIRE PROTECTION SYSTEMS SHALL REMAIN IN OPERATION DURING ALL PHASES OF CONSTRUCTION. NO SYSTEMS ARE TO BE SHUT DOWN WITHOUT AUTHORIZATION FROM THE OWNER AND LOCAL FIRE DISTRICT.

9. THE LOCATION OF THE FIRE SPRINKLER HEADS SHALL BE COORDINATED WITH THE NEW CEILING LAYOUTS AND ALL OTHER TRADES FOR COMPLETE FIRE PROTECTION COVERAGE OF ALL AREAS. PROVIDE DETAILED PLANS FOR APPROVAL PRIOR TO INSTALLATION.

10. HEADS SHALL BE SYMMETRICALLY LOCATED IN CENTER OF CEILING PANELS. COORDINATE LAYOUT WITH CEILING OR SOFFIT LIGHT FIXTURES, HVAC DIFFUSERS AND RETURN GRILLS, SPEAKERS, FIRE ALARM DEVICES, ETC. PROVIDE PENDENT AND/OR CONCEALED TYPE SPRINKLER HEADS WHERE REQUIRED.

11. WORKMANSHIP: ALL WORK SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER ACCORDING TO THE BEST TRADE PRACTICE BY THOSE SKILLED IN THEIR PARTICULAR TRADE. PIPES, HANGERS, AND DEVICES,TO BE INSTALLED LEVEL, SQUARE OR CENTERED TO GIVE A NEAT AND PLEASING APPEARANCE. ALL EQUIPMENT IS TO BE INSTALLED STRICTLY PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE ALL WORK WITH OTHER TRADES AND ARCHITECT.

12. THE ANNULAR SPACE BETWEEN PIPE SLEEVES AND THE PIPE THROUGH ALL RATED WALLS AND FLOORS SHALL BE FIRESTOPPED. FIRESTOPPING ALL PIPE PENETRATIONS SHALL COMPLY WITH U.L REQUIREMENTS. MANUFACTURER PREAPPROVED UL PENETRATION FOR PROSET, OR APPROVED EQUAL. SUBMIT SHOP DRAWINGS.

13. BY OTHERS: A. ELECTRICAL CONTRACTOR: ALL POWER AND ALARM WIRING, CONDUITS, DISCONNECTS, AND FINAL CONNECTIONS. NO FIELD SUPPLIED ELECTRICAL DEVICE SHALL BE MOUNTED ON PIPING AND NO RIGID ELECTRICAL CONNECTIONS SHALL BE MADE B. GENERAL CONTRACTOR: CUTTING, FRAMING, PATCHING, FURRING, AND PAINTING.

14. WARRANTY:
ALL MATERIALS AND EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE GUARANTEED FREE FROM ALL FIRE PROTECTION, ELECTRICAL, AND WORKMANSHIP DEFECTS FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGES TO THE PREMISES CAUSED BY LEAKS AND/OR BREAKS IN PIPES AND FIXTURES INSTALLED UNDER THIS CONTRACT.

15. C–16 CONTRACTOR SHALL GENERATE SUBMITTAL, COORDINATED SHOP DRAWINGS AND INSTALLATION DRAWINGS AS A REFLECTION OF WHAT THE ENGINEER HAS SHOWN ON THE CONTRACT DOCUMENTS. CONTRACTOR IS EXPECTED TO CAPTURE ALL NECESSARY MODIFICATIONS TO THE LAYOUT PRIOR TO SUBMITTAL REVIEW AND INSTALLATION. SPRINKLER LAYOUT CHANGES REQUIRED AFTER THE C–16 CONTRACTOR HAS SUBMITTED SHOP DRAWINGS FOR REVIEW SHALL NOT WARRANT A CHANGE ORDER IF PLANS SUBMITTED WERE RECEIVED WITH DEFICIENCIES OR CODE VIOLATIONS.

SCOPE OF WORK

PROJECT DESCRIPTION : REPLACE EXISTING FIRE SPRINKLER SYSTEM WITH NEW FOR DEMO AREA OVERHANG OUTSIDE.

OWNER: RIO CITY CAFE

CODE ANALYSIS:

TOTAL BUILDING AREA: 2,050 SF. BUILDING HEIGHT: 1 STORY
CONSTRUCTION TYPE: V–A OCCUPANCY TYPE: A–3

VICINITY MAP

OVERHEAD FIRE SPRINKLER SYSTEM NOTES

1. NFPA 13 (2022) SEC. 6.10.2.1.1, UNDERGROUND MAINS AND LEAD–IN CONNECTIONS TO SYSTEM RISERS SHALL BE COMPLETELY FLUSHED BEFORE CONNECTION IS MADE TO THE OVERHEAD FIRE SPRINKLER PIPING SYSTEM. (WITNESSED BY THE INSPECTOR OF RECORD)

2. NFPA 13 (2022) SEC. 18.4.2, CLEARANCE SHALL BE PROVIDED AROUND ALL PIPING EXTENDING THROUGH WALLS, FLOORS, PLATFORMS AND FOUNDATIONS INCLUDING DRAINS SUCH THAT THE DIAMETER OF THE HOLES IS 2 INCHES LARGER THAN THE PIPE FOR PIPE UP TO 3", AND 4" LARGER THAN THE PIPE FOR PIPE 4" AND LARGER.

3. NFPA 13 (2022) SEC. 28.2.1, ALL INTERIOR PIPING AND APPURTENANCES SUBJECTED TO SYSTEM WORKING PRESSURE SHALL BE HYDROSTATICALLY TESTED AT 200 PSI AND SHALL MAINTAIN THAT PRESSURE WITHOUT LOSS FOR 2 HOURS. (WITNESSED BY IOR)

4. NFPA 13 (2022) SEC. 16.2.7.5, VERIFY THAT THE SPARE SPRINKLER HEAD CABINET INCLUDES A WRENCH AND NO FEWER THAN A TOTAL OF (6) SPARE SPRINKLER HEADS MATCHING THE TYPES AND TEMPERATURE RATINGS IN EACH PROTECTED BUILDING FOR SYSTEMS WITH LESS THAN 300 SPRINKLERS, AND (12) SPARE SPRINKLERS FOR SYSTEMS WITH 300–1000 SPRINKLERS.

5. NFPA 13 (2022) SEC. 18.6.1, PROVIDE RESTRAINT OF BRANCH LINES BY USING ONE OF THE FOLLOWING:

   A. A LISTED SWAY BRACE ASSEMBLY
   B. A WRAPAROUND U–HOOK SATISFYING THE REQUIREMENTS OF 9.3.5.5.11
   C. NO. 12, 440–LB WIRE INSTALLED AT LEAST 45 DEGREES FROM THE VERTICAL PLANE AND ANCHORED ON BOTH SIDES OF THE PIPE.
   D. A HANGER NO LESS THAN 45 DEGREES FROM VERTICAL INSTALLED WITHIN 6 INCHES OF THE VERTICAL HANGER ARRANGED FOR RESTRAINT AGAINST UPWARD MOVEMENT, PROVIDED IT IS UTILIZED SUCH THAT L/R DOES NOT EXCEED 400, WHERE THE ROD SHALL EXTEND TO THE PIPE OR HAVE A SURGE CLIP INSTALLED.

6. NFPA 13 (2022) SEC. 17.4.3.7, SPRIGS 4 FT OR LONGER SHALL BE RESTRAINED AGAINST LATERAL MOVEMENT TO PREVENT DAMAGE TO PIPING.

7. NFPA 13 (2022) SEC. 29.4, HYDRAULIC CALCULATION DESIGN DATA PLACARDS ARE TO BE ATTACHED TO THE FIRE SPRINKLER SYSTEM RISER.

8. NFPA 13 (2022) SEC. 29.1, THE FIRE SPRINKLER CONTRACTOR (C–16), SHALL COMPLETE AND SIGN THE CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR THE OVERHEAD FIRE SPRINKLER SYSTEM USING THE FORM IN FIGURE 25.1. THIS FORM SHALL BE GIVEN TO THE DSA PROJECT INSPECTOR WHO WILL TURN IT IN FOR DSA RECORDS.

9. NFPA 13 (2022) SEC. 29.2.3.4, THE MAIN DRAIN VALVE SHALL BE OPENED AND REMAIN OPEN UNTIL THE SYSTEM PRESSURE STABILIZES. STATIC AND RESIDUAL PRESSURES SHALL BE RECORDED ON THE CONTRACTOR'S MATERIAL AND TEST CERTIFICATE. THE TEST IS TO BE WITNESSED BY THE INSPECTOR OF RECORD – IOR.

10. GENERAL INFORMATION PLACARD SHALL BE ATTACHED TO EACH RISER PER NFPA 13 SEC. 29.6.

FIRE SPRINKLER LEGEND

1 / FP1	DETAIL DESIGNATION; DETAIL NUMBER; SHEET NO. WHERE SHOWN
##	HYDRAULIC CALCULATION REFERENCE NODE
SB2	LATERAL SEISMIC BRACE
SB1	LONGITUDINAL SEISMIC BRACE
	FOUR WAY BRACE
	FIRE SPRINKLER RISER
	GROOVED COUPLING
	BRANCH LINE HANGER DESIGNATION
	MAIN HANGER DESIGNATION
	BRANCH LINE HANGER WITH SURGE RESTRAINER
	CHANGE IN ELEVATION
	CAP
	PLUG
	VALVE

GENERAL NOTES

1. THE SYSTEM DESIGN AND INSTALLATION SHALL COMPLY WITH NFPA 13, 2022 EDITION
2. SYSTEM DESIGN IS FOR: LIGHT HAZARD
3. ALL PIPE 2" AND SMALLER SHALL BE SCHEDULE 40, GALVANIZED AT EXTERIOR PIPING STEEL ANSI/ASTM A53.
4. ALL PIPE 2 1/2" – 6" SHALL BE SCHEDULE 10, GALVANIZED AT EXTERIOR PIPING STEEL ANSI/ASTM 795
5. CITY WATER SUPPLY INFORMATION: CONTRACTOR TO CONFIRM
6. THREADED FITTINGS SHALL BE CLASS 125 THREADED DUCTILE IRON GALVANIZED THREADED OR GROOVED
7. ALL THREADED PIPE AND FITTINGS SHALL HAVE THREADS CUT TO ANSI/ASME STANDARD B1.20.1.
8. ALL PIPE WELDING SHALL BE IN COMPLIANCE WITH THE REQUIREMENTS AWS D10.9 (STANDARD FOR BUILDING SERVICE PIPING), LEVEL AR–3
9. ALL PIPE SHALL BE EARTHQUAKE BRACED AS OUTLINED IN NFPA 13, 2022 EDITION, SECTION 18.1.
10. ALL HANGER COMPONENTS AND INSTALLATION SHALL BE IN ACCORDANCE WITH NFPA 13, 2022 EDITION, SECTION 17.1.
11. ELECTRICAL WIRING AND ANY PAINTING OF THE PIPE THAT MAY BE REQUIRED SHALL BE BY OTHERS.
12. ALL NEW PIPING IS TO BE HYDROSTATICALLY TESTED TO CODE FOR A PERIOD NOT LESS THAN TWO HOURS.
13. FLOW AND TAMPER SWITCHES ARE TO BE CONNECTED TO FIRE ALARM PANEL.

FIRE PROTECTION SHEET INDEX

SHEET NO.	SHEET TITLE
FP001	FIRE PROTECTION SYMBOLS AND ABBREVIATIONS SHEET
FD111	FIRE PROTECTION DEMO FLOOR PLAN
FP111	FIRE PROTECTION FLOOR PLAN

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CLIENT
CITY OF SACRAMENTO

ISSUED

MARK	DATE	DESCRIPTION
	02/07/2025	100% CONSTRUCTION DOCUMENTS

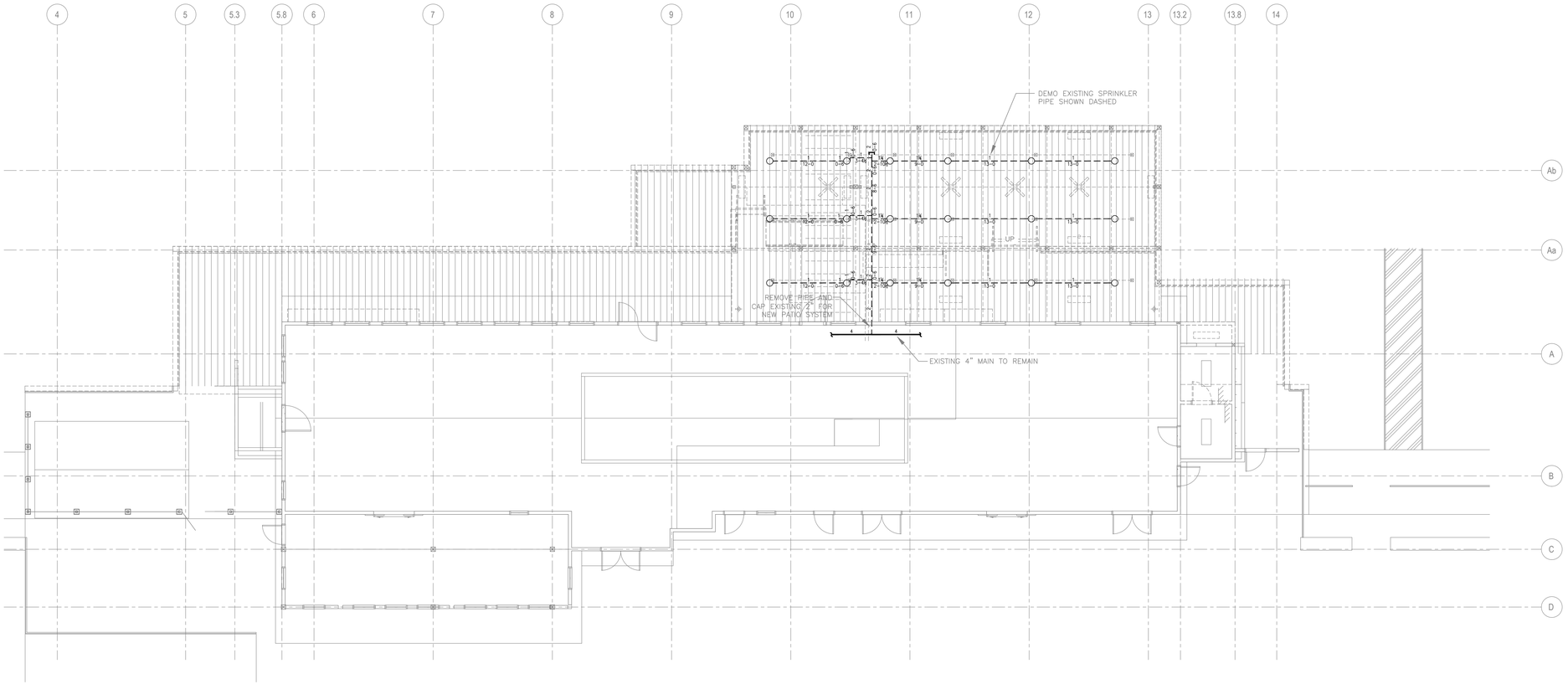
MANAGEMENT

LIONAKIS PROJECT NO: 019124.02
CLIENT PROJECT NO:

AGENCY

TITLE
FIRE SPRINKLER SYMBOLS AND ABBREVIATIONS SHEET

SHEET
FP001



LIONAKIS

2025 Nineteenth Street
Sacramento, CA 95818
P 916.558.1900
www.lionakis.com

CONSULTANT

MEP & FS / Sustainability / CxA

1209 Pleasant Grove Blvd.
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CONSULTING ENGINEERS

www.lpengineers.com
Job #: 21-2249

SEAL

REGISTERED PROFESSIONAL ENGINEER
SEAN POURVAZIR
M 32311
REN. 6-30-25
MECHANICAL
STATE OF CALIFORNIA

PROJECT

RIO CITY CAFE DECK REPAIR

1110 FRONT ST.
SACRAMENTO, CA 95814

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MANAGEMENT

LIONAKIS PROJECT NO:	019124.02
CLIENT PROJECT NO:	
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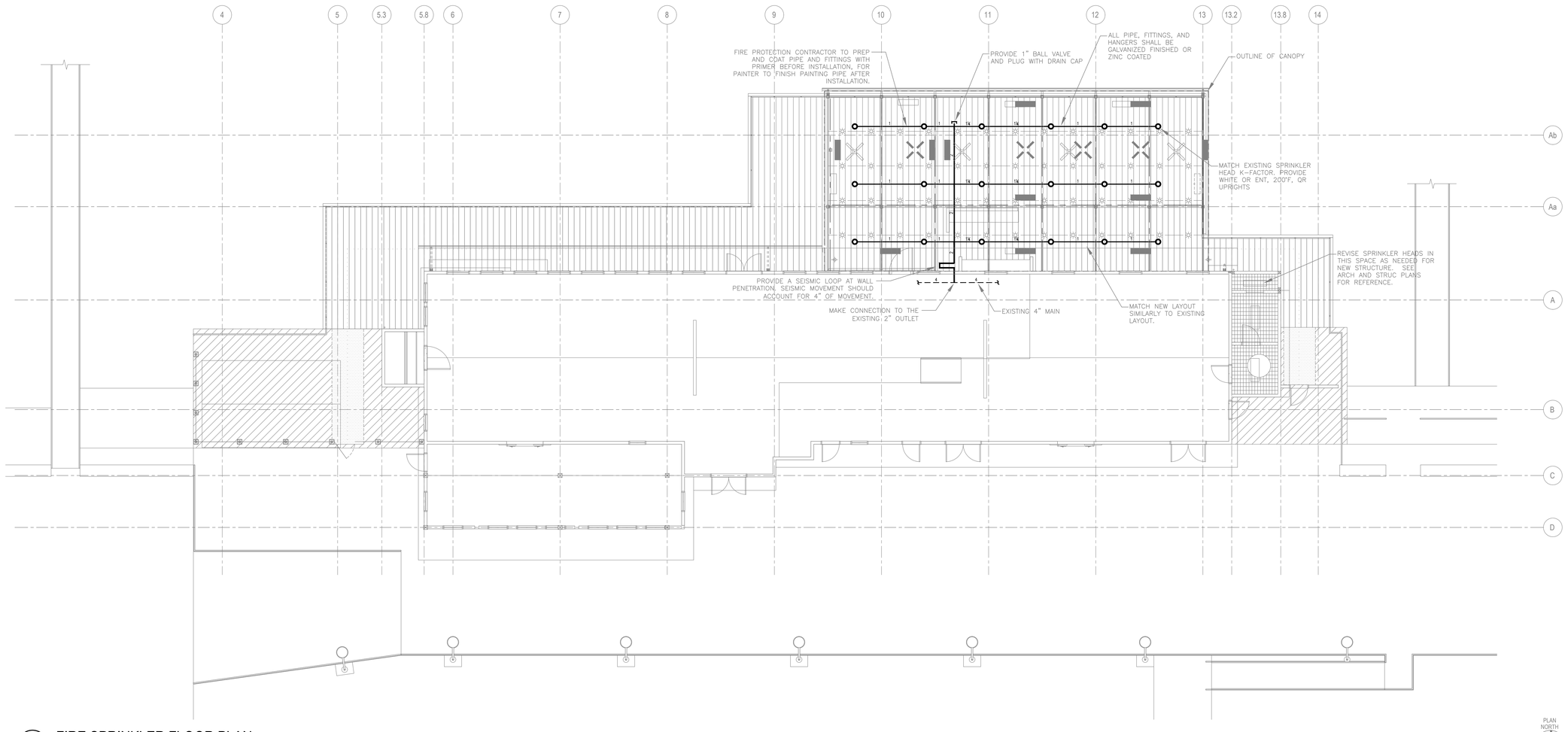
AGENCY

TITLE

FIRE SPRINKLER DEMO FLOOR PLAN

SHEET

FD111



1 FIRE SPRINKLER FLOOR PLAN
SCALE 1/8" = 1'-0"

PLAN NORTH

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FIRE SPRINKLER FLOOR PLAN

SHEET

FP111

RESOLUTION NO.

Adopted by the Sacramento City Council

April 1, 2025

Contract Supplements and Budgetary Adjustments for the Rio City Café Deck Repair Project (B18119000)

BACKGROUND

A. The outdoor dining deck overlooking the Sacramento River, located at 1110 Front Street in Old Sacramento, was evaluated by a local Engineering firm, Lionakis and was deemed unsafe and in need of replacement in 2019.

B. Lionakis has prepared a complete set of construction drawings, specifications and calculations to remove and replace the deck.

C. In August of 2022, the City Council suspended competitive bidding to allow the use of a design-assist approach to construction based on the complexity of removing and replacing the deck located over the Sacramento River.

D. In September of 2022, RFQ Q22014541002 was issued soliciting design assist construction companies for the demolition and construction of a new deck.

E. Traimid Construction of Central California (Triamid) was chosen as the design assist contractor.

F. Based on the complete set of construction documents prepared by Lionakis, Triamid has bid out all sub-contracts and developed a Guaranteed Maximum Price (GMP) of $2,129,757.00.

BASED ON THE FACTS SET FORTH IN THE BACKGROUND, THE CITY COUNCIL RESOLVES AS FOLLOWS:

Section 1. The Interim City Manager or the interim City Manager's designee is authorized to execute Contract Supplement No. 1 to City Agreement No. 2023-0918 with Traimid Construction of Central California increasing the not-to-exceed amount by $2,949,829 for a new total not-to-exceed amount of $3,129,757.

Section 2 Increase the Interim City Manager's change order authority to six percent ($187,785) of the new not-to-exceed amount of $3,129,757 for the construction phase of the Rio City Deck Replacement Project.

Section 3 The costs for reconstruction of the new deck are estimated at $3,073,352 in contract costs. In addition, the City may incur construction management and other administrative costs as the project progresses.

Section 4 The City has been awarded approximately $4.6 million in grant funds from the State of California for Riverfront safety and pedestrian improvements. These funds will be allocated to the Old Sac Revitalization and Improvement Project (C15002100) to restore the deck, and these improvements will create a safer environment for the community.